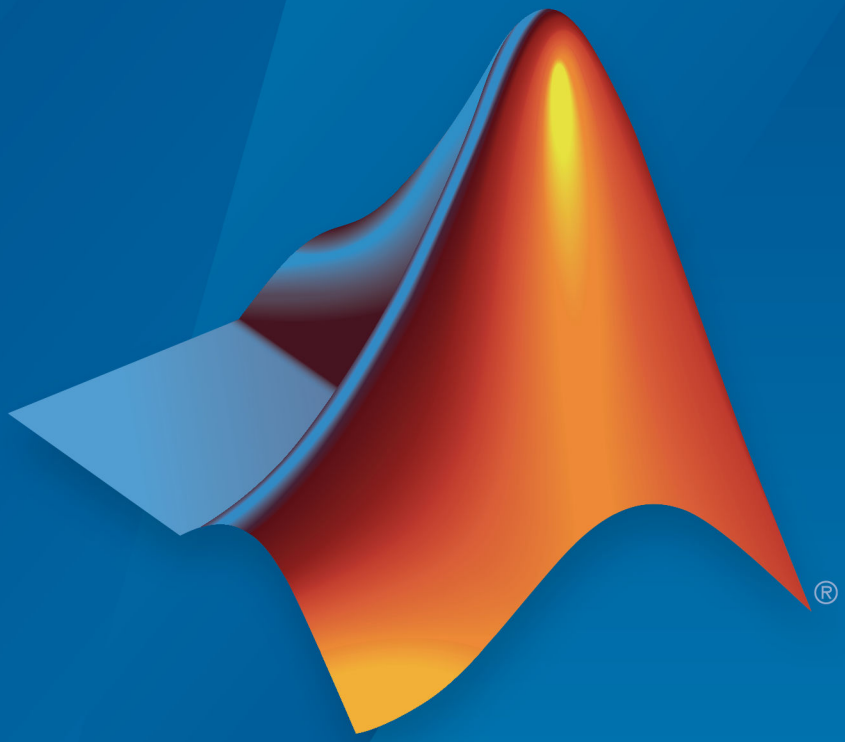
Database Toolbox™

User's Guide



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Before You Begin

Database Toolbox Product Description

Exchange data with relational and nonrelational databases

Database Toolbox provides functions and an app for working with relational databases. It includes support for nonrelational databases, and provides a native SQLite database. You can access data in relational databases using SQL commands, or use the Database Explorer app to interact with a database without using SQL.

The toolbox can connect to any ODBC- or JDBC-compliant relational database, including Oracle®, SAS®, MySQL®, Microsoft® SQL Server®, Microsoft Access™, and PostgreSQL. You can create, query, and manipulate native SQLite relational databases without additional software or database drivers.

The toolbox supports nonrelational databases Neo4j® and MongoDB®. The Neo4j interface lets you access data stored as graphs or queried using nongraph operations. The NoSQL database interface to MongoDB provides access to unstructured data.

The toolbox lets you access multiple databases simultaneously within a single session and enables segmented import of large data sets using DatabaseDatastore. You can split SQL queries and parallelize access to data (with MATLAB® Distributed Computing Server™ and Parallel Computing Toolbox™).

Key Features

- Database Explorer app for working with databases interactively
- JDBC- and ODBC-compliant database connections, with fast read/write via a native ODBC interface
- Functions for executing queries using SQL files and SQL statements
- Data import and export with multiple databases in a single session
- Large data set import via a single transaction, via multiple transactions, or as a DatabaseDatastore object
- Direct data import into numeric, cell, structure, table, and dataset arrays
- Support for NoSQL databases MongoDB and Neo4j

Data Type Support

You can import these data types into the MATLAB workspace and export them back to your database.

Database	Supported Data Type
All databases	• `BOOLEAN` • `CHAR` • `DATE` • `DECIMAL` • `DOUBLE` • `FLOAT` • `INTEGER` • `NUMERIC` • `REAL` • `SMALLINT` • `TIME` • `TIMESTAMP` **Note** When importing `TIMESTAMP` data into MATLAB, you can get an incorrect value at the daylight savings time change. To avoid an incorrect value, convert `TIMESTAMP` data to strings in your SQL query. Then, convert the strings back to the MATLAB data type you want. Or, connect to your database using a different driver.

Database	Supported Data Type
Microsoft SQL Server	• `NTEXT` • `TEXT` • `VARCHAR(MAX)` • `CHAR(8000)` • `NCHAR(4000)` • `NVARCHAR(MAX)` • `TINYINT`
MySQL	• `MEDIUMTEXT` • `LONGTEXT` • `TINYINT`
Oracle	• `LONG` • `VARCHAR2(4000)` • `NCHAR(2000)` • `NVARCHAR2(4000)`

To import data of another data type, manipulate the data before importing it into the MATLAB workspace. For details, see your database documentation.

See Also

`datainsert` | `exec` | `fastinsert` | `fetch` | `insert` | `update`

More About

- “Connecting to Database Using Native ODBC Interface” on page 3-17
- “Import Data from Databases into MATLAB” on page 5-2
- “Export Data to New Record in Database” on page 5-20

Data Retrieval Restrictions

In this section...

Spaces in Table Names or Column Names

Microsoft Access supports the use of spaces in table and column names, but most other databases do not. Queries that retrieve data from tables and fields whose names contain spaces require delimiters around table names and field names. In Access, enclose the table names or field names in quotation marks, for example, `"order id"`. Other databases use different delimiters, such as brackets, [ ].

Quotation Marks in Table Names or Column Names

Do not include quotation marks in table names or column names. The Database Toolbox software does not support data retrieval from table and column names that contain quotation marks.

Reserved Words in Column Names

You cannot use the Database Toolbox software to import or export data in columns whose names contain database reserved words, such as `DATE` or `TABLE`.

See Also

More About

- “Data Import Using Database Explorer App or Command Line” on page 2-143

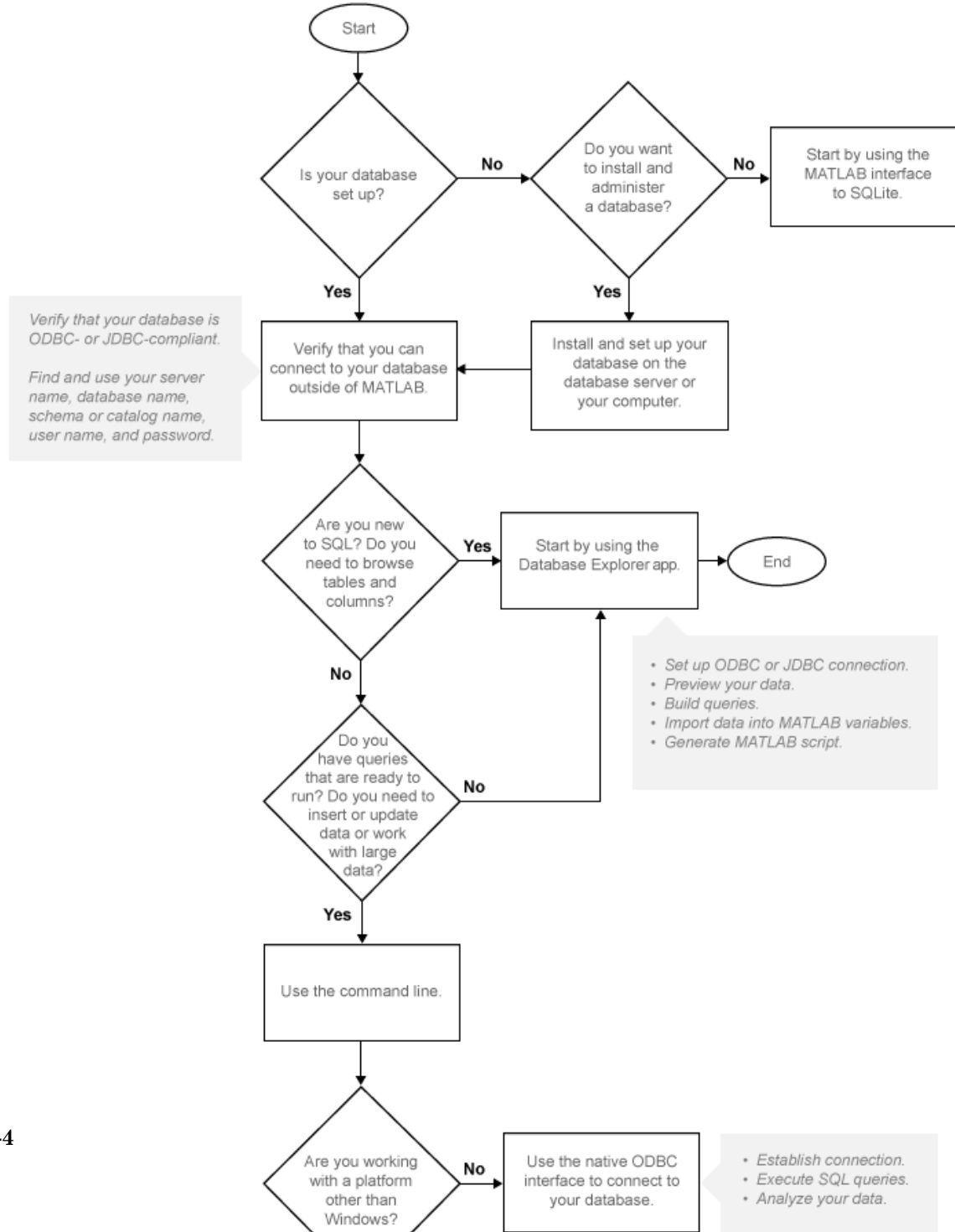
Getting Started with Database Toolbox

Access Relational Database Data in MATLAB

This tutorial shows how to use Database Toolbox with relational databases. To gain the maximum benefit from this toolbox and understand its capabilities, use the following steps and decision flow chart.

1. If you do not have an installed database and want to store relational data quickly, use the MATLAB interface to SQLite. For details, see "Working with MATLAB Interface to SQLite" on page 2-6.
2. Install your database. For details, refer to your database administrator or your database documentation.
3. Choose between using the **Database Explorer** app or the command line.
4. Choose between using an ODBC driver or a JDBC driver. For details, see "Choosing Between ODBC and JDBC Drivers" on page 2-13.
5. For ODBC drivers, the driver is typically preinstalled on your computer. For JDBC drivers, install the driver. For details about ODBC and JDBC drivers, see Driver Installation. If you have questions about which driver you need, refer to your database administrator or your database documentation.
6. Create a data source for ODBC-compliant drivers. For JDBC-compliant drivers, add the full path of the driver to the static Java® class path. Then, create a data source for JDBC-compliant drivers. For details, see "Configuring Driver and Data Source" on page 2-15.
7. Test the connection to your database using the Database Explorer app or the command line.
8. Connect to your database using the Database Explorer app or the command line. For details, see "Connecting to Database" on page 2-140.
9. Select data from your database and import the data into a MATLAB variable by using the Database Explorer app or the command line. For details, see "Data Import Using Database Explorer App or Command Line" on page 2-143.
10. Insert data into your database by exporting data from a MATLAB variable. For details, see "Inserting Data Using Command Line" on page 2-146.
11. When you use the Database Explorer app to import data, generate a MATLAB script to automate your tasks. For details, see "Generate MATLAB Script" on page 4-18.

This flow chart illustrates the steps to take and the decisions to make when you use Database Toolbox with relational databases.


Start
Is your database set up?
No
Do you want to install and administer a database?
No
Start by using the MATLAB interface to SQLite.
Yes
Yes
Verify that your database is ODBC- or JDBC-compliant.
Find and use your server name, database name, schema or catalog name, user name, and password.
Verify that you can connect to your database outside of MATLAB.
Install and set up your database on the database server or your computer.
Are you new to SQL? Do you need to browse tables and columns?
Yes
Start by using the Database Explorer app.
End
No
• Set up ODBC or JDBC connection.
• Preview your data.
• Build queries.
• Import data into MATLAB variables.
• Generate MATLAB script.
Do you have queries that are ready to run? Do you need to insert or update data or work with large data?
No
Yes
Use the command line.
Are you working with a platform other than Windows?
No
Use the native ODBC interface to connect to your database.
• Establish connection.
• Execute SQL queries.
• Analyze your data.

See Also

More About

- “Setup Requirements for Database Connection” on page 2-12
- “Choosing Between ODBC and JDBC Drivers” on page 2-13
- “Configuring Driver and Data Source” on page 2-15
- “Connecting to Database” on page 2-140
- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Working with MATLAB Interface to SQLite” on page 2-6

Working with MATLAB Interface to SQLite

To analyze your data using SQL in MATLAB without access to a database or driver, use the MATLAB interface to SQLite. After installing Database Toolbox, you can use the MATLAB interface to SQLite to move data between MATLAB and a SQLite database file. The SQLite connection is different from a database connection created using a JDBC driver. For background information about SQLite databases, see SQLite Home Page. To use all the Database Toolbox functionality, install the SQLite JDBC driver and connect to your SQLite database file using a URL string. For details, see “Configuring Driver and Data Source” on page 2-15.

In this section...

MATLAB Interface to SQLite Advantages

The advantages of using the MATLAB interface to SQLite are:

- Start working with data immediately after installing the Database Toolbox by creating a SQLite database file.
- No installation or administration of software or drivers required.
- Share data using SQLite database files.
- Support for Windows®, Linux®, and Mac.

SQLite JDBC Connection Differences

The following table describes the differences between the MATLAB interface to SQLite and connecting to a SQLite database using the JDBC driver.

	SQLite Connection Using the MATLAB Interface to SQLite	SQLite Database Connection Using a JDBC Driver
Driver installation	Not required	Required
Database installation	Not required	Required

	SQLite Connection Using the MATLAB Interface to SQLite	SQLite Database Connection Using a JDBC Driver
Database administration	Not required	Required
Database connection function	`sqlite`	`database`
Import data	Yes	Yes
Export data	Yes	Yes
Database Explorer	No	Yes
Run stored procedures	No	Yes
Database metadata	No	Yes
Other complex database operations and functionality	No	Yes

MATLAB Interface to SQLite Workflow

To connect to a database quickly and import data, use the MATLAB interface to SQLite. These steps provide a high-level workflow for using the MATLAB interface to SQLite.

1. Create a SQLite database file using `sqlite`. The SQLite database file has a `.db` extension.
2. Create tables in the SQLite database file using `exec`.
3. Export your data into the SQLite database file using `insert`.
4. Import data into MATLAB using `fetch`.
5. Perform data analysis in MATLAB.
6. Export results into the SQLite database file using `insert`.
7. Close the SQLite connection using `close`.
8. Share the SQLite database file with others.

MATLAB Interface to SQLite Limitations

The limitations of using the MATLAB interface to SQLite are:

- Only `DOUBLE`, `INT64`, and `CHAR` data types are supported.

- `NULL` values in columns are not supported.
- Database Explorer is not supported. Use the command line.

See Also

`close` | `exec` | `fetch` | `insert` | `sqlite`

Related Examples

- “Import Data Using MATLAB® Interface to SQLite” on page 5-67

More About

- “Access Relational Database Data in MATLAB” on page 2-3
- “Configuring Driver and Data Source” on page 2-15

External Websites

- SQLite Home Page

Connection Options

You can connect to a database in various ways using Database Toolbox. If you have access to a database, create a data source. Then, you can connect to the database either by using the **Database Explorer** app or the command line. If you do not have an installed database and want to store relational data quickly, you can use the MATLAB interface to SQLite. For details, see "Working with MATLAB Interface to SQLite" on page 2-6.

Creating or Connecting to Data Source

If you already have a database driver installed, you can create a data source. For an ODBC driver, use the Microsoft ODBC Data Source Administrator. For a JDBC driver, add the path of the driver to the Java class path in MATLAB. For examples, see "Configuring Driver and Data Source" on page 2-15. Otherwise, see Driver Installation for information about installing your driver. If your data sources are defined, then you are ready to connect to your database. For details, see "Connecting to Database" on page 2-140. After establishing a connection, you can explore the database and view data using the **Database Explorer** app or the command line. For details, see "Data Import Using Database Explorer App or Command Line" on page 2-143.

Defining Operating System Authentication

Operating system authentication enables you to connect to a database using your operating system user account. The operating system performs user validation, and the database does not require a different user name and password. Operating system authentication facilitates the maintenance of database access credentials. For example, Windows provides operating system authentication that can be configured to work with a Microsoft SQL Server database. For details about Microsoft SQL Server Windows authentication, see Set up the operating system authentication. on page 2-34

Connection Options

Use this table to choose your best connection option.

Connection Option	Why Use This Option?
Database Explorer app	Use the Database Explorer app to: • Visually inspect the structure, or schema, of a database. • Assess the general size of a database by viewing the database structure. • Select the data in a table and import it into a MATLAB variable. • Generate a MATLAB script. • Generate an SQL query.
Command line	Use the command line to: • Import data from a database into MATLAB. • Export data from MATLAB into a database. • Work with large amounts of data. • Run SQL queries stored in text files. • Run stored procedures and functions.

There are multiple options to connect to your database using the command line. Use this table to choose your best connection option.

Command-Line Connection Option	Why Use This Option?
ODBC connection	Connect to your database with maximum performance. For details, see “Connecting to Database Using Native ODBC Interface” on page 3-17.
JDBC connection	Achieve maximum platform independence. Use functionality not supported by native ODBC.
SQLite connection	Import data without installing a database or a driver. For details, see “Working with MATLAB Interface to SQLite” on page 2-6.

You can create multiple connections at a time to the same database or a different database. For creating multiple connections using the Database Explorer app, see “Create SQL Queries Using Database Explorer App” on page 4-2. Or, you can use the `database` function to create multiple connections at the command line.

See Also

`database`

More About

- “Choosing Between ODBC and JDBC Drivers” on page 2-13
- “Connecting to Database” on page 2-140
- “Connecting to Database Using Native ODBC Interface” on page 3-17
- “Data Import Using Database Explorer App or Command Line” on page 2-143
- “Working with MATLAB Interface to SQLite” on page 2-6

Setup Requirements for Database Connection

Refer to these setup requirements to establish the first connection to a database.

- If you do not have an installed database and want to store relational data quickly, use the MATLAB interface to SQLite. For details, see “Working with MATLAB Interface to SQLite” on page 2-6.
- Ensure that you know the name of your database server or machine, the name of your database, the port number, and your user name and password. For ODBC drivers, once you create a data source, remember the data source name. For JDBC drivers, ensure that you know the file path where the JDBC driver is installed. For some JDBC drivers, you also need the URL string and the driver Java class object. For some databases, more credentials are required. Contact your database administrator for all required database credentials to establish a connection to the database.
- Ensure that you have access to your database and driver documentation.
- Determine if your database uses operating system authentication. If you can connect to your database from outside of MATLAB without providing a user name and password, then your database uses operating system authentication. Exceptions to this rule are databases set up without any operating system or database authentication requirements, such as Microsoft Access and SQLite database files. Connecting to a database using operating system authentication from MATLAB can require additional steps.
- Ensure that you have write access to the path MATLAB displays after you execute `prefdir` at the command line.
- For ODBC data sources, ensure that you have administrator rights to the database for creating and modifying data sources.

See Also

`database`

More About

- “Access Relational Database Data in MATLAB” on page 2-3
- “Connecting to Database” on page 2-140

Choosing Between ODBC and JDBC Drivers

In this section...

Defining Database Drivers

Database vendors, such as Microsoft and Oracle, implement their database systems using technologies that vary depending on customer needs, market demands, and other factors. Software applications written in popular programming languages, such as C, C++, and Java, need a way to communicate with these databases. Open Database Connectivity (ODBC) and Java Database Connectivity (JDBC) are standards for drivers that enable programmers to write database-agnostic software applications. ODBC and JDBC provide a set of rules recommended for efficient communication with a database. The database vendor is responsible for implementing and providing drivers that follow these rules.

Deciding Between ODBC and JDBC Drivers

ODBC is a standard Microsoft Windows interface that enables communication between database management systems and applications typically written in C or C++.

JDBC is a standard interface that enables communication between database management systems and applications written in Oracle Java.

Database Toolbox has a C++ library that connects natively to an ODBC driver. Database Toolbox has a Java library that connects directly to a pure JDBC driver.

Depending on your environment and what you want to accomplish, decide whether using an ODBC driver or a JDBC driver meets your needs.

Use native ODBC for:

- Fastest performance for data imports and exports
- Memory-intensive data imports and exports

Use JDBC for:

- Platform independence, allowing you to work with any operating system (including Mac and Linux), driver version, or bitness
- Access to Database Toolbox functions not supported by the native ODBC interface (such as `runstoredprocedure`)

See Also

`close` | `database`

More About

- "Access Relational Database Data in MATLAB" on page 2-3
- "Connection Options" on page 2-9
- "Configuring Driver and Data Source" on page 2-15
- "Connecting to Database" on page 2-140
- "Connecting to Database Using Native ODBC Interface" on page 3-17
- "Working with Large Data Sets" on page 2-148

Configuring Driver and Data Source

To connect to an installed database, install the driver. Then, define a data source for ODBC or add the full path of the driver to the static Java class path for JDBC. If you do not have an installed database and want to store relational data quickly, you can use the MATLAB interface to SQLite. For details, see "Working with MATLAB Interface to SQLite" on page 2-6.

ODBC uses a Data Source Name (DSN) that is the logical name to refer to the drive and other required information for accessing data. This name is used to connect to an ODBC data source, such as a Microsoft SQL Server database.

Find your database environment in the following table by choosing your platform across the top and your database on the left. The link brings you to a page that has all the required steps for connecting to your database.

Database	Platform		
	Windows	macOS 64-bit	Linux 64-bit
Microsoft Access	"Microsoft Access ODBC for Windows" on page 2-18		
Microsoft SQL Server	"Microsoft SQL Server ODBC for Windows" on page 2-24 "Microsoft SQL Server JDBC for Windows" on page 2-31	"Microsoft SQL Server JDBC for macOS" on page 2-82	"Microsoft SQL Server JDBC for Linux" on page 2-87
Oracle	"Oracle ODBC for Windows" on page 2-41 "Oracle JDBC for Windows" on page 2-47	"Oracle JDBC for macOS" on page 2-93	"Oracle JDBC for Linux" on page 2-99

Database	Platform		
	Windows	macOS 64-bit	Linux 64-bit
MySQL	"MySQL ODBC for Windows" on page 2-54 "MySQL JDBC for Windows" on page 2-60	"MySQL JDBC for macOS" on page 2-105	"MySQL JDBC for Linux" on page 2-110
PostgreSQL	"PostgreSQL ODBC for Windows" on page 2-65 "PostgreSQL JDBC for Windows" on page 2-71	"PostgreSQL JDBC for macOS" on page 2-115	"PostgreSQL JDBC for Linux" on page 2-120
SQLite	"SQLite JDBC for Windows" on page 2-76	"SQLite JDBC for macOS" on page 2-125	"SQLite JDBC for Linux" on page 2-131

Microsoft Access is not supported for Mac 64-bit and Linux 64-bit platforms.

For ODBC- or JDBC- compliant databases that are not listed in the table, see "Other ODBC- or JDBC-Compliant Databases" on page 2-137.

See Also

`close` | `database`

More About

- "Access Relational Database Data in MATLAB" on page 2-3
- "Setup Requirements for Database Connection" on page 2-12
- "Choosing Between ODBC and JDBC Drivers" on page 2-13
- "Connecting to Database" on page 2-140
- "Modify and Delete Data Sources" on page 4-14

- “Working with MATLAB Interface to SQLite” on page 2-6

Microsoft Access ODBC for Windows

This tutorial shows how to set up a data source and connect to a Microsoft Access database using the Database Explorer app or the command line. This tutorial uses the Microsoft Access Driver (*.mdb, *accdb) to connect to a sample Microsoft Access 2010 database.

Step 1. Setup the sample Access database.

You can access the sample database file, `tutorial.mdb`, in the folder returned by entering this code at the command line.

```
fullfile(matlabroot,'toolbox','database','dbdemos')
```

Copy this database file into a folder where you have permission to write. Ensure that the database file is writable by verifying its properties:

1. Right-click the database file and select **Properties**.
2. On the **General** tab, if the **Read-only** option is selected, clear it.

Note Depending on the Access version you are running, you might need to convert the database to that version. For example, beginning in Access 2007, the software includes the option to save as `*.accdb`. For details, consult your database administrator.

Step 2. Verify the driver installation.

The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

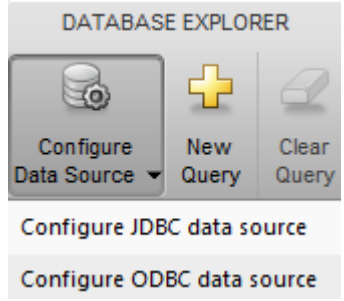
Note Database Toolbox no longer supports connecting to a database using a 32-bit driver. Use the 64-bit version of Access. Or, to connect to the 32-bit version of Access, see http://www.mathworks.com/matlabcentral/answers/235949-how-to-connect-to-32-bit-microsoft-access-database-from-64-bit-matlab. For details about working with the 64-bit version of Windows, see http://www.mathworks.com/products/matlab/preparing-for-64-bit-windows.html.

Step 3. Set up the data source using the Database Explorer app.

Set up the sample Access database as the data source by using the Database Explorer app. You can locate the target database on a PC running the Windows operating system or on another system to which the PC is networked. These instructions use the Microsoft ODBC Data Source Administrator Version 6.1 for the US English version of Microsoft Access 2010 for Windows systems.

The Database Explorer app accesses the Microsoft ODBC Data Source Administrator automatically when you configure an ODBC data source. Alternatively, you can access the Microsoft ODBC Data Source Administrator using the `configureODBCDataSource` function.

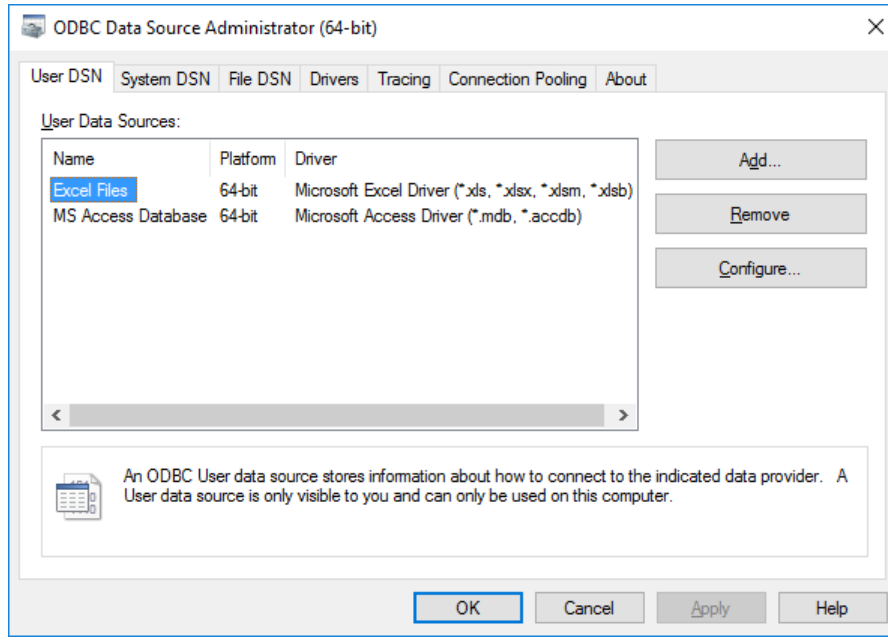
1. Close any open Access databases.
2. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
3. Select **Configure Data Source > Configure ODBC data source**.



In the ODBC Data Source Administrator dialog box, you define the ODBC data source.

Tip When setting up an ODBC data source, you can specify a user data source name (DSN) or a system DSN. A user DSN is specific to the person logged into a machine. Only this person sees the data sources that are defined on the user DSN tab. A system DSN is not specific to the person logged into a machine. Any person who logs into the machine can see the data sources that are defined on the system DSN tab. Your ability to set up a user DSN or system DSN depends on the database and

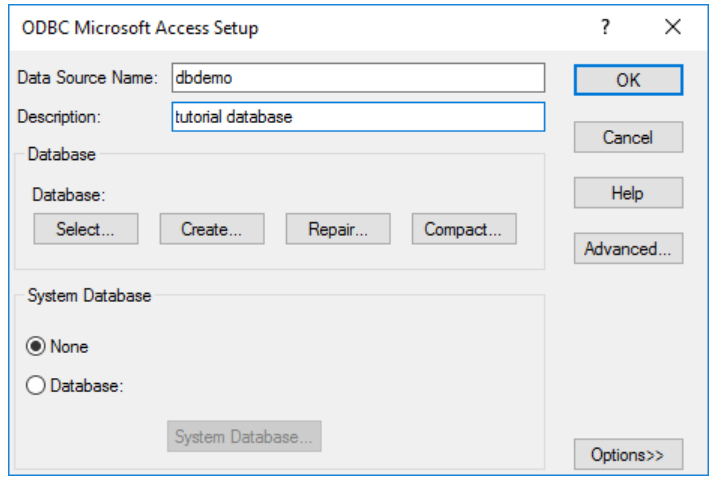
ODBC driver you are using. For details, contact the database administrator or refer to the ODBC driver documentation.



4 On the **User DSN** tab, click **Add**. The Create New Data Source dialog box opens and displays a list of installed ODBC drivers.

5 Select `Microsoft Access Driver (*.mdb, *.accdb)` and click **Finish**.

6 In the ODBC Microsoft Access Setup dialog box for your driver, enter `dbdemo` as the data source name. Enter `tutorial database` as the description.



7 Click **Select** to open the Select Database dialog box, where you specify the database you want to use. For the `dbdemo` data source, select `tutorial.mdb`. If the database is on a system to which your PC is connected:

   a Click **Network**.

   b In the Map Network Drive dialog box, specify the folder containing the database you want to use. Ensure that you map to the *folder* and not the database file.

   c Click **Finish**.

8 Click **OK** to close the Select Database dialog box. In the ODBC Microsoft Access Setup dialog box, click **OK**. The ODBC Data Source Administrator dialog box displays the `dbdemo` data source and any additional data sources that you added on the **User DSN** tab. Click **OK** to close the dialog box.

After you complete the data source setup, connect to the Access database using the Database Explorer app or the command line with the native ODBC connection.

Step 4. Connect using the Database Explorer app or the command line.

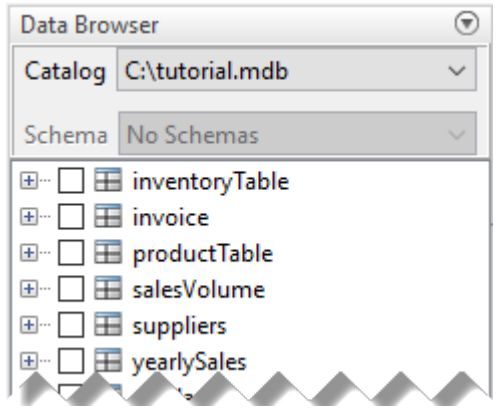
Connect to Access Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source `dbdemo` from the **Data Source** list.

3 Leave the **Username** and **Password** boxes blank, and click **Connect**.

The Database Explorer app connects to the database and displays a list of its objects, such as tables, in the **Data Browser** pane. The data source tab named **dbdemo** appears to the right of the pane. The data source tab contains empty **SQL Query** and **Data Preview** panes.



4 Select tables in the **Data Browser** pane to query the database.

5 Close the **dbdemo** data source tab to close the SQL query and the database connection.

Tip If multiple database connections to different databases are open, then close the Database Explorer app to close all database connections.

Connect to Access Using ODBC Driver and Command Line

1 Connect to the database with the ODBC data source name. For example, this code assumes that you are connecting to a data source named `dbdemo` with a blank user name and password.

```
conn = database('dbdemo','','');
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps
Database Explorer

Functions
`close` | `database`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Microsoft SQL Server ODBC for Windows

This tutorial shows how to set up a data source and connect to a Microsoft SQL Server database using the Database Explorer app or the command line. This tutorial uses the Microsoft ODBC Driver 13.1 for SQL Server to connect to a Microsoft SQL Server 2016 Express database.

In this section...

Step 1. Verify the driver installation.

The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

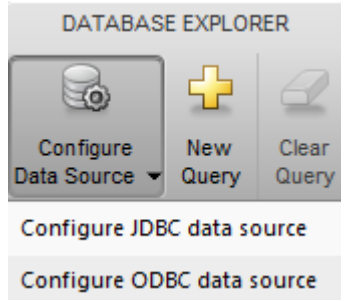
Note Database Toolbox no longer supports connecting to a database using a 32-bit driver. Use the 64-bit version of SQL Server. If you have issues working with the ODBC driver, use the JDBC driver instead. For details, see “Microsoft SQL Server JDBC for Windows” on page 2-31. For details about working with the 64-bit version of Windows, see http://www.mathworks.com/products/matlab/preparing-for-64-bit-windows.html.

Step 2. Set up the data source using the Database Explorer app.

The Database Explorer app accesses the Microsoft ODBC Data Source Administrator automatically when you configure an ODBC data source. Alternatively, you can access the Microsoft ODBC Data Source Administrator using the `configureODBCDataSource` function.

1 Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.

2 Select **Configure Data Source** > **Configure ODBC data source**.



In the ODBC Data Source Administrator dialog box, you define the ODBC data source.

Tip When setting up an ODBC data source, you can specify a user data source name (DSN) or a system DSN. A user DSN is specific to the person logged into a machine. Only this person sees the data sources that are defined on the user DSN tab. A system DSN is not specific to the person logged into a machine. Any person who logs into the machine can see the data sources that are defined on the system DSN tab. Your ability to set up a user DSN or system DSN depends on the database and ODBC driver you are using. For details, contact the database administrator or refer to the ODBC driver documentation.

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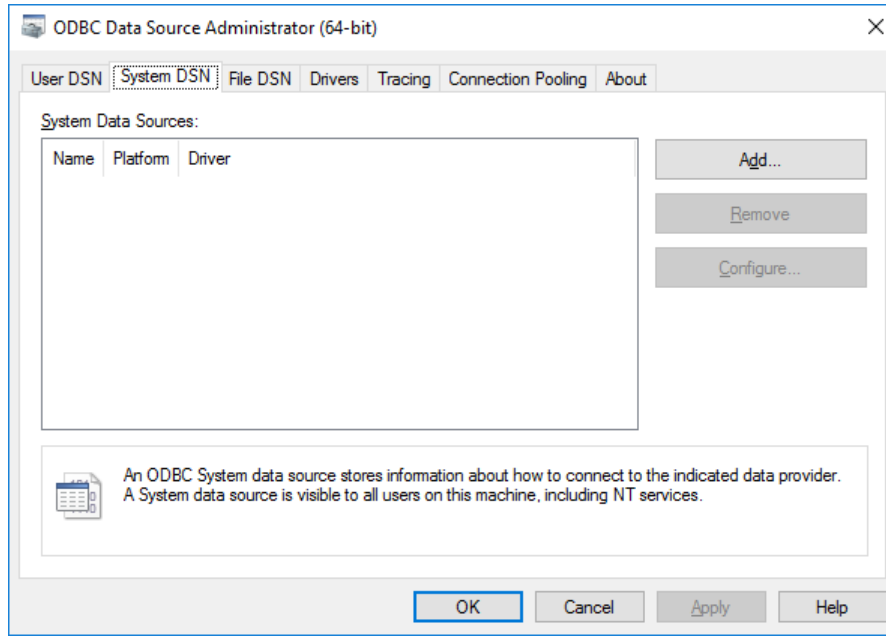
3 Click the **System DSN** tab, and then click **Add**.



The Create New Data Source dialog box opens and displays a list of installed ODBC drivers.

4 Select `SQL Server Native Client 11.0`.

Note The name of the ODBC driver can vary.

Click **Finish**.

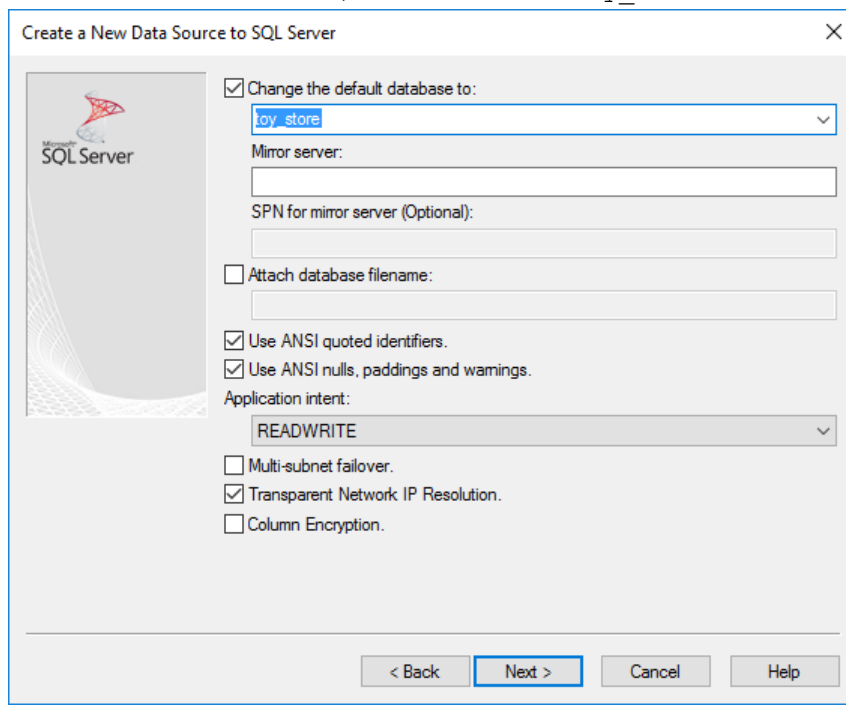
5 In the Create a New Data Source to SQL Server dialog box, enter an appropriate name for the data source. You use this name to establish a connection to your database. Here, in the **Name** box, enter `MS SQL Server` as the data source name. In the **Description** box, enter `Microsoft SQL Server` as the description. From the **Server** list, select the database server for this data source to use. Consult your database administrator for the name of your database server. Click **Next**.

6 You can set up an ODBC data source with or without Windows authentication.

If you want to connect to SQL Server using Windows authentication, select **With Integrated Windows Authentication**. Then click **Next**.

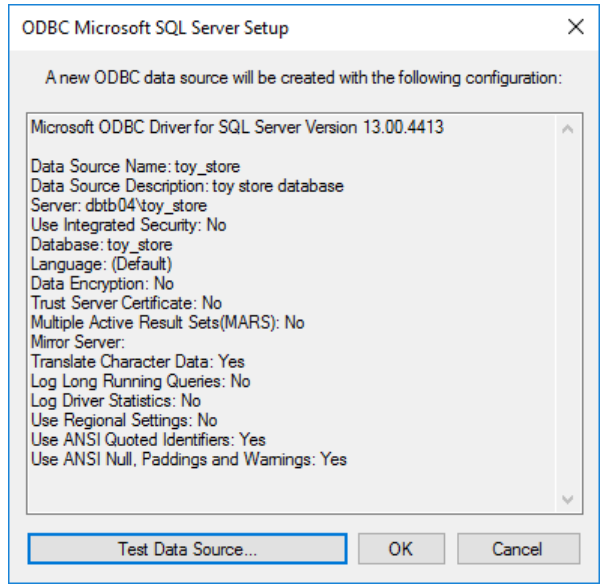
Or, if you want to connect to SQL Server without Windows authentication, select **With SQL Server authentication using a login ID and password entered by the user**. Enter your user name in the **Login ID** box and your password in the **Password** box. Then click **Next**.

7 In the Create a New Data Source to SQL Server dialog box, select **Change the default database to** and enter the name of the default database on the database server for connection. Here, use the database `toy_store`. Then click **Next**.

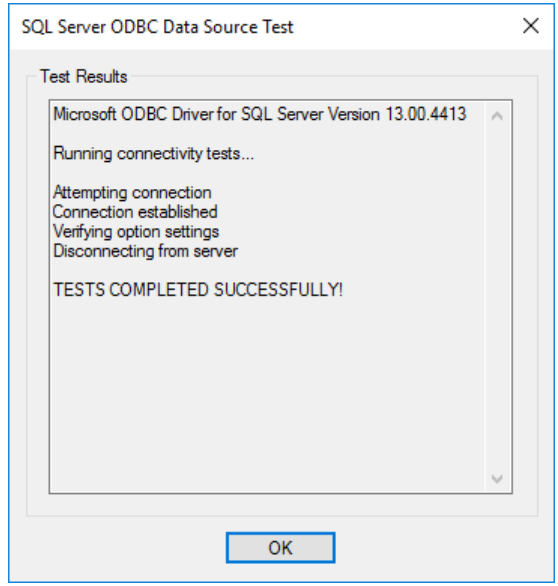


8 Click **Finish** to accept the default settings.

9 In the ODBC Microsoft SQL Server Setup dialog box, test your connection by clicking **Test Data Source**.



10 If the connection succeeds, the SQL Server ODBC Data Source Test dialog box opens and displays a message indicating the tests completed successfully. Click **OK** to close this dialog box. Click **OK** to close the ODBC Microsoft SQL Server Setup dialog box.



11 The ODBC Data Source Administrator dialog box shows the new data source under System Data Sources on the **System DSN** tab. Click **OK** to close the ODBC Data Source Administrator dialog box.

After you complete the data source setup, connect to the SQL Server database using the Database Explorer app or the command line with the native ODBC connection.

Step 3. Connect using the Database Explorer app or the command line.

Connect to SQL Server Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, connect with Windows authentication by selecting the data source you defined from the **Data Source** list. Leave the **Username** and **Password** boxes blank. Click **Connect**.

Or, connect without Windows authentication by selecting the data source you defined. Enter a user name and password. Click **Connect**.

The Catalog and Schema dialog box opens.

3 Select the catalog and schema from the **Catalog** and **Schema** lists. Click **OK**.

The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `MS SQL Server`, and two tabs named `MS SQL Server` and `MS SQL Server1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to SQL Server Using ODBC Driver and Command Line

1 To connect with Windows authentication, connect to the database with the authenticated ODBC data source name and a blank user name and password. For

example, this code assumes that you are connecting to a data source named `MS SQL Server Auth`.

```
conn = database('MS SQL Server Auth','','');
```

Or, to connect without Windows authentication, connect to the database with the ODBC data source name. For example, this code assumes that you are connecting to a data source named `MS SQL Server` with the user name `username` and the password `pwd`.

```
conn = database('MS SQL Server','username','pwd');
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps

Database Explorer

Functions

`close` | `database`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Microsoft SQL Server JDBC for Windows

This tutorial shows how to set up a data source and connect to a Microsoft SQL Server database using the Database Explorer app or the command line. This tutorial uses the Microsoft JDBC Driver 4.0 for Microsoft SQL Server to connect to a Microsoft SQL Server 2016 Express database.

In this section...

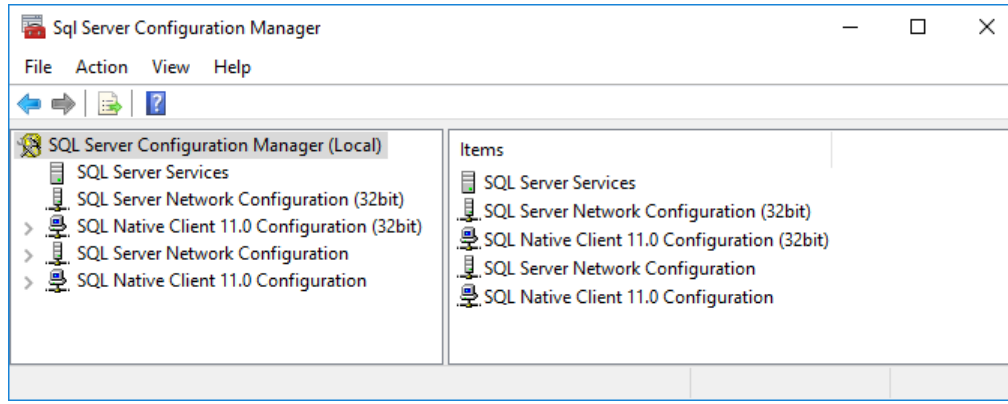
Step 1. Verify the driver installation.

If the JDBC driver for Microsoft SQL Server is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Verify the port number.

Complete the following steps on the machine where SQL Server is installed to find your port number for database connection. If you experience connection issues with the port number that you find, contact your database administrator.

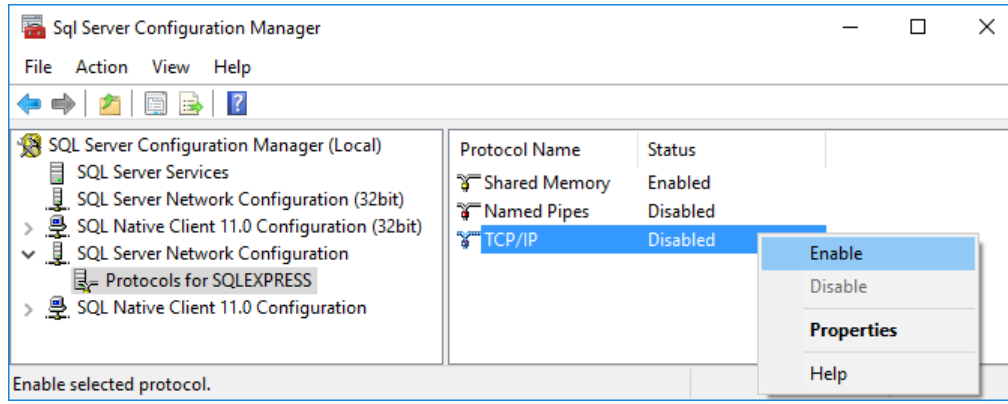
1 On the machine where your SQL Server database is installed, click **Start**. Select your Microsoft SQL Server version folder and click **SQL Server Configuration Manager**.



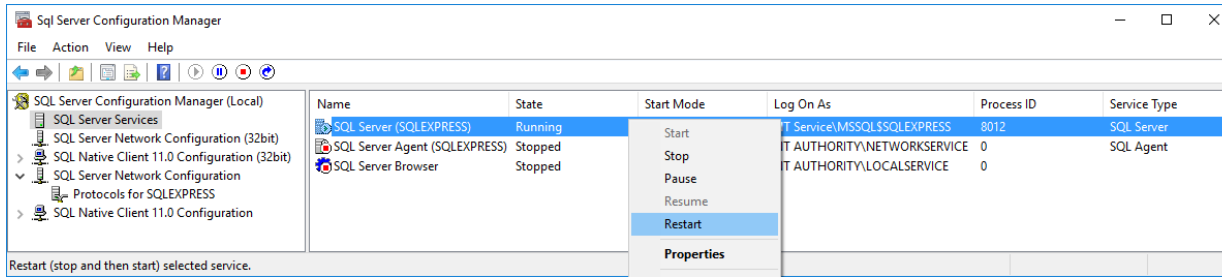
2 On the left of the Sql Server Configuration Manager window, click **SQL Server Network Configuration**. Double-click **Protocols for SQLEXPRESS**.

3 See if TCP/IP is enabled. If so, skip steps 4 and 5.

4 If TCP/IP is disabled, right-click **TCP/IP** and select **Enable**.

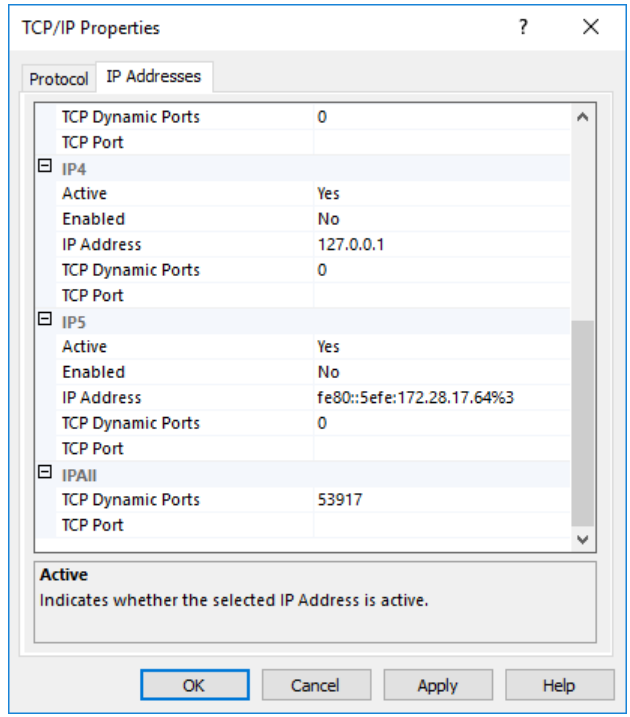


5 To finish the process of enabling the TCP/IP protocol, restart the server. On the left side of the window, click **SQL Server Services**. Right-click **SQL Server (SQLEXPRESS)** and click **Restart**. The server restarts, enabling TCP/IP.



6 Click **Protocols for SQLEXPRESS** and right-click **TCP/IP**. Select **Properties**.

7 In the TCP/IP Properties dialog box, scroll to the bottom on the **IP Addresses** tab until you see the **IPAll** group. The number next to **TCP Dynamic Ports** is the port number. Use this port number in the JDBC Data Source Configuration dialog box when configuring a data source using the Database Explorer app. Or, enter this port number as an input argument of the `database` function at the command line. Here, the port number is `53917`. If this number is `0` or if you want to configure your SQL Server database server to listen to a specific port, delete the entry in the **TCP Dynamic Ports** box. Then, enter another port number in the **TCP Port** box.



8 Click **Apply** and click **OK** to close the TCP/IP Properties dialog box. Then, close the Sql Server Configuration Manager dialog box.

Step 3. Set up the operating system authentication.

Windows authentication enables you to connect to a database using your Windows user account. In this case, Windows performs user validation, and the database does not require a different user name and password. Windows authentication facilitates the maintenance of database access credentials. After you add the required libraries to the system path, the Microsoft SQL Server JDBC driver enables connectivity using Windows authentication. The following steps show how to add these libraries to the Java library path in MATLAB. For details about Java libraries, see “Java Class Path” (MATLAB).

1 Ensure that you have the latest Java driver library installed on your computer. To install the latest library, see Driver Installation.

2 Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.

3 Close MATLAB.

4 Navigate to the folder from step 2, and create a file named `javalibrarypath.txt` in the folder.

5 Open `javalibrarypath.txt` and insert the path to the Java library file `sqljdbc_auth.dll`. This file is installed in the following location:

```
<installation>\sqljdbc_<version>\<language>\auth\<arch>
```

`<installation>` is the installation folder of the Microsoft SQL Server JDBC driver, `<version>` is the JDBC driver version, `<language>` is the JDBC driver language, and `<arch>` is the architecture.

Use the x64 folder. In the entry, include the full path to the library file. Do not include the library file name. The following is an example of the path: `C:\DB_Drivers\sqljdbc_4.0\enu\auth\x64`. Save and close `javalibrarypath.txt`.

6 Restart MATLAB.

Step 4. Add the JDBC driver to the MATLAB static Java class path.

1 Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.

2 Close MATLAB.

3 Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.

4 Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `C:\DB_Drivers\sqljdbc_4.0\enu\sqljdbc4.jar`. Save and close `javaclasspath.txt`.

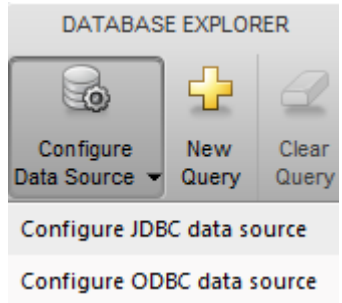
5 Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).

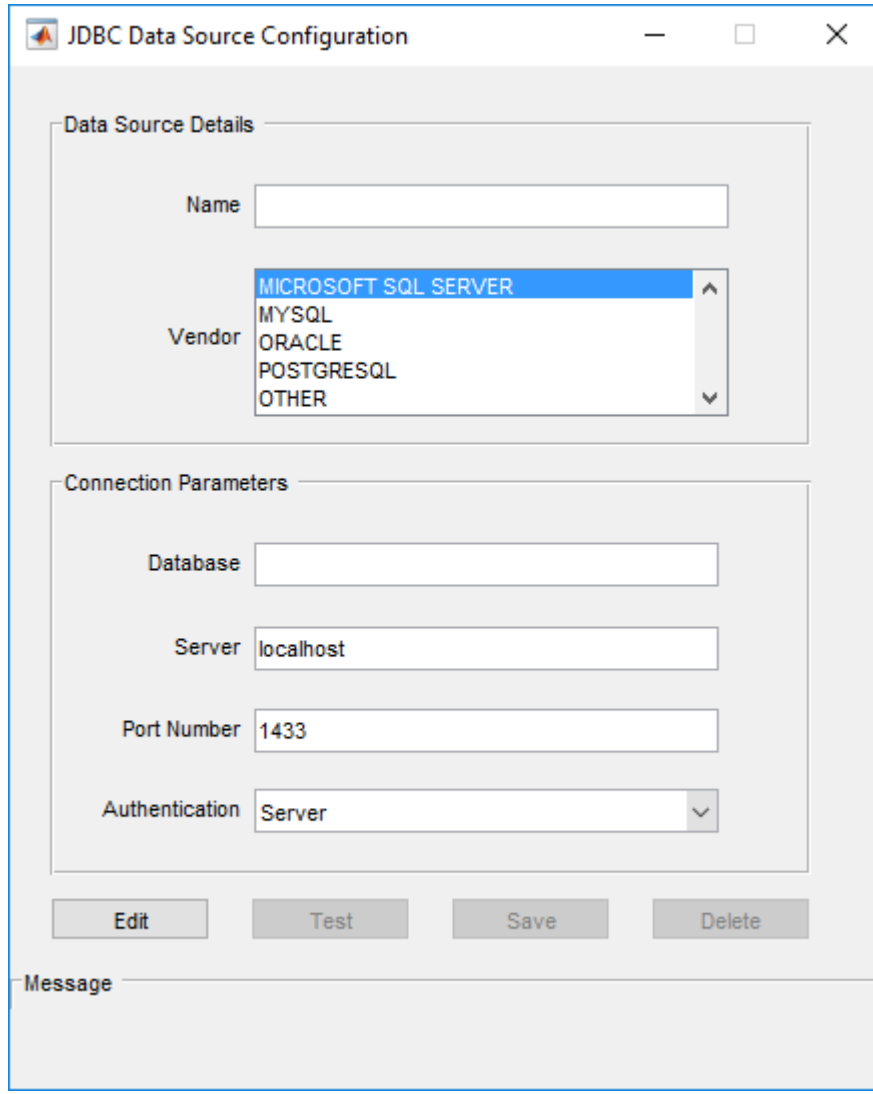
Step 5. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to SQL Server Using JDBC Driver and Command Line" on page 2-39.

1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source > Configure JDBC data source**.



The JDBC Data Source Configuration dialog box opens.



3 In the **Name** box, enter a data source name. If you enter a name that duplicates an existing ODBC data source name, the Database Explorer app appends `_JDBC` to the name after you save it.

4 From the **Vendor** list, select `MICROSOFT SQL SERVER`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the

bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 4 on page 2-35.

5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number.

6 To establish the data source with Windows authentication, set **Authentication** to `Windows`.

Or, to establish the data source without Windows authentication, set **Authentication** to `Server`.

7 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database. If you are connecting with Windows authentication, then leave these boxes blank. Click **Test**.

If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

8 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the SQL Server database using the Database Explorer app or the command line with the JDBC connection.

Step 6. Connect using the Database Explorer app or the command line.

Connect to SQL Server Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, connect with Windows authentication by selecting the data source you defined from the **Data Source** list. Leave the **Username** and **Password** boxes blank. Click **Connect**.

Or, connect to your database without Windows authentication by selecting the data source you defined. Enter a user name and password. Click **Connect**.

The Catalog and Schema dialog box opens.

3 Select the catalog and schema from the **Catalog** and **Schema** lists. Click **OK**.

The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The

title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `MS SQL Server`, and two tabs named `MS SQL Server` and `MS SQL Server1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to SQL Server Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1 To connect with Windows authentication, use the `Vendor` name-value pair argument of the `database` function to specify a connection to a SQL Server database. Use the `AuthType` name-value pair argument to connect with Windows authentication. Specify a blank user name and password. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the port number `123456`.

```
conn = database('dbname','','','Vendor','Microsoft SQL Server', ...
    'Server','sname','AuthType','Windows', ...
    'PortNumber',123456);
```

Or, to connect without Windows authentication, use the `AuthType` name-value pair argument of the `database` function to specify a connection to the database server. For example, this code assumes that you are connecting to a database named `dbname` with the user name `username` and the password `pwd`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server','Server','sname', ...
    'AuthType','Server','PortNumber',123456);
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps

Database Explorer

Functions

`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Oracle ODBC for Windows

This tutorial shows how to set up a data source and connect to an Oracle database using the Database Explorer app or the command line. This tutorial uses the OraClient11g_home1 ODBC driver to connect to an Oracle 11g Enterprise Edition database.

In this section...

Step 1. Verify the driver installation.

The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

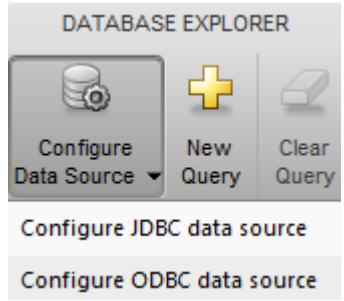
Note: Database Toolbox no longer supports connecting to a database using a 32-bit driver. Use the 64-bit version of Oracle. If you have issues working with the ODBC driver, use the JDBC driver instead. For details, see "Oracle JDBC for Windows" on page 2-47. For details about working with the 64-bit version of Windows, see http://www.mathworks.com/products/matlab/preparing-for-64-bit-windows.html.

Step 2. Set up the data source using the Database Explorer app.

The Database Explorer app accesses the Microsoft ODBC Data Source Administrator automatically when you configure an ODBC data source. Alternatively, you can access the Microsoft ODBC Data Source Administrator using the `configureODBCDataSource` function.

1 Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.

2 Select **Configure Data Source** > **Configure ODBC data source**.



In the ODBC Data Source Administrator dialog box, you define the ODBC data source.

Tip When setting up an ODBC data source, you can specify a user data source name (DSN) or a system DSN. A user DSN is specific to the person logged into a machine. Only this person sees the data sources that are defined on the user DSN tab. A system DSN is not specific to the person logged into a machine. Any person who logs into the machine can see the data sources that are defined on the system DSN tab. Your ability to set up a user DSN or system DSN depends on the database and ODBC driver you are using. For details, contact the database administrator or refer to the ODBC driver documentation.

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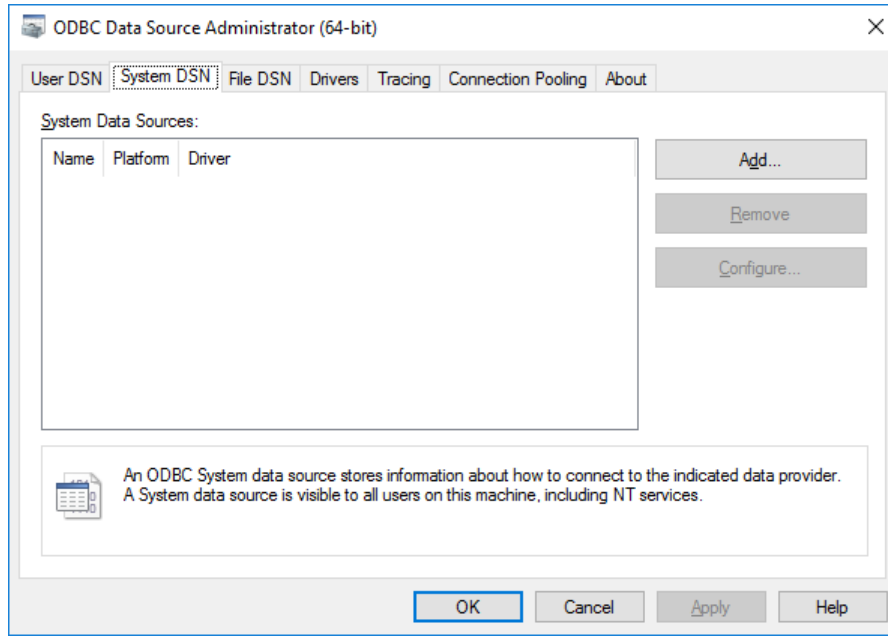
3 Click the **System DSN** tab, and then click **Add**.

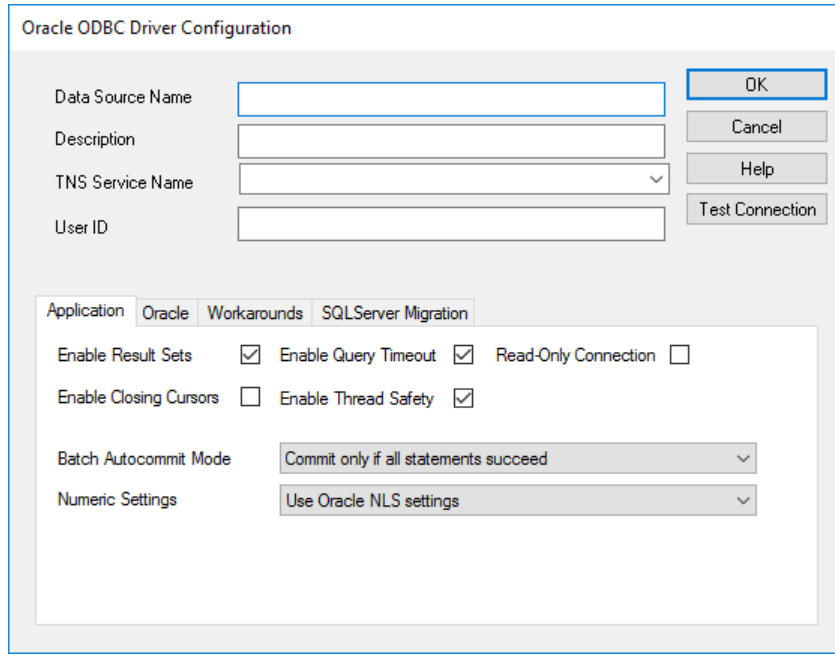


The Create New Data Source dialog box opens and displays a list of installed ODBC drivers.

4 Select the ODBC driver `Oracle in OraClient11g_home1`.

Note The name of the ODBC driver can vary.

Click **Finish**.



5 In the Oracle ODBC Driver Configuration dialog box, enter an appropriate name for the data source. You use this name to establish a connection to your database. Here, in the **Data Source Name** box, enter `ORA` as the data source name. In the **Description** box, enter a description for this data source, such as `Oracle database`. In the **TNS Service Name** box, enter the name of your database.

6 You can set up an ODBC data source with or without Windows authentication.

To establish the data source without Windows authentication, enter your user name in the **User ID** box. Or, to establish the data source with Windows authentication, leave this box blank. Leave the **Application**, **Oracle**, **Workarounds**, and **SQLServer Migration** tabs with the default settings.

7 Click **Test Connection** to test the connection to your database. The Oracle ODBC Driver Connect dialog box opens. If you are establishing the data source with Windows authentication, the Testing Connection dialog box opens.

8 Enter your password in the **Password** box. Your database name and user name are automatically entered in the **Service Name** and **User Name** boxes. Click **OK**. If your computer successfully connects to the database, the Testing Connection dialog box displays a message indicating the connection is successful. Click **OK**.

9 Click **OK** in the Oracle ODBC Driver Configuration dialog box. The ODBC Data Source Administrator dialog box shows the ODBC data source `ORA`.

After you complete the data source setup, connect to the Oracle database using the Database Explorer app or the command line with the native ODBC connection.

Step 3. Connect using the Database Explorer app or the command line.

Connect to Oracle Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, connect with Windows authentication by selecting the data source you defined from the **Data Source** list. Leave the **Username** and **Password** boxes blank. Click **Connect**.

Or, connect without Windows authentication by selecting the data source you defined. Enter a user name and password. Click **Connect**.

The Catalog and Schema dialog box opens.

3 In the **Schema** list, select the schema. Click **OK**.

The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `ORA`, and two tabs named `ORA` and `ORA1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to Oracle Using ODBC Driver and Command Line

1 To connect with Windows authentication, connect to the database with the authenticated ODBC data source name and a blank user name and password. For

example, this code assumes that you are connecting to a data source named `Oracle_Auth`.

```
conn = database('Oracle_Auth','','');
```

Or, to connect without Windows authentication, connect to the database with the ODBC data source name. For example, this code assumes that you are connecting to a data source named `Oracle` with the user name `username` and the password `pwd`.

```
conn = database('Oracle','username','pwd');
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps

Database Explorer

Functions

`close` | `database`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Oracle JDBC for Windows

This tutorial shows how to set up a data source and connect to an Oracle database using the Database Explorer app or the command line. This tutorial uses the Oracle Database 11g Release 2 (11.2.0.3) JDBC driver for use with JDK™ 1.6 to connect to an Oracle 11g Enterprise Edition Release 11.2.0.1.0 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for Oracle is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Set up the operating system authentication.

Windows authentication enables you to connect to a database using your system or network user name and password. In this case, the database does not require a different user name and password. Windows authentication facilitates connecting to the database and maintaining database access credentials. After you add the required libraries to the system path, the Oracle JDBC driver enables connectivity using Windows authentication. The following steps show how to add these libraries to the Java library path in MATLAB. For details about Java libraries, see "Java Class Path" (MATLAB).

1. Ensure that you have the latest Oracle OCI libraries installed on your computer. To install the latest library, see Driver Installation.
2. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
3. Close MATLAB.

4 Navigate to the folder from step 2, and create a file named `javalibrarypath.txt` in the folder.

5 Open `javalibrarypath.txt` and insert the path to the Oracle OCI libraries. The entry must include the full path to the library files. The entry must not contain the library file names. The following is an example of the path: `C:\DB_Libraries \instantclient_11_2`. Save and close `javalibrarypath.txt`.

6 In the environment variables of the advanced system settings, add the Oracle OCI library full path to the Windows Path environment variable.

7 Restart MATLAB.

Step 3. Add the JDBC driver to the MATLAB static Java class path.

1 Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.

2 Close MATLAB.

3 Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.

4 Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `C:\DB_Drivers\ojdbc6.jar`. Save and close `javaclasspath.txt`.

5 Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).

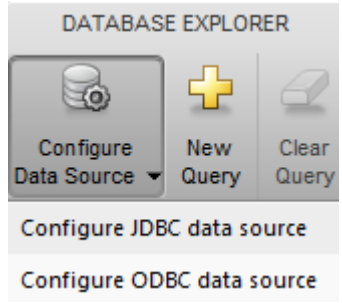
Step 4. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to Oracle Using JDBC Driver and Command Line" on page 2-52.

1 Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to

open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.

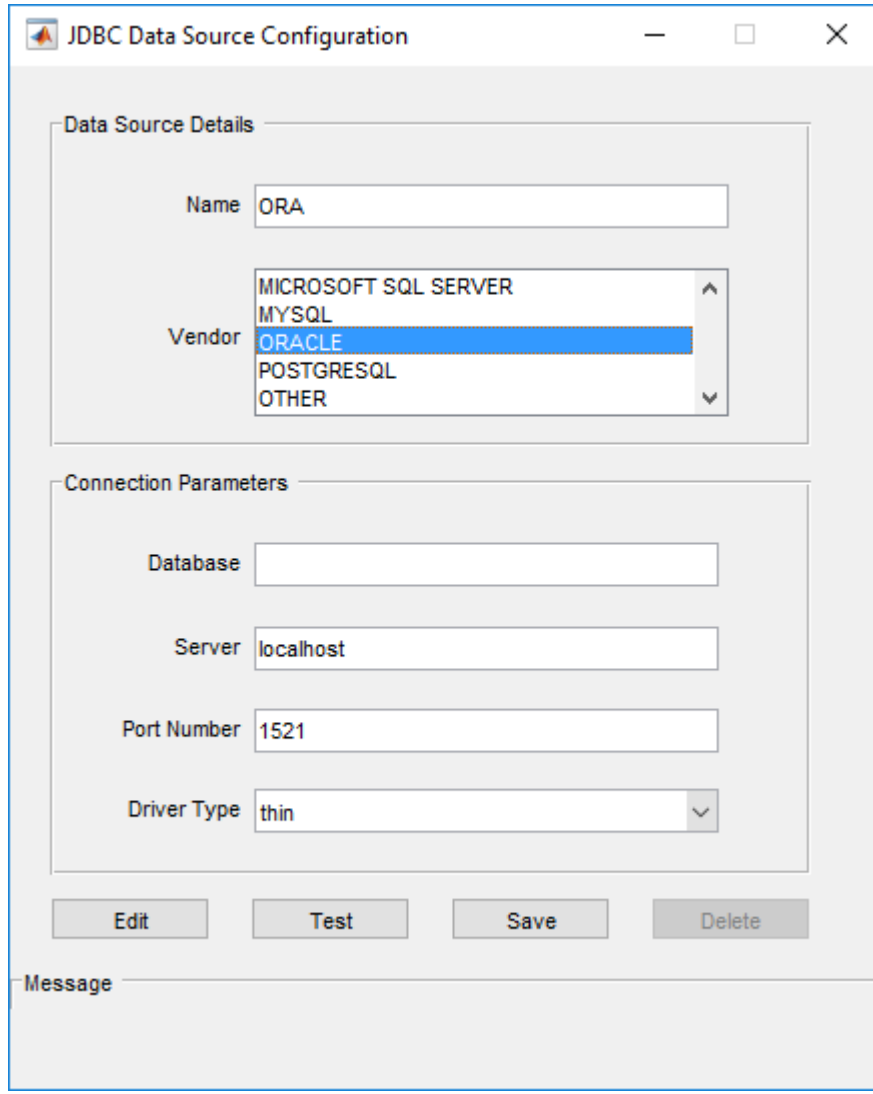
2 Select **Configure Data Source** > **Configure JDBC data source**.



The JDBC Data Source Configuration dialog box opens.

3 In the **Name** box, enter the name of your data source. (This example uses a data source named `ORA`.) You use this name to establish a connection to your database. If you enter a name that duplicates an existing ODBC data source name, the Database Explorer app appends `_JDBC` to the name after you save it.

4 From the **Vendor** list, select `ORACLE`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 3 on page 2-48.



5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number.

6 To establish the data source with Windows authentication, set **Driver Type** to `oci`.

Or, to establish the data source without Windows authentication, set **Driver Type** to `thin`.

7 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database. If you are connecting with Windows authentication, then leave these boxes blank. Click **Test**.

If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

8 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the Oracle database using the Database Explorer app or the command line with the JDBC connection.

Step 5. Connect using the Database Explorer app or the command line.

Connect to Oracle Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, connect to your database with Windows authentication by selecting the data source you defined from the **Data Source** list. Leave the **Username** and **Password** boxes blank. Click **Connect**.

Or, connect to your database without Windows authentication by selecting the data source you defined. Enter a user name and password. Click **Connect**.

The Catalog and Schema dialog box opens.

3 In the **Schema** list, select the schema. Click **OK**.

The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `ORA`, and two tabs named `ORA` and `ORA1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to Oracle Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1 To connect with Windows authentication, use the `Vendor` name-value pair argument of the `database` function to specify a connection to an Oracle database. Use the `DriverType` name-value pair argument to connect with Windows authentication by specifying the `oci` value. Specify a blank user name and password. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the port number `123456`.

```
conn = database('dbname','','', ...
    'Vendor','Oracle','DriverType','oci', ...
    'Server','sname','PortNumber',123456);
```

`dbname` can be the service name or the Oracle system identifier (SID), depending on your specific Oracle database setup. For details, see your `tnsnames.ora` file, which is often in `<ORACLE_HOME>\NETWORK\ADMIN` where `<ORACLE_HOME>` is the folder containing the installed database or Oracle client.

Or, to connect without Windows authentication, use the `DriverType` name-value pair argument of the `database` function with the value `thin` to specify a connection to the database server. For example, this code assumes that you are connecting to a database named `dbname` with the user name `username` and the password `pwd`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Oracle','DriverType','thin', ...
    'Server','sname','PortNumber',123456);
```

If you have trouble using the `database` function, use the full entry from your `tnsnames.ora` file in the URL string as one consecutive line. Leave the first argument blank. For example, this code assumes that the value of the `URL` name-value pair argument is set to the specified `tnsnames.ora` file entry for an Oracle database.

```
conn = database('','username','pwd', ...
    'Vendor','Oracle', ...
    'URL',['jdbc:oracle:thin:@(DESCRIPTION = ' ...
```

```
    '(ADDRESS = (PROTOCOL = TCP)(HOST = sname)' ...
    '(PORT = 123456)) (CONNECT_DATA = ' ...
    '(SERVER = DEDICATED) (SERVICE_NAME = dbname) ) )']);
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps

Database Explorer

Functions

`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

MySQL ODBC for Windows

This tutorial shows how to set up a data source and connect to a MySQL database using the Database Explorer app or the command line. This tutorial uses a MySQL ODBC 5.3 Driver to connect to the MySQL database.

In this section...
“Step 1. Verify the driver installation.” on page 2-54
“Step 2. Set up the data source using the Database Explorer app.” on page 2-54
“Step 3. Connect using the Database Explorer app or the command line.” on page 2-58

Step 1. Verify the driver installation.

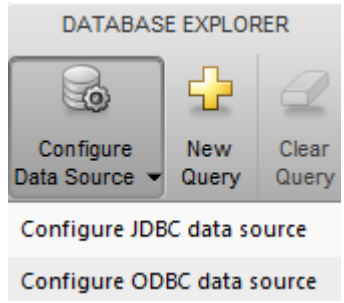
The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

Note: Database Toolbox no longer supports connecting to a database using a 32-bit driver. Use the 64-bit version of MySQL. If you have issues working with the ODBC driver, use the JDBC driver instead. For details, see “MySQL JDBC for Windows” on page 2-60. For details about working with the 64-bit version of Windows, see http://www.mathworks.com/products/matlab/preparing-for-64-bit-windows.html.

Step 2. Set up the data source using the Database Explorer app.

The Database Explorer app accesses the Microsoft ODBC Data Source Administrator automatically when you configure an ODBC data source. Alternatively, you can access the Microsoft ODBC Data Source Administrator using the `configureODBCDataSource` function.

1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source** > **Configure ODBC data source**.

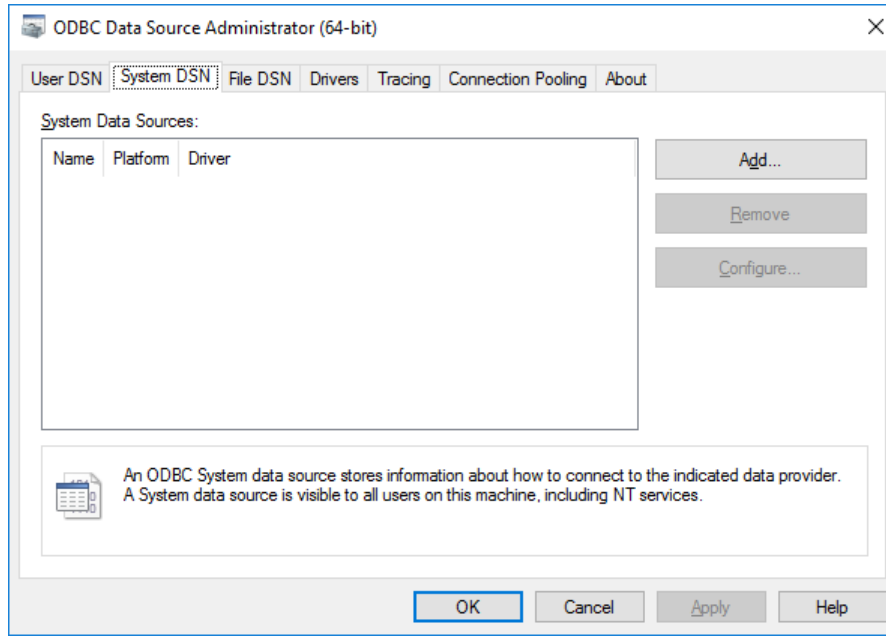


In the ODBC Data Source Administrator dialog box, you define the ODBC data source.

Tip When setting up an ODBC data source, you can specify a user data source name (DSN) or a system DSN. A user DSN is specific to the person logged into a machine. Only this person sees the data sources that are defined on the user DSN tab. A system DSN is not specific to the person logged into a machine. Any person who logs into the machine can see the data sources that are defined on the system DSN tab. Your ability to set up a user DSN or system DSN depends on the database and ODBC driver you are using. For details, contact the database administrator or refer to the ODBC driver documentation.

---

3 Click the **System DSN** tab, and then click **Add**.



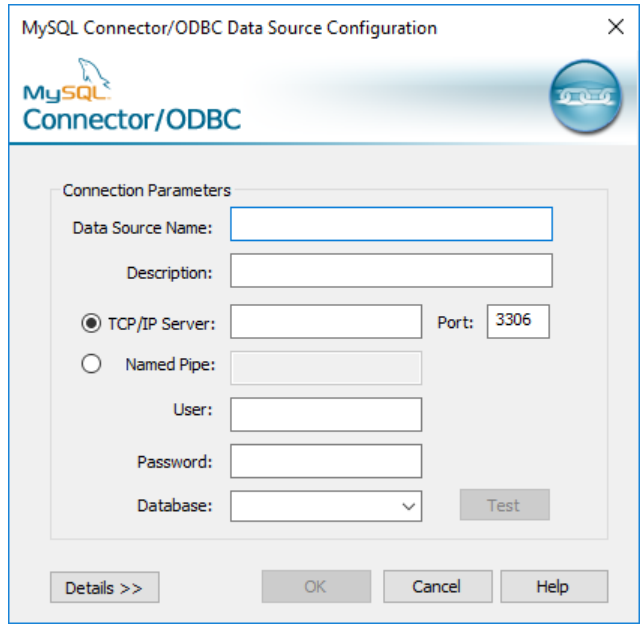
The Create New Data Source dialog box opens and displays a list of installed ODBC drivers.

4 Select the ODBC driver `MySQL ODBC 5.2a Driver`.

Note The name of the ODBC driver can vary.

Click **Finish**.

5 In the MySQL Connector/ODBC Data Source Configuration dialog box, fill out the boxes.



- In the **Data Source Name** box, enter an appropriate name for the data source, such as `MySQL`. You use this name to establish a connection to your database.
- In the **Description** box, enter a description for this data source, such as `MySQL database`.
- In the **TCP/IP Server** box, enter the name of your database server. Consult your database administrator for the name of your database server.
- In the **Port** box, enter the port number. The default port number is `3306`.
- In the **User** box, enter your user name.
- In the **Password** box, enter your password.
- In the **Database** box, enter the name of your database.

6 Click **Test** to test the connection to your database. If your computer successfully connects to the database, the Test Result dialog box opens and displays a message indicating the connection is successful.

7 Click **OK** in the MySQL Connector/ODBC Data Source Configuration dialog box. The ODBC Data Source Administrator dialog box shows the ODBC data source `MySQL`.

After you complete the data source setup, connect to the MySQL database using the Database Explorer app or the command line with the native ODBC connection.

Step 3. Connect using the Database Explorer app or the command line.

Connect to MySQL Using Database Explorer App

1. On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.
2. In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.
3. In the **Catalog** list, select the catalog. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.
4. Select tables in the **Data Browser** pane to query the database.
5. Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `MySQL`, and two tabs named `MySQL` and `MySQL1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to MySQL Using ODBC Driver and Command Line

1. Connect to the database with the ODBC data source name. For example, this code assumes that you are connecting to a data source named `MySQL` with the user name `username` and the password `pwd`.

   ```
   conn = database('MySQL','username','pwd');
   ```
2. Close the database connection.

   ```
   close(conn)
   ```

See Also

Apps
Database Explorer

Functions
`close` | `database`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

MySQL JDBC for Windows

This tutorial shows how to set up a data source and connect to a MySQL database using the Database Explorer app or the command line. This tutorial uses the MySQL Connector/J 5.1.17 driver to connect to a MySQL Version 5.5.16 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for MySQL is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

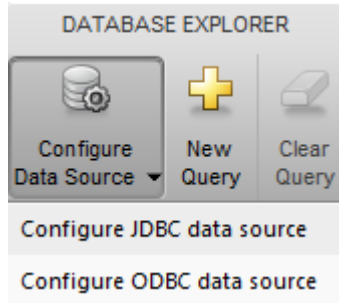
1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `C:\DB_Drivers\mysql-connector-java-5.1.17-bin.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Java Class Path” (MATLAB).

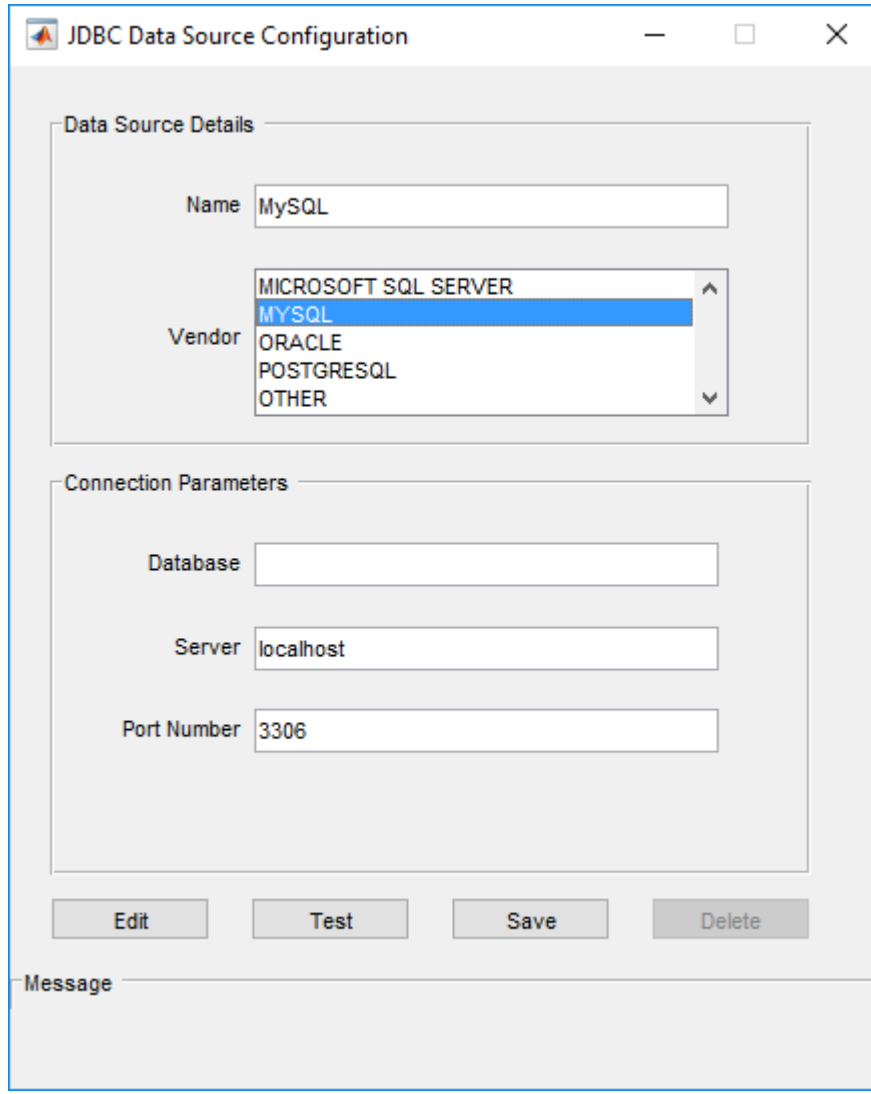
Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to MySQL Using JDBC Driver and Command Line" on page 2-64.

1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source** > **Configure JDBC data source**.



   The JDBC Data Source Configuration dialog box opens.
3. In the **Name** box, enter the name of your data source. (This example uses a data source named `MySQL`.) You use this name to establish a connection to your database. If you enter a name that duplicates an existing ODBC data source name, the Database Explorer app appends `_JDBC` to the name after you save it.
4. From the **Vendor** list, select `MYSQL`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-60.



5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number.

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the MySQL database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to MySQL Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.

3 In the **Catalog** list, select the catalog. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `MySQL`, and two tabs named `MySQL` and `MySQL1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to MySQL Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1. Use the `Vendor` name-value pair argument of the `database` function to specify a connection to a MySQL database. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the user name `username` and the password `pwd`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','MySQL', ...
    'Server','sname');
```

2. Close the database connection.

```
close(conn)
```

See Also

Apps
Database Explorer

Functions
`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

PostgreSQL ODBC for Windows

This tutorial shows how to set up a data source and connect to a PostgreSQL database using the Database Explorer app or the command line. This tutorial uses the PostgreSQL ANSI(x64) driver to connect to a PostgreSQL 9.2 database.

In this section...
“Step 1. Verify the driver installation.” on page 2-65
“Step 2. Set up the data source using the Database Explorer app.” on page 2-65
“Step 3. Connect using the Database Explorer app or the command line.” on page 2-69

Step 1. Verify the driver installation.

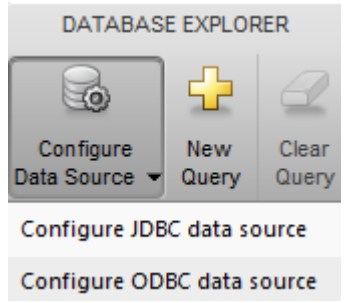
The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

Note: Database Toolbox no longer supports connecting to a database using a 32-bit driver. Use the 64-bit version of PostgreSQL. If you have issues working with the ODBC driver, use the JDBC driver instead. For details, see “PostgreSQL JDBC for Windows” on page 2-71. For details about working with the 64-bit version of Windows, see http://www.mathworks.com/products/matlab/preparing-for-64-bit-windows.html.

Step 2. Set up the data source using the Database Explorer app.

The Database Explorer app accesses the Microsoft ODBC Data Source Administrator automatically when you configure an ODBC data source. Alternatively, you can access the Microsoft ODBC Data Source Administrator using the `configureODBCDataSource` function.

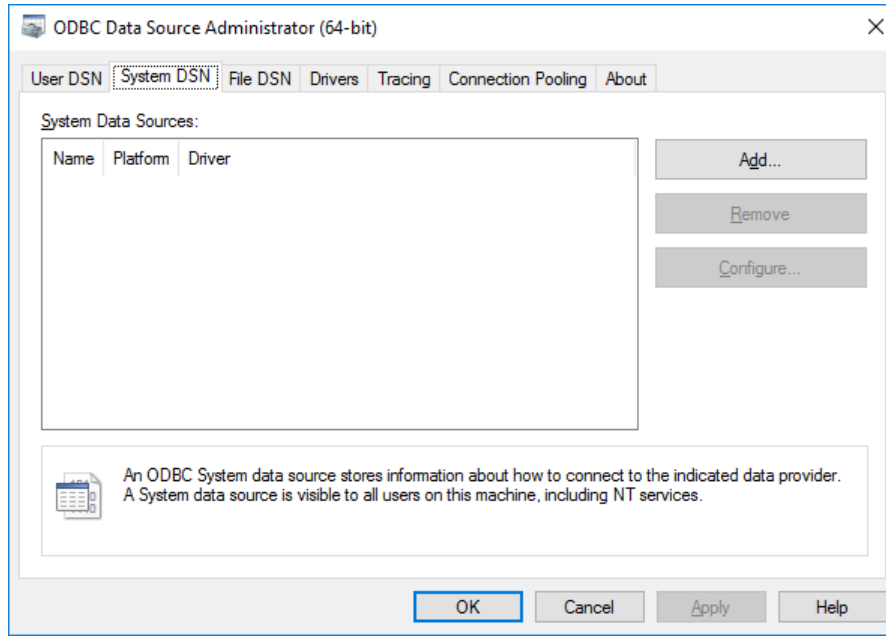
1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source** > **Configure ODBC data source**.



In the ODBC Data Source Administrator dialog box, you define the ODBC data source.

Tip When setting up an ODBC data source, you can specify a user data source name (DSN) or a system DSN. A user DSN is specific to the person logged into a machine. Only this person sees the data sources that are defined on the user DSN tab. A system DSN is not specific to the person logged into a machine. Any person who logs into the machine can see the data sources that are defined on the system DSN tab. Your ability to set up a user DSN or system DSN depends on the database and ODBC driver you are using. For details, contact the database administrator or refer to the ODBC driver documentation.

3 Click the **System DSN** tab, and then click **Add**.



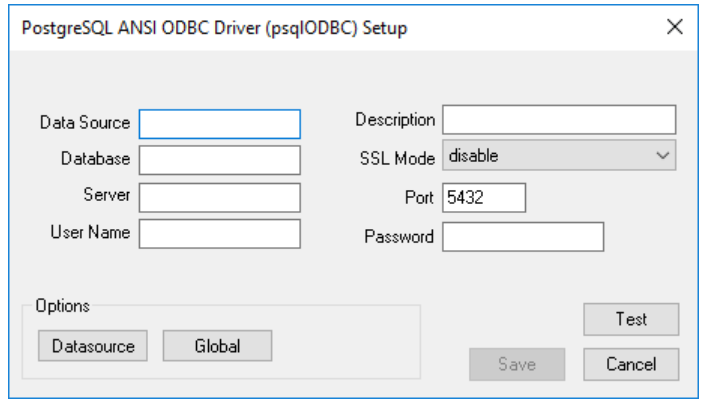
The Create New Data Source dialog box opens and displays a list of installed ODBC drivers.

4 Select the ODBC driver `PostgreSQL ANSI(x64)`.

Note The name of the ODBC driver can vary.

Click **Finish**.

5 In the PostgreSQL ANSI ODBC Driver (psqlODBC) Setup dialog box, fill out the boxes.



- In the **Data Source** box, enter an appropriate name for the data source, such as `PostgreSQL`. You use this name to establish a connection to your database.
- In the **Description** box, enter a description for this data source, such as `PostgreSQL database`.
- In the **Database** box, enter the name of your database.
- In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server.
- In the **Port** box, enter the port number. The default port number is `5432`.
- In the **User Name** box, enter your user name.
- In the **Password** box, enter your password.

6 Click **Test** to test the connection to your database. If your computer successfully connects to the database, the Connection Test dialog box opens and displays a message indicating the connection is successful.

7 Click **Save** in the PostgreSQL ANSI ODBC Driver (psqlODBC) Setup dialog box. The ODBC Data Source Administrator dialog box shows the ODBC data source `PostgreSQL30`.

After you complete the data source setup, connect to the PostgreSQL database using the Database Explorer app or the command line with the native ODBC connection.

Step 3. Connect using the Database Explorer app or the command line.

Connect to PostgreSQL Using Database Explorer App

1. On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.
2. In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.
3. Select the catalog and schema from the **Catalog** and **Schema** lists. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.
4. Select tables in the **Data Browser** pane to query the database.
5. Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `Postgresql`, and two tabs named `Postgresql` and `Postgresql1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to PostgreSQL Using ODBC Driver and Command Line

1. Connect to the database with the ODBC data source name. For example, this code assumes that you are connecting to a data source named `PostgreSQL` with the user name `username` and the password `pwd`.

   ```
   conn = database('PostgreSQL','username','pwd');
   ```
2. Close the database connection.

   ```
   close(conn)
   ```

See Also

Apps

Database Explorer

Functions

`close` | `database`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

PostgreSQL JDBC for Windows

This tutorial shows how to set up a data source and connect to a PostgreSQL database using the Database Explorer app or the command line. This tutorial uses the JDBC4 PostgreSQL Driver, Version 8.4 to connect to a PostgreSQL 9.2 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for PostgreSQL is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `C:\DB_Drivers\postgresql-8.4-702.jdbc4.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

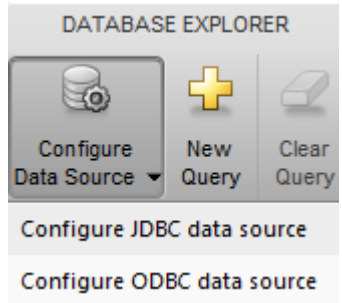
Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).

Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to PostgreSQL Using JDBC Driver and Command Line" on page 2-75.

1 Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.

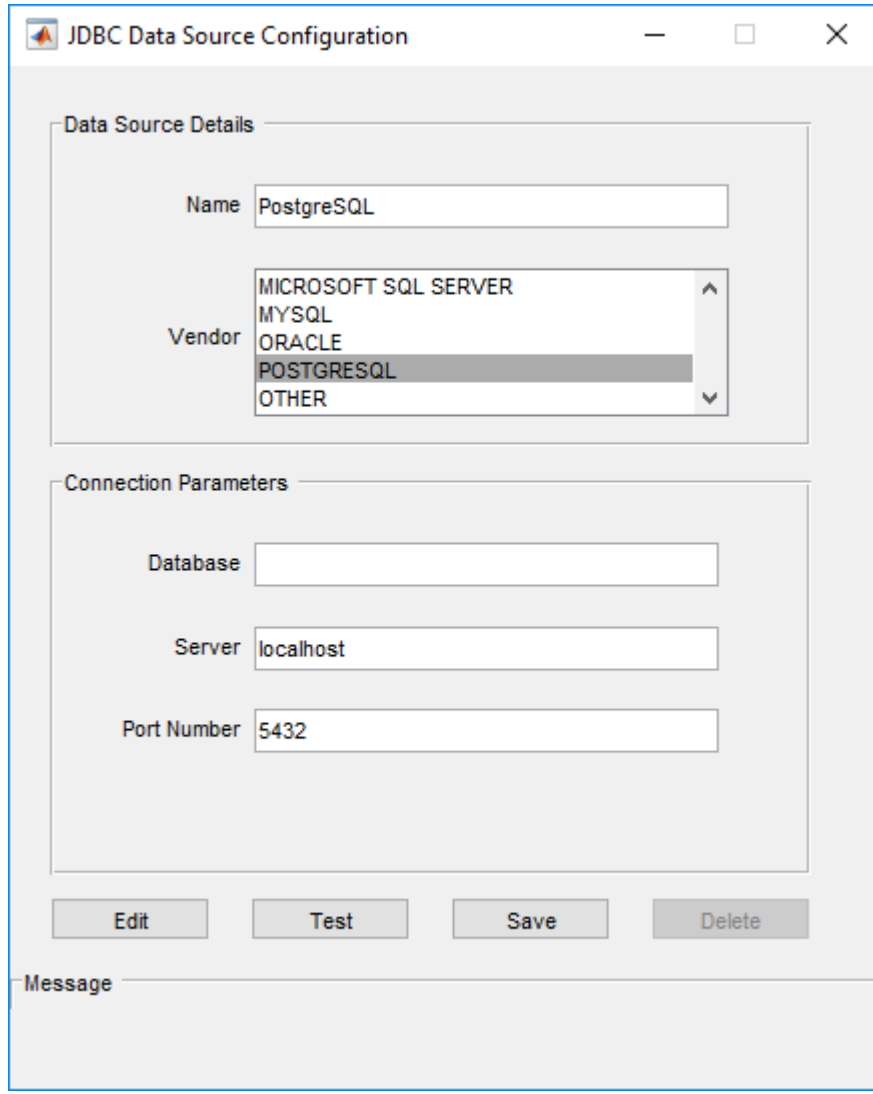
2 Select **Configure Data Source** > **Configure JDBC data source**.



The JDBC Data Source Configuration dialog box opens.

3 In the **Name** box, enter a data source name. (This example uses a data source named `PostgreSQL`.) You use this name to establish a connection to your database. If you enter a name that duplicates an existing ODBC data source name, the Database Explorer app appends `_JDBC` to the name after you save it.

4 From the **Vendor** list, select `POSTGRESQL`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-71.



5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number.

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the PostgreSQL database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to PostgreSQL Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source name you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.

3 Select the catalog and schema from the **Catalog** and **Schema** lists. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `Postgresql`, and two tabs named `Postgresql` and `Postgresql1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to PostgreSQL Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1. Use the `Vendor` name-value pair argument of the `database` function to specify a connection to a PostgreSQL database. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the user name `username` and the password `pwd`.

   ```
   conn = database('dbname','username','pwd', ...
       'Vendor','PostgreSQL', ...
       'Server','sname');
   ```

2. Close the database connection.

   ```
   close(conn)
   ```

See Also

Apps
Database Explorer

Functions
`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

SQLite JDBC for Windows

This tutorial shows how to set up a data source and connect to a SQLite database using the Database Explorer app or the command line. This tutorial uses the SQLite JDBC 3.7.2 Driver to connect to a SQLite Version 3.7.17 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for SQLite is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

If you do not want to install a driver and want to store relational data quickly, you can use the MATLAB interface to SQLite. For details, see “Working with MATLAB Interface to SQLite” on page 2-6.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `C:\DB_Drivers\sqlite-jdbc-3.7.2.jar`. Save and close `javaclasspath.txt`.

5 Restart MATLAB.

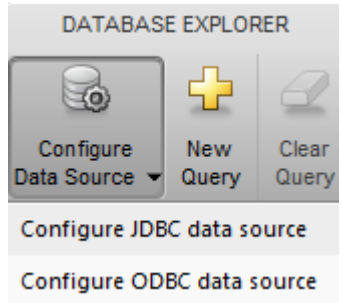
Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).

Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to SQLite Using JDBC Driver and Command Line" on page 2-80.

1 Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.

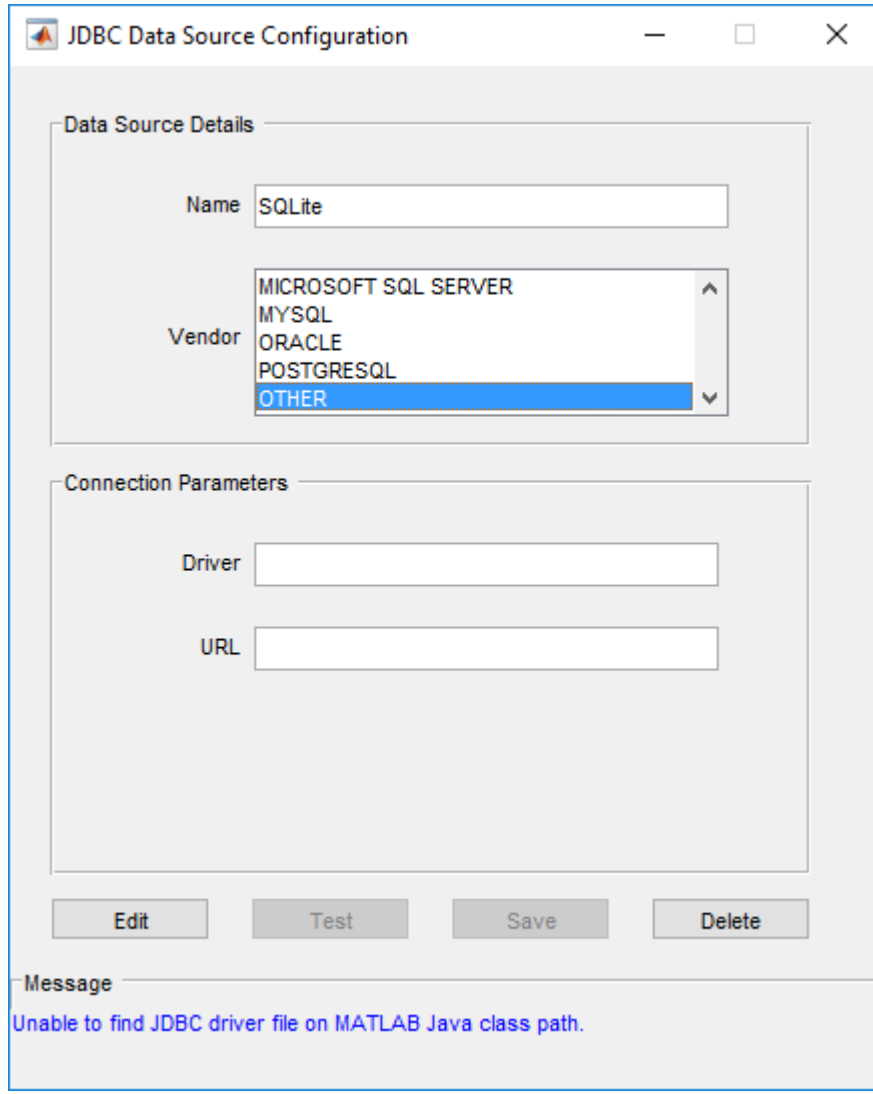
2 Select **Configure Data Source > Configure JDBC data source**.



The JDBC Data Source Configuration dialog box opens.

3 In the **Name** box, enter a data source name. (This example uses a data source named `SQLite`.) If you enter a name that duplicates an existing ODBC data source name, the Database Explorer app appends `_JDBC` to the name after you save it.

4 From the **Vendor** list, select `OTHER`.



Your entries for **Driver** and **URL** can vary depending on the type and version of the JDBC driver and your database. For details, see the JDBC driver documentation for your database.

5 In the **Driver** box, enter the SQLite driver Java class object. Here, use `org.sqlite.JDBC`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-76.

6 Connect to the SQLite database by creating a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type, in this case, `sqlite`. The last part of the URL string is `subname`. For SQLite, `subname` contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer. Enter your string in the **URL** box and press **Enter**.

7 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

8 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the SQLite database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to SQLite Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

3 Select tables in the **Data Browser** pane to query the database.

4 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `SQLite`, and two tabs named `SQLite` and `SQLite1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to SQLite Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1 Connect to the SQLite database by using the `database` function.

- Enter the data source name that you defined for the first argument.
- Enter your user name `username` and password `pwd`, or leave these arguments blank if your database does not require them.
- The fourth argument is the driver Java class object. This code assumes that the class object is `org.sqlite.JDBC`.
- The last argument is the URL string `URL` that you create using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type, in this case, `sqlite`. The last part of the URL string is `subname`. For SQLite, `subname` contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer.

For example, this code assumes that you are connecting to a data source named `SQLite`.

```
conn = database('SQLite','username','pwd','org.sqlite.JDBC','URL');
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps
Database Explorer

Functions
`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Microsoft SQL Server JDBC for macOS

This tutorial shows how to set up a data source and connect to a Microsoft SQL Server database using the Database Explorer app or the command line. This tutorial uses the Microsoft JDBC Driver 4.0 for Microsoft SQL Server to connect to a Microsoft SQL Server 2016 Express database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for SQL Server is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/sqljdbc4.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).

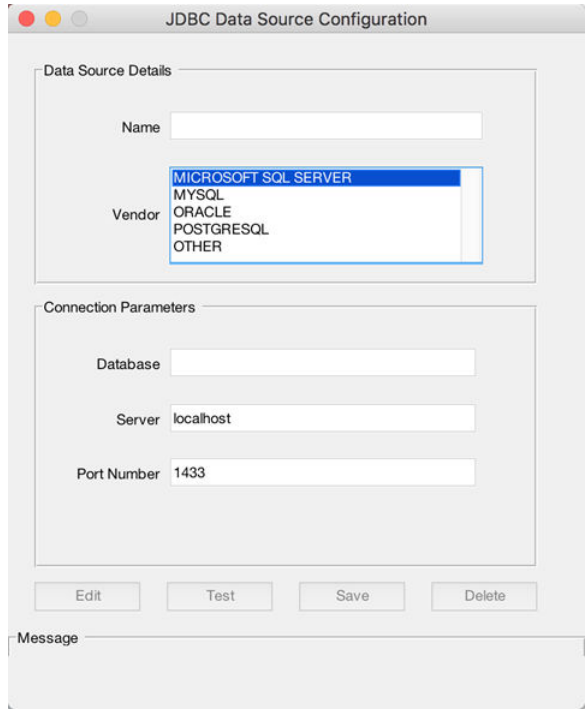
Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see “Connect to SQL Server Using JDBC Driver and Command Line” on page 2-85.

1 Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.

2 Select **Configure Data Source** > **Configure JDBC data source**.

The JDBC Data Source Configuration dialog box opens.



3 In the **Name** box, enter a data source name.

4 From the **Vendor** list, select `MICROSOFT SQL SERVER`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-82.

5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number.

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the SQL Server database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to SQL Server Using Database Explorer App

1. On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.
2. In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.
3. Select the catalog and schema from the **Catalog** and **Schema** lists. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.
4. Select tables in the **Data Browser** pane to query the database.
5. Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `MS SQL Server`, and two tabs named `MS SQL Server` and `MS SQL Server1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to SQL Server Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1. Use the `Vendor` name-value pair argument of the `database` function to specify a connection to a SQL Server database. Set the `AuthType` name-value pair argument to `Server`. For example, this code assumes that you are connecting to a database

named `dbname`, on a database server named `sname`, with the user name `username`, the password `pwd`, and the port number `123456`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server','Server','sname', ...
    'AuthType','Server','PortNumber',123456);
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps

Database Explorer

Functions

`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Microsoft SQL Server JDBC for Linux

This tutorial shows how to set up a data source and connect to a Microsoft SQL Server database using the Database Explorer app or the command line. This tutorial uses the Microsoft JDBC Driver 4.0 for Microsoft SQL Server to connect to a Microsoft SQL Server 2016 Express database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for Microsoft SQL Server is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/sqljdbc4.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Java Class Path” (MATLAB).

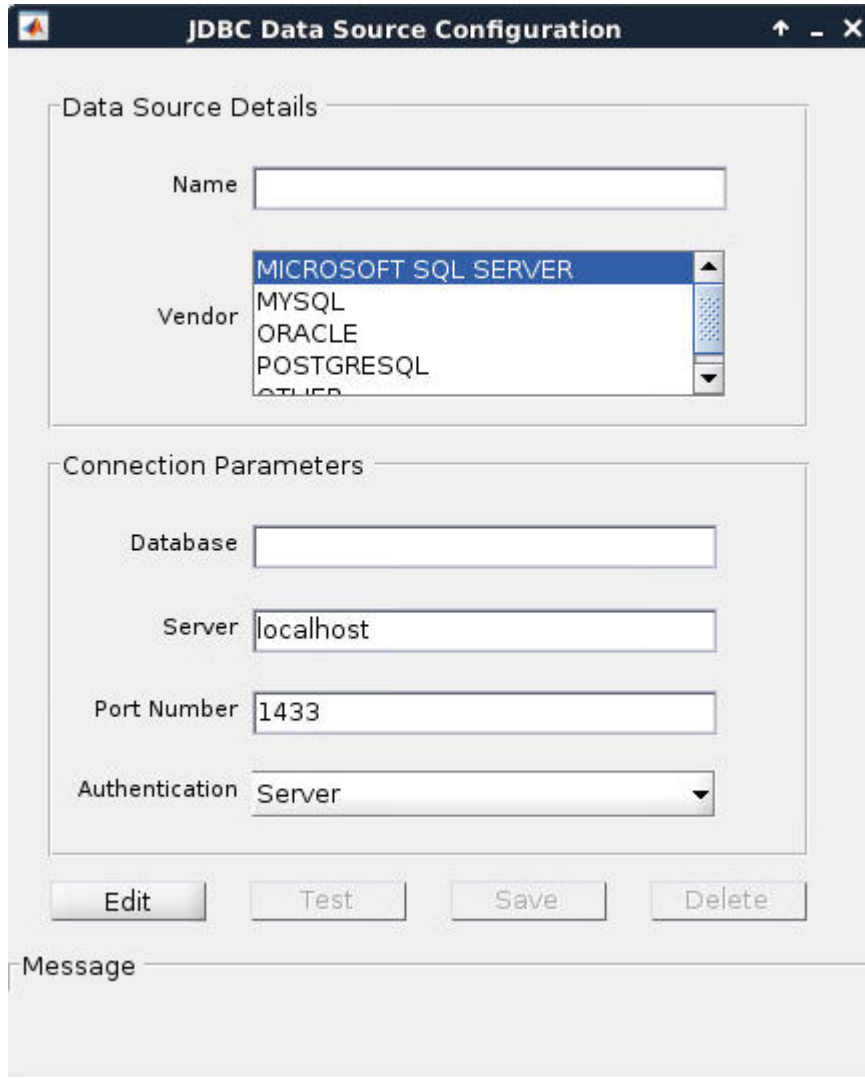
Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see “Connect to SQL Server Using JDBC Driver and Command Line” on page 2-91.

1 Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.

2 Select **Configure Data Source** > **Configure JDBC data source**.

The JDBC Data Source Configuration dialog box opens.



3 In the **Name** box, enter a data source name.

4 From the **Vendor** list, select `MICROSOFT SQL SERVER`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-87.

5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number. From the **Authentication** list, select `Server`.

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the SQL Server database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to SQL Server Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.

3 Select the catalog and schema from the **Catalog** and **Schema** lists. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is

`MS SQL Server`, and two tabs named `MS SQL Server` and `MS SQL Server1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to SQL Server Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1 Use the `Vendor` name-value pair argument of the `database` function to specify a connection to a SQL Server database. Set the `AuthType` name-value pair argument to `Server`. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the user name `username`, the password `pwd`, and the port number `123456`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server','Server','sname', ...
    'AuthType','Server','PortNumber',123456);
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps
Database Explorer

Functions
`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)

- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Oracle JDBC for macOS

This tutorial shows how to set up a data source and connect to an Oracle database using the Database Explorer app or the command line. This tutorial uses the Oracle Database 11g Release 2 (11.2.0.3) JDBC driver for use with JDK 1.6 to connect to an Oracle 11g Enterprise Edition Release 11.2.0.1.0 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for Oracle is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/ojdbc6.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Java Class Path” (MATLAB).

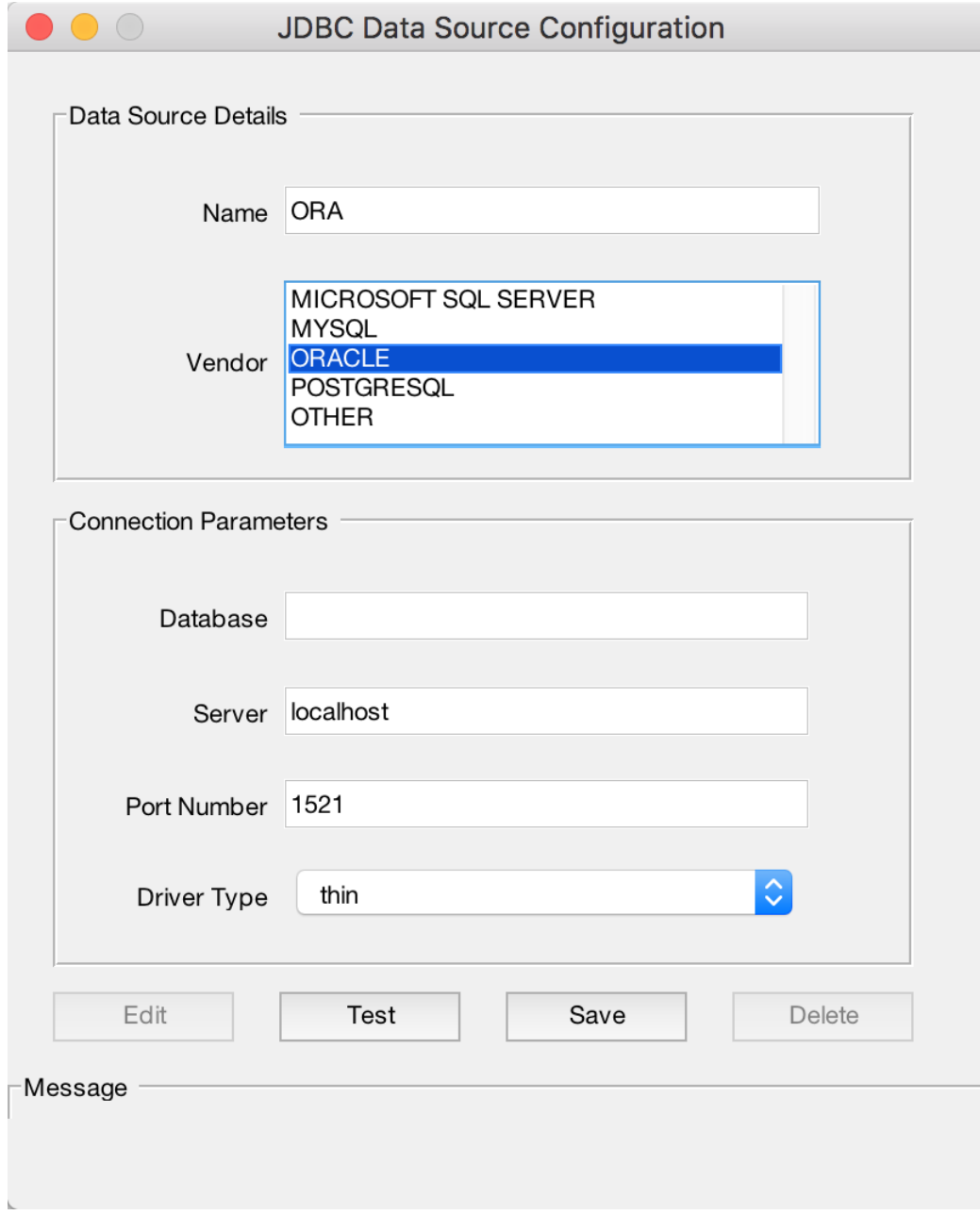
Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to Oracle Using JDBC Driver and Command Line" on page 2-97.

1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source** > **Configure JDBC data source**.

   The JDBC Data Source Configuration dialog box opens.

3. In the **Name** box, enter a data source name. (This example uses a data source named `ORA`.)
4. From the **Vendor** list, select `ORACLE`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-93.


JDBC Data Source Configuration
Data Source Details
Name
ORA
Vendor
MICROSOFT SQL SERVER
MYSQL
ORACLE
POSTGRESQL
OTHER
Connection Parameters
Database
Server
localhost
Port Number
1521
Driver Type
thin
Edit
Test
Save
Delete
Message

5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number. From the **Driver Type** list, select `thin` or `oci`. (Use `thin` as the default driver. Use `oci` if you installed an OCI driver.)

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the Oracle database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to Oracle Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.

3 In the **Schema** list, select the schema. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `ORA`, and two tabs named `ORA` and `ORA1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to Oracle Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1. Use the `Vendor` name-value pair argument of the `database` function to specify a connection to an Oracle database. Set the `DriverType` name-value pair argument to `thin`. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the user name `username`, the password `pwd`, and the port number `123456`.

   ```
   conn = database('dbname','username','pwd', ...
       'Vendor','Oracle','DriverType','thin', ...
       'Server','sname','PortNumber',123456);
   ```

   `dbname` can be the service name or the Oracle system identifier (SID), depending on your specific Oracle database setup. For details, see your `tnsnames.ora` file, which is often in `<ORACLE_HOME>/NETWORK/ADMIN` where `<ORACLE_HOME>` is the folder containing the installed database or the Oracle client.

   If you have trouble using the `database` function, use the full entry from your `tnsnames.ora` file in the URL string as one consecutive line. Leave the first argument blank. For example, this code assumes that the value of the `URL` name-value pair argument is set to the specified `tnsnames.ora` file entry for an Oracle database.

   ```
   conn = database('','username','pwd', ...
       'Vendor','Oracle', ...
       'URL',['jdbc:oracle:thin:@(DESCRIPTION = ' ...
       '(ADDRESS = (PROTOCOL = TCP)(HOST = sname)' ...
       '(PORT = 123456)) (CONNECT_DATA = ' ...
       '(SERVER = DEDICATED) (SERVICE_NAME = dbname) ) )']);
   ```

2. Close the database connection.

   ```
   close(conn)
   ```

See Also

Apps
Database Explorer

Functions
`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Oracle JDBC for Linux

This tutorial shows how to set up a data source and connect to a Oracle database using the Database Explorer app or the command line. This tutorial uses the Oracle Database 11g Release 2 (11.2.0.3) JDBC driver for use with JDK 1.6 to connect to a Oracle 11g Enterprise Edition Release 11.2.0.1.0 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for Oracle is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/ojdbc6.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

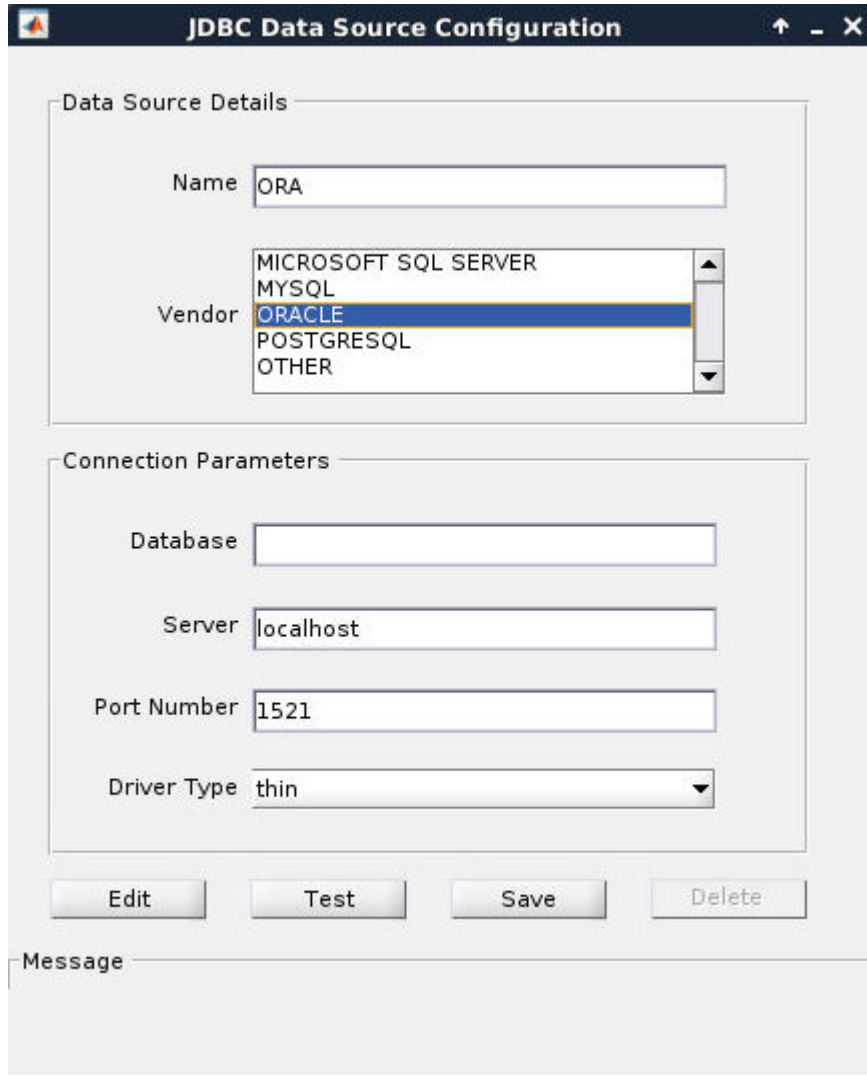
Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Java Class Path” (MATLAB).

Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to Oracle Using JDBC Driver and Command Line" on page 2-103.

1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source** > **Configure JDBC data source**.

   The JDBC Data Source Configuration dialog box opens.
3. In the **Name** box, enter a data source name. (This example uses a data source named `ORA`.)
4. From the **Vendor** list, select `ORACLE`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-99.



5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number. From the **Driver Type** list, select `thin` or `oci`. (Use `thin` as the default driver. Use `oci` if you installed an OCI driver.)

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the Oracle database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to Oracle Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.

3 In the **Schema** list, select the schema. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `ORA`, and two tabs named `ORA` and `ORA1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to Oracle Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1 Use the `Vendor` name-value pair argument of the `database` function to specify a connection to an Oracle database. Set the `DriverType` name-value pair argument to `thin`. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the user name `username`, the password `pwd`, and the port number `123456`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Oracle','DriverType','thin', ...
    'Server','sname','PortNumber',123456);
```

`dbname` can be the service name or the Oracle system identifier (SID), depending on your specific Oracle database setup. For details, see your `tnsnames.ora` file, which is often in `<ORACLE_HOME>/NETWORK/ADMIN` where `<ORACLE_HOME>` is the folder containing the installed database or the Oracle client.

If you have trouble using the `database` function, use the full entry from your `tnsnames.ora` file in the URL string as one consecutive line. Leave the first argument blank. For example, this code assumes that the value of the `URL` name-value pair argument is set to the specified `tnsnames.ora` file entry for an Oracle database.

```
conn = database('','username','pwd', ...
    'Vendor','Oracle', ...
    'URL',['jdbc:oracle:thin:@(DESCRIPTION = ' ...
    '(ADDRESS = (PROTOCOL = TCP)(HOST = sname)' ...
    '(PORT = 123456)) (CONNECT_DATA = ' ...
    '(SERVER = DEDICATED) (SERVICE_NAME = dbname) ) )']);
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps
Database Explorer

Functions

`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

MySQL JDBC for macOS

This tutorial shows how to set up a data source and connect to a MySQL database using the Database Explorer app or the command line. This tutorial uses the MySQL Connector/J 5.1.17 driver to connect to a MySQL Version 5.5.16 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for MySQL is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/mysql-connector-java-5.1.17-bin.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

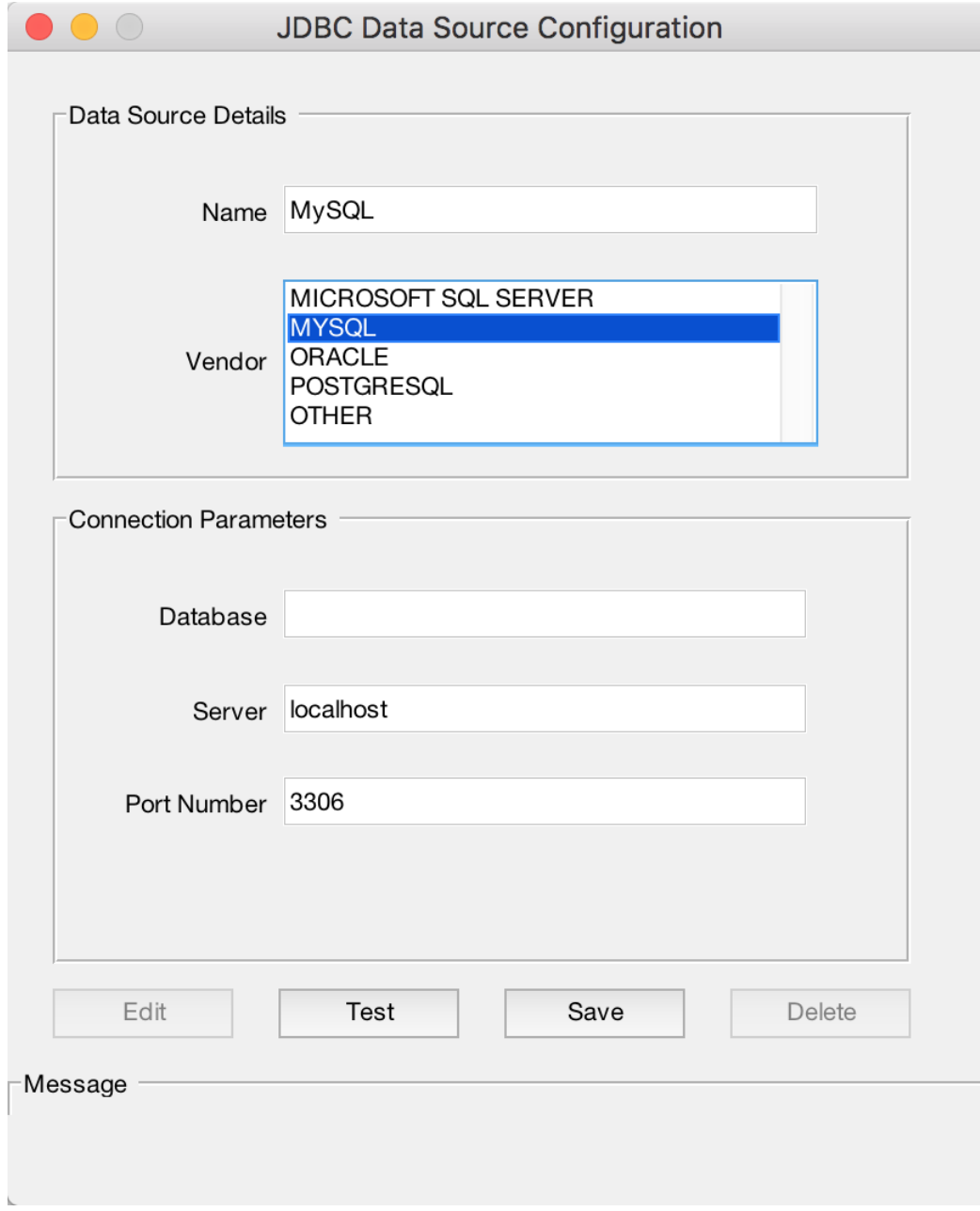
Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).

Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see “Connect to MySQL Using JDBC Driver and Command Line” on page 2-109.

1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source** > **Configure JDBC data source**.

   The JDBC Data Source Configuration dialog box opens.
3. In the **Name** box, enter a data source name. (This example uses a data source named `MySQL`.)
4. From the **Vendor** list, select `MYSQL`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-105.


JDBC Data Source Configuration
Data Source Details
Name
MySQL
Vendor
MICROSOFT SQL SERVER
MYSQL
ORACLE
POSTGRESQL
OTHER
Connection Parameters
Database
Server
localhost
Port Number
3306
Edit
Test
Save
Delete
Message

5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number.

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the MySQL database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to MySQL Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.

3 In the **Catalog** list, select the catalog. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `MySQL`, and two tabs named `MySQL` and `MySQL1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to MySQL Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1. Use the `Vendor` name-value pair argument of the `database` function to specify a connection to a MySQL database. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the user name `username` and the password `pwd`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','MySQL', ...
    'Server','sname');
```

2. Close the database connection.

```
close(conn)
```

See Also

Apps
Database Explorer

Functions
`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

MySQL JDBC for Linux

This tutorial shows how to set up a data source and connect to a MySQL database using the Database Explorer app or the command line. This tutorial uses the MySQL Connector/J 5.1.17 driver to connect to a MySQL Version 5.5.16 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for MySQL is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/mysql-connector-java-5.1.17-bin.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Java Class Path” (MATLAB).

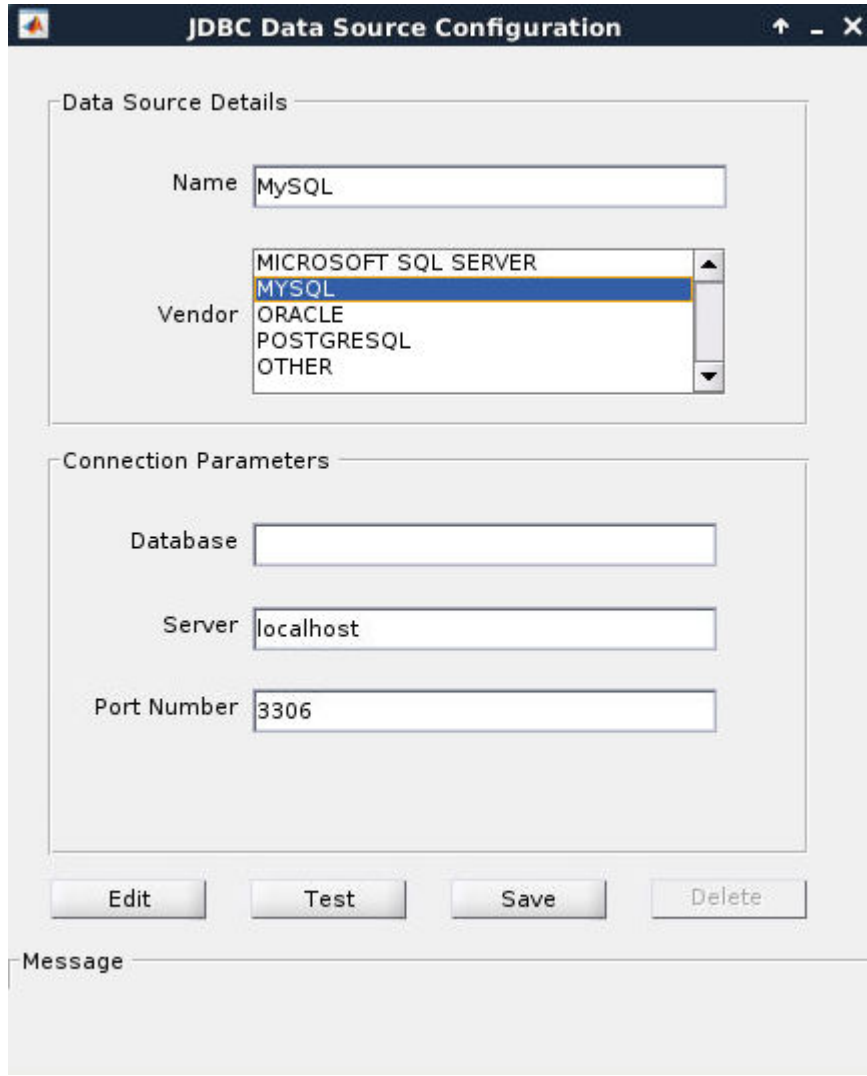
Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see “Connect to MySQL Using JDBC Driver and Command Line” on page 2-114.

1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source** > **Configure JDBC data source**.

The JDBC Data Source Configuration dialog box opens.

3. In the **Name** box, enter a data source name. (This example uses a data source named `MySQL`.)
4. From the **Vendor** list, select `MYSQL`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-110.



5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number.

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the MySQL database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to MySQL Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.

3 In the **Catalog** list, select the catalog. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `MySQL`, and two tabs named `MySQL` and `MySQL1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to MySQL Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1. Use the `Vendor` name-value pair argument of the `database` function to specify a connection to a MySQL database. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the user name `username` and the password `pwd`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','MySQL', ...
    'Server','sname');
```

2. Close the database connection.

```
close(conn)
```

See Also

Apps
Database Explorer

Functions
`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

PostgreSQL JDBC for macOS

This tutorial shows how to set up a data source and connect to a PostgreSQL database using the Database Explorer app or the command line. This tutorial uses the JDBC4 PostgreSQL Driver, Version 8.4 to connect to a PostgreSQL 9.2 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for PostgreSQL is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/postgresql-8.4-702.jdbc4.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).

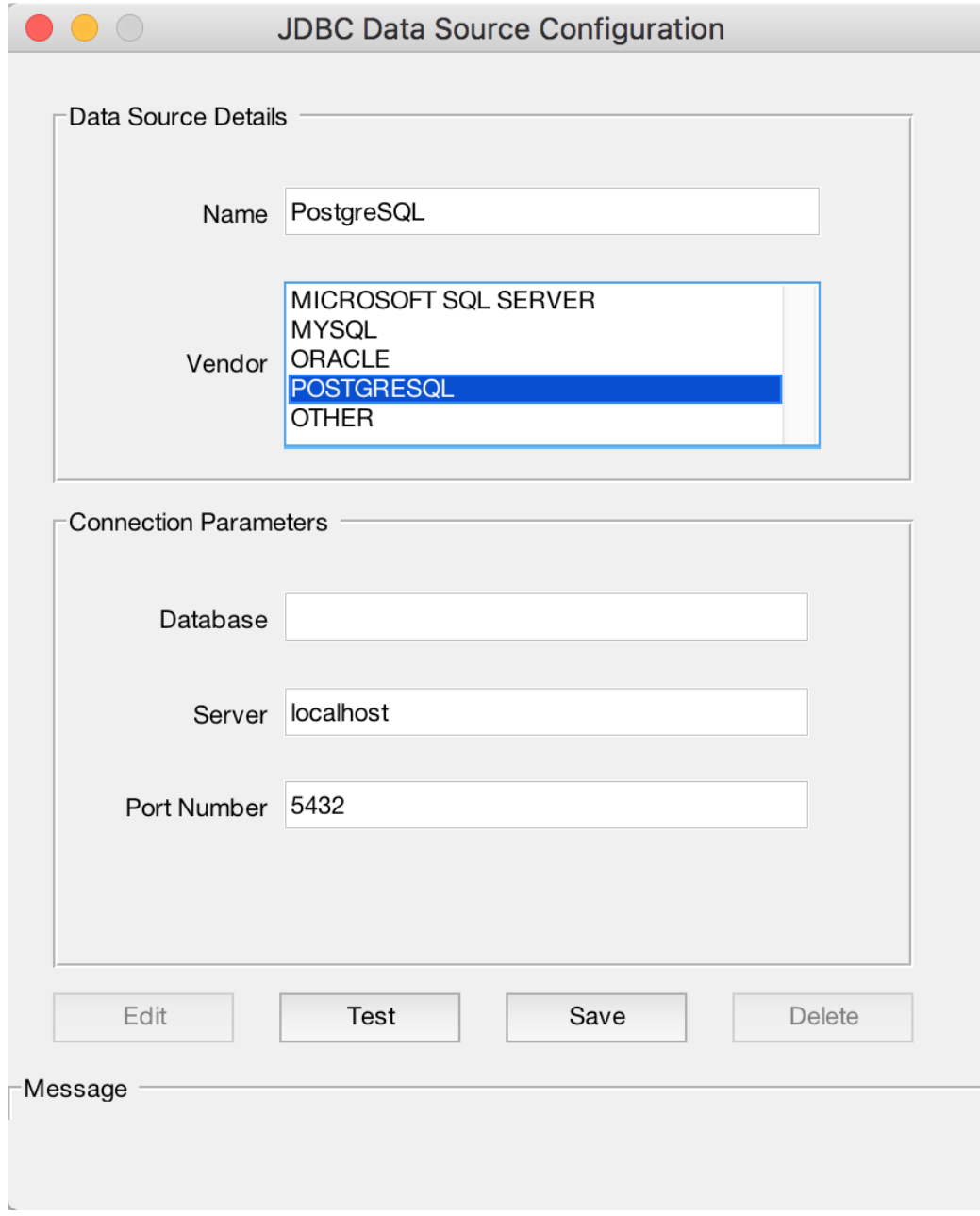
Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see “Connect to PostgreSQL Using JDBC Driver and Command Line” on page 2-119.

1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source** > **Configure JDBC data source**.

The JDBC Data Source Configuration dialog box opens.

3. In the **Name** box, enter a data source name. (This example uses a data source named `PostgreSQL`.)
4. From the **Vendor** list, select `POSTGRESQL`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-115.


JDBC Data Source Configuration
Data Source Details
Name
PostgreSQL
Vendor
MICROSOFT SQL SERVER
MYSQL
ORACLE
POSTGRESQL
OTHER
Connection Parameters
Database
Server
localhost
Port Number
5432
Edit
Test
Save
Delete
Message

5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number.

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the PostgreSQL database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to PostgreSQL Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.

3 Select the catalog and schema from the **Catalog** and **Schema** lists. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `PostgreSQL`, and two tabs named `PostgreSQL` and `PostgreSQL1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to PostgreSQL Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1. Use the `Vendor` name-value pair argument of the `database` function to specify a connection to a PostgreSQL database. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the user name `username` and the password `pwd`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','PostgreSQL', ...
    'Server','sname');
```

2. Close the database connection.

```
close(conn)
```

See Also

Apps
Database Explorer

Functions
`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

PostgreSQL JDBC for Linux

This tutorial shows how to set up a data source and connect to a PostgreSQL database using the Database Explorer app or the command line. This tutorial uses the JDBC4 PostgreSQL Driver, Version 8.4 to connect to a PostgreSQL 9.2 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for PostgreSQL is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/postgresql-8.4-702.jdbc4.jar`. Save and close `javaclasspath.txt`.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Java Class Path” (MATLAB).

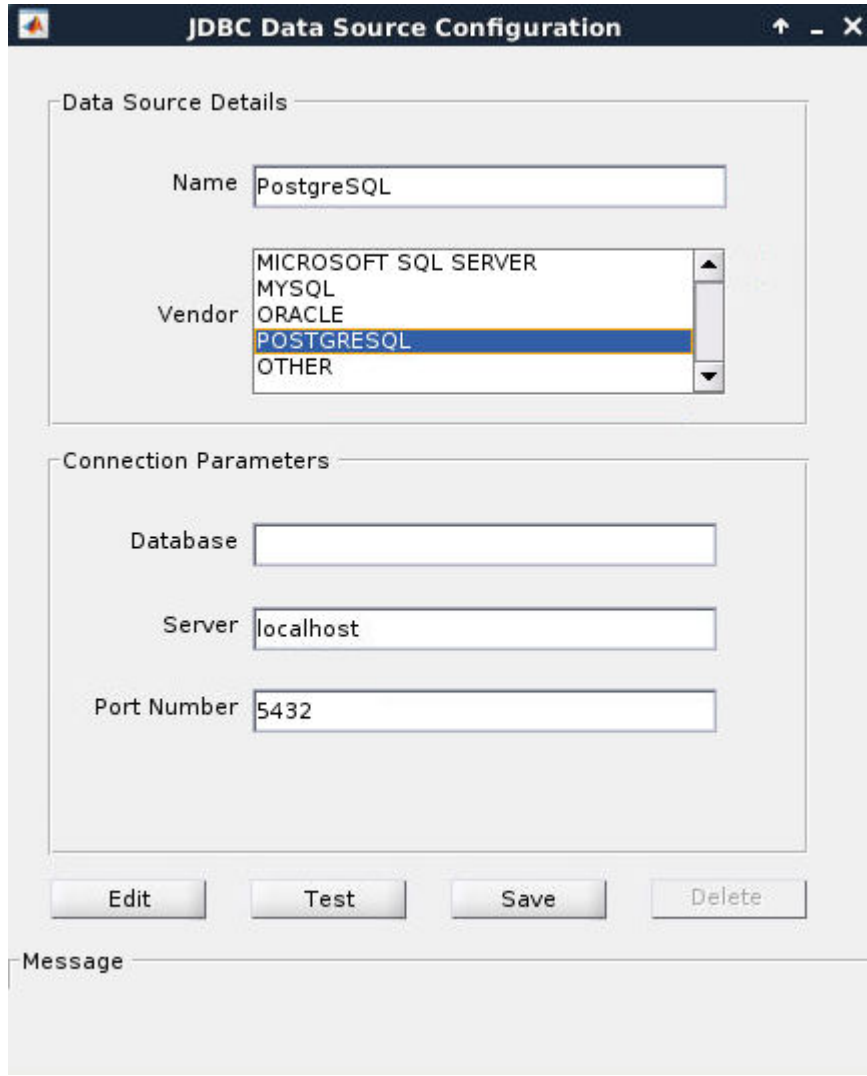
Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to PostgreSQL Using JDBC Driver and Command Line" on page 2-124.

1. Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.
2. Select **Configure Data Source** > **Configure JDBC data source**.

   The JDBC Data Source Configuration dialog box opens.

3. In the **Name** box, enter a data source name. (This example uses a data source named `PostgreSQL`.)
4. From the **Vendor** list, select `POSTGRESQL`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-120.



5 In the **Database** box, enter the name of your database. In the **Server** box, enter the name of your database server. Consult your database administrator for the name of your database server. In the **Port Number** box, enter the port number.

6 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

7 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the PostgreSQL database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to PostgreSQL Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Catalog and Schema dialog box opens.

3 Select the catalog and schema from the **Catalog** and **Schema** lists. Click **OK**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

4 Select tables in the **Data Browser** pane to query the database.

5 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `PostgreSQL`, and two tabs named `PostgreSQL` and `PostgreSQL1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to PostgreSQL Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1. Use the `Vendor` name-value pair argument of the `database` function to specify a connection to a PostgreSQL database. For example, this code assumes that you are connecting to a database named `dbname`, on a database server named `sname`, with the user name `username` and the password `pwd`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','PostgreSQL', ...
    'Server','sname');
```

2. Close the database connection.

```
close(conn)
```

See Also

Apps
Database Explorer

Functions
`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

SQLite JDBC for macOS

This tutorial shows how to set up a data source and connect to a SQLite database using the Database Explorer app or the command line. This tutorial uses the SQLite JDBC 3.7.2 Driver to connect to a SQLite Version 3.7.17 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for SQLite is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

If you do not want to install a driver and want to store relational data quickly, you can use the MATLAB interface to SQLite. For details, see "Working with MATLAB Interface to SQLite" on page 2-6.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/sqlite-jdbc-3.7.2.jar`. Save and close `javaclasspath.txt`.

5 Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).

Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to SQLite Using JDBC Driver and Command Line" on page 2-129.

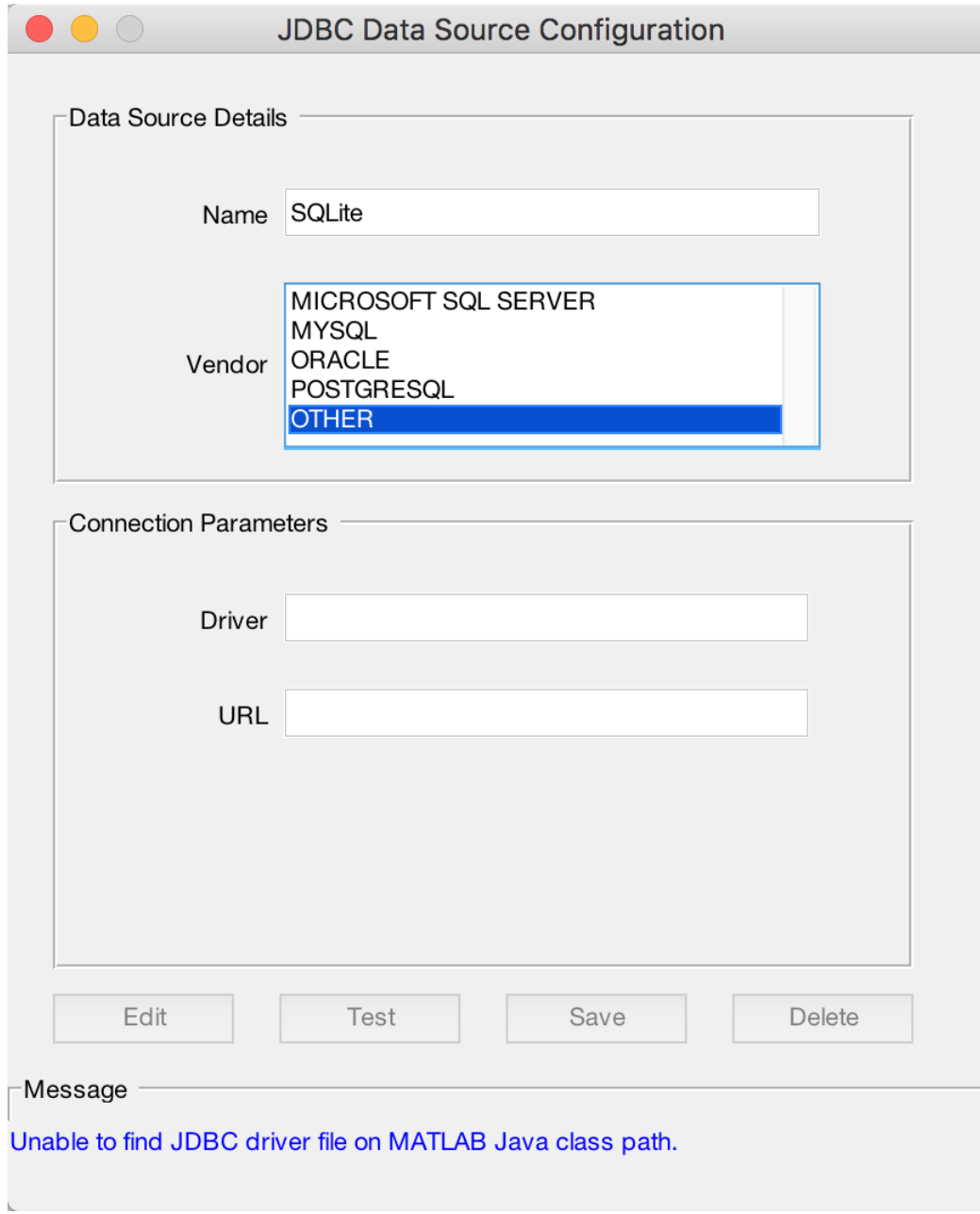
1 Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.

2 Select **Configure Data Source > Configure JDBC data source**.

The JDBC Data Source Configuration dialog box opens.

3 In the **Name** box, enter a data source name. (This example uses a data source named `SQLite`.)

4 From the **Vendor** list, select `OTHER`.


JDBC Data Source Configuration
Data Source Details
Name
SQLite
Vendor
MICROSOFT SQL SERVER
MYSQL
ORACLE
POSTGRESQL
OTHER
Connection Parameters
Driver
URL
Edit
Test
Save
Delete
Message
Unable to find JDBC driver file on MATLAB Java class path.

Your entries for **Driver** and **URL** can vary depending on the type and version of the JDBC driver and your database. For details, see the JDBC driver documentation for your database.

5 In the **Driver** box, enter the SQLite driver Java class object. Here, use `org.sqlite.JDBC`. If you did not add the JDBC driver file path to the Java class path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-125.

6 Connect to the SQLite database by creating a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type, in this case, `sqlite`. The last part of the URL string is `subname`. For SQLite, `subname` contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer. Enter your string in the **URL** box and press **Enter**.

7 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

8 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the SQLite database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to SQLite Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The

title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

3 Select tables in the **Data Browser** pane to query the database.

4 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `SQLite`, and two tabs named `SQLite` and `SQLite1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to SQLite Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1 Connect to the SQLite database by using the `database` function.

- Enter the data source name that you defined for the first argument.
- Enter your user name `username` and password `pwd`, or leave these arguments blank if your database does not require them.
- The fourth argument is the driver Java class object. This code assumes that the class object is `org.sqlite.JDBC`.
- The last argument is the URL string `URL` that you create using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type, in this case, `sqlite`. The last part of the URL string is `subname`. For SQLite, `subname` contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer.

For example, this code assumes that you are connecting to a data source named `SQLite`.

```
conn = database('SQLite','username','pwd','org.sqlite.JDBC','URL');
```

2 Close the database connection.

```
close(conn)
```

See Also

Apps

Database Explorer

Functions

`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

SQLite JDBC for Linux

This tutorial shows how to set up a data source and connect to a SQLite database using the Database Explorer app or the command line. This tutorial uses the SQLite JDBC 3.7.2 Driver to connect to a SQLite Version 3.7.17 database.

In this section...

Step 1. Verify the driver installation.

If the JDBC driver for SQLite is not installed on your computer, find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

If you do not want to install a driver and want to store relational data quickly, you can use the MATLAB interface to SQLite. For details, see "Working with MATLAB Interface to SQLite" on page 2-6.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` function in the Command Window. The output of this command is a file path to the MATLAB preferences folder on your computer. For details, see `prefdir`.
2. Close MATLAB.
3. Navigate to the folder from step 1, and create a file named `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt`. Add the full path to the database driver JAR file in `javaclasspath.txt`. The full path includes the path to the folder where you downloaded the JAR file from the database provider followed by the JAR file name. The following is an example of the path: `/home/user/DB_Drivers/sqlite-jdbc-3.7.2.jar`. Save and close `javaclasspath.txt`.

5 Restart MATLAB.

Alternatively, you can use `javaaddpath` to add a JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).

Step 3. Set up the data source using the Database Explorer app.

This step is required only for connecting to a database using the Database Explorer app. If you want to use the command line to connect to your database, see "Connect to SQLite Using JDBC Driver and Command Line" on page 2-135.

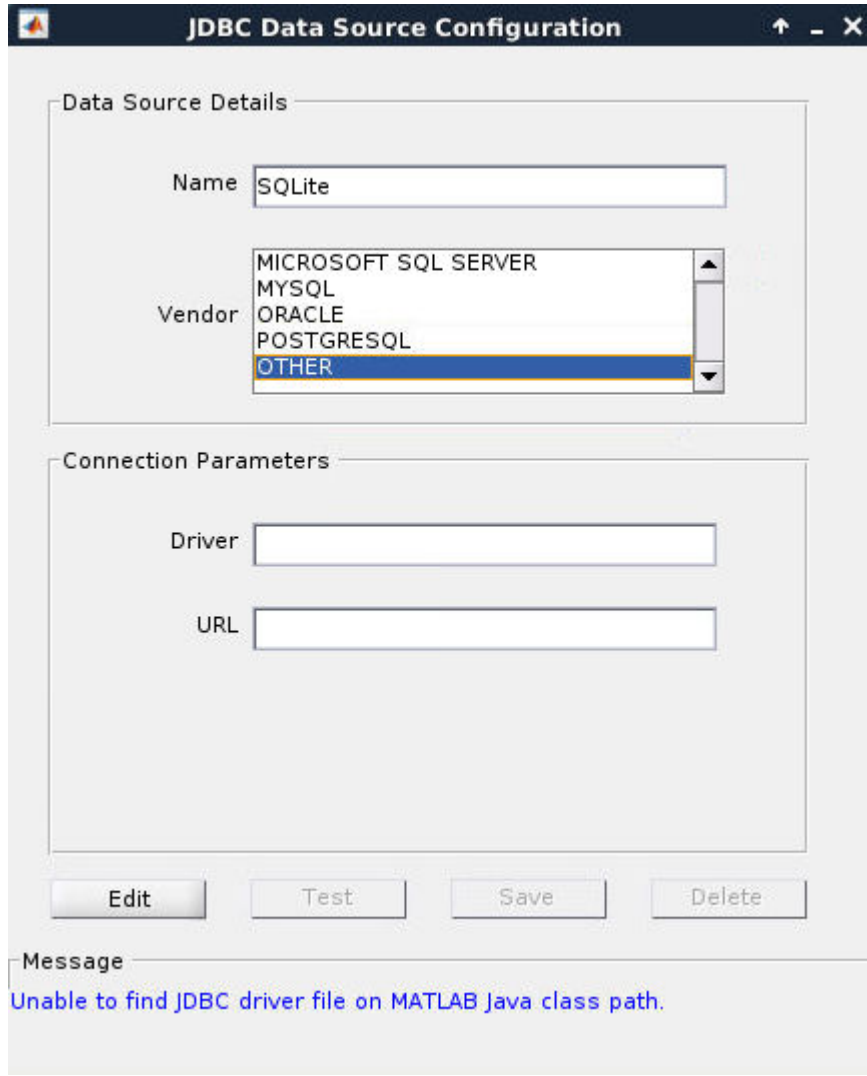
1 Open the Database Explorer app by clicking the **Apps** tab on the MATLAB Toolstrip. Then, on the right of the **Apps** section, click the **Show more** arrow to open the apps gallery. Under **Database Connectivity and Reporting**, click **Database Explorer**. Alternatively, enter `databaseExplorer` at the command line.

2 Select **Configure Data Source > Configure JDBC data source**.

The JDBC Data Source Configuration dialog box opens.

3 In the **Name** box, enter a data source name. (This example uses a data source named `SQLite`.)

4 From the **Vendor** list, select `OTHER`.



Your entries for **Driver** and **URL** can vary depending on the type and version of the JDBC driver and your database. For details, see the JDBC driver documentation for your database.

5 In the **Driver** box, enter the SQLite driver Java class object. Here, use `org.sqlite.JDBC`. If you did not add the JDBC driver file path to the Java class

path, the dialog box displays this message at the bottom: `Unable to find JDBC driver file on MATLAB Java class path`. Address this message by following the steps described in Step 2 on page 2-131.

6 Connect to the SQLite database by creating a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type, in this case, `sqlite`. The last part of the URL string is `subname`. For SQLite, `subname` contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer. Enter your string in the **URL** box and press **Enter**.

7 Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database, or leave these boxes blank if your database does not require them. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box displays a message indicating the connection is successful. Otherwise, it displays an error message.

8 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved successfully. Close this dialog box.

After you complete the data source setup, connect to the SQLite database using the Database Explorer app or the command line with the JDBC connection.

Step 4. Connect using the Database Explorer app or the command line.

Connect to SQLite Using Database Explorer App

1 On the **Database Explorer** tab, in the **Data Source** section, click **New Query**.

2 In the Connect to a Data Source dialog box, select the data source you defined from the **Data Source** list. Enter a user name and password, or leave these boxes blank if your database does not require them. Click **Connect**.

   The Database Explorer app connects to the database and displays database tables in the **Data Browser** pane. A data source tab appears to the right of the pane. The title of the data source tab is the data source name that you defined during the setup. The data source tab contains empty **SQL Query** and **Data Preview** panes.

3 Select tables in the **Data Browser** pane to query the database.

4 Close the data source tab to close the SQL query and the database connection.

Tip To close the database connection, close all tabs that have titles beginning with the name of the corresponding data source. For example, if the data source name is `SQLite`, and two tabs named `SQLite` and `SQLite1` are open, then close both tabs.

To close all database connections, close the Database Explorer app.

Connect to SQLite Using JDBC Driver and Command Line

When using the command line, you do not have to set up a data source with the Database Explorer app. You can use the command line to pass all the required parameters for connection.

1. Connect to the SQLite database by using the `database` function.

   - Enter the data source name that you defined for the first argument.
   - Enter your user name `username` and password `pwd`, or leave these arguments blank if your database does not require them.
   - The fourth argument is the driver Java class object. This code assumes that the class object is `org.sqlite.JDBC`.
   - The last argument is the URL string `URL` that you create using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type, in this case, `sqlite`. The last part of the URL string is `subname`. For SQLite, `subname` contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer.

   For example, this code assumes that you are connecting to a data source named `SQLite`.

   ```
   conn = database('SQLite','username','pwd','org.sqlite.JDBC','URL');
   ```

2. Close the database connection.

   ```
   close(conn)
   ```

See Also

Apps
Database Explorer

Functions

`close` | `database` | `javaaddpath`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Other ODBC- or JDBC-Compliant Databases

This tutorial provides steps for configuring data sources and connecting to other ODBC- or JDBC-compliant databases that are not listed in “Configuring Driver and Data Source” on page 2-15. You can create a data source. Then, you can connect to your database using the Database Explorer app or the command line.

ODBC-Compliant Databases

These steps show how to configure a driver and connect to an ODBC-compliant database with MATLAB. Database Toolbox can connect to any ODBC-compliant database that is relational and uses ANSI® SQL. For example, if your database is Microsoft Excel® or IBM DB2®, follow these basic steps:

1. If your driver is not preinstalled on your computer, find a compatible driver and install it on your computer. You can view preinstalled drivers using the Microsoft ODBC Data Source Administrator dialog box. For details about this dialog box, see Driver Installation.
2. Create a data source by using the installed driver and the Microsoft ODBC Data Source Administrator dialog box.
3. Use the Database Explorer app to test your connection and connect to your database. For an example, see “MySQL ODBC for Windows” on page 2-54.

   Or, you can connect to your database using the `database` function at the command line.
4. For detailed assistance, contact your database administrator or refer to your database documentation.

JDBC-Compliant Databases

These steps show how to configure a driver and connect to a JDBC-compliant database with MATLAB. Database Toolbox can connect to any JDBC-compliant database that is relational and uses ANSI SQL. For example, if your database is Apache™ Derby or Microsoft Windows Azure®, follow these basic steps:

Note The details of these steps can vary depending on your database and database version. For detailed assistance, contact your database administrator or refer to your database documentation.

---

1. If your driver is not preinstalled on your computer, find a compatible driver and install it on your computer.
2. Add the JDBC driver path to the static Java class path or the dynamic Java class path. For details about static and dynamic class paths, see "Java Class Path" (MATLAB).
3. To connect to a JDBC-compliant database, you must know your database driver Java class object. For example, the Java class object for a SQLite database driver is `org.sqlite.JDBC`. Specify this driver value using either the **Driver** box in the JDBC Data Source Configuration dialog box or the `driver` input argument of the `database` function at the command line.

   Note For JDBC-compliant databases, specify the driver and URL in the JDBC Data Source Configuration dialog box of the Database Explorer app or in the `database` function. The driver and the URL string can vary depending on the type and version of the JDBC driver and the database you are working with. For details about the driver and URL, see the JDBC driver documentation for your database.

4. To connect to a JDBC-compliant database, you must create a URL string. The URL string is in the form `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is the database type. The last part of the URL string is `subname`. The `subname` contains the location of the database and additional connection information, such as the port number. For example, if you are using SQLite, the string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer. Use this string for establishing a connection either with the Database Explorer app or the command line.
5. Use the Database Explorer app to test your connection and connect to your database. For an example, see "SQLite JDBC for Windows" on page 2-76.

   Or, you can connect to your database using the `database` function at the command line.

See Also

Apps
Database Explorer

Functions

`close` | `database` | `javaaddpath`

Related Examples

- “MySQL ODBC for Windows” on page 2-54
- “SQLite JDBC for Windows” on page 2-76

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Java Class Path” (MATLAB)
- “Modify and Delete Data Sources” on page 4-14
- “Database Explorer App Error Messages” on page 3-14
- “Database Connection Error Messages” on page 3-6

Connecting to Database

To connect to a database from MATLAB, install an ODBC or JDBC driver and create a data source. For details about driver installation and data source setup, see “Configuring Driver and Data Source” on page 2-15. If you do not have an installed database and want to store relational data quickly, you can use the MATLAB interface to SQLite. For details, see “Working with MATLAB Interface to SQLite” on page 2-6.

You can connect to a database using the **Database Explorer** or the command line. These two options enable you to perform different actions. For details about deciding which option to use, see “Connection Options” on page 2-9.

After deciding between the Database Explorer app and the command line, connect to your database by following the steps for the corresponding database and driver type, as given in this list.

Microsoft Access

- ODBC
  - “Connect to Access Using Database Explorer App” on page 2-21
  - “Connect to Access Using ODBC Driver and Command Line” on page 2-22

Microsoft SQL Server

- ODBC
  - “Connect to SQL Server Using Database Explorer App” on page 2-29
  - “Connect to SQL Server Using ODBC Driver and Command Line” on page 2-29
- JDBC
  - “Connect to SQL Server Using Database Explorer App” on page 2-38
  - “Connect to SQL Server Using JDBC Driver and Command Line” on page 2-39

Oracle

- ODBC

MySQL

PostgreSQL

SQLite

- No driver or database installation is required. To create a SQLite connection, use `sqlite` to create a new SQLite database file or connect to an existing SQLite database file.

Other ODBC- or JDBC-Compliant Databases

For an example of how to connect to a database that is not listed here, see "Other ODBC- or JDBC-Compliant Databases" on page 2-137.

See Also

`close` | `database`

More About

- "Setup Requirements for Database Connection" on page 2-12
- "Access Relational Database Data in MATLAB" on page 2-3
- "Connection Options" on page 2-9
- "Choosing Between ODBC and JDBC Drivers" on page 2-13
- "Configuring Driver and Data Source" on page 2-15
- "Working with MATLAB Interface to SQLite" on page 2-6

Data Import Using Database Explorer App or Command Line

In this section...

You can import data from a database into MATLAB using the **Database Explorer** app or the command line. To select data for import, you can build an SQL query visually by using the Database Explorer app. Or, you can use the command line to write SQL queries. To achieve maximum performance with large data sets, use the command line instead of the Database Explorer app.

After importing data, you can repeat the steps in the process, such as connecting to a database, executing an SQL query, and so on, by using a MATLAB script to automate them.

To open multiple connections to the same database simultaneously, you can create multiple SQL queries using the Database Explorer app. Or, you can connect to the database using the command line.

If you do not have access to a database and want to import your data quickly, you can use the MATLAB interface to SQLite. For details, see “Working with MATLAB Interface to SQLite” on page 2-6.

Data Import Using Database Explorer App

If you have minimal proficiency writing SQL queries or want to browse the data in a database quickly, use the **Database Explorer** app. To build queries, see “Create SQL Queries Using Database Explorer App” on page 4-2. After creating a query using the Database Explorer app, you can generate the SQL code for the query. For details, see “Generate SQL Query” on page 4-17. You can embed the generated SQL code into the SQL query that you specify in the `exec` function. Or, you can create an SQL script file to use with the `runsqlscript` function.

If you want to automate the current task after you create the SQL query, then generate a MATLAB script. For details, see “Generate MATLAB Script” on page 4-18.

Data Import Using Command Line

If you know how to write SQL queries, use the command line to explore a database. You can write basic SQL statements as character vectors or string scalars. For a simple example, see “Import Data from Databases into MATLAB” on page 5-2. If you have variables in the MATLAB workspace, you can add them to the SQL query. For an example, see “Create Queries with Characters and Variables” on page 5-6.

You can import data into MATLAB in one of two ways. Use the `select` function for maximum memory efficiency and quick access to imported data in one step. Use the `exec` and `fetch` functions for a two-step approach with maximum flexibility for setting database preferences and importing numeric data with double precision. The `exec` function executes the SQL statement, and the `fetch` function imports the data from the database into a MATLAB variable. This table provides details about the two ways to import data into MATLAB.

Functionality	One-Step Data Import	Two-Step Data Import
Function	`select`	`exec` and `fetch`
SQL statement	Single `SELECT` statement only	Single or multiple `SELECT` statements
Data types for imported numeric values	Specified by the database table definition	MATLAB `double`
Memory management	Integer classes for numeric values	Number of imported rows or database preferences
Database preferences	Setting database preferences not required	Setting database preferences required using `setdbprefs`

For memory management, see “Data Import Approaches and Memory Management” on page 5-45.

If you are not comfortable writing SQL queries, then use the Database Explorer app to select data to import from your database.

If you have a stored procedure that imports data, then use the `runstoredprocedure` or `exec` function.

Custom Data Types

When importing data from a database, Database Toolbox functions return custom data types, such as Oracle ref cursors, as Java objects. You can manually parse these objects to retrieve their data contents. Use the `methods` function to access all the methods of a Java object. Use the available methods to retrieve data from a Java object. The steps for your object are specific to your database. For details, refer to your JDBC driver or database documentation.

SQL Queries Saved in Scripts or Files

If you have a long SQL query or multiple SQL queries that you want to run sequentially to import data, create an SQL script file containing your SQL queries. To execute the SQL script file, use the `runsqlscript` function. If you have SQL queries stored in `.sql` or text files that you want to run from MATLAB, you also can use this function.

See Also

`database` | `exec` | `fetch` | `select`

More About

- "Connection Options" on page 2-9
- "Connecting to Database Using Native ODBC Interface" on page 3-17
- "Data Import Approaches and Memory Management" on page 5-45
- "Working with Large Data Sets" on page 2-148
- "Working with MATLAB Interface to SQLite" on page 2-6
- "Data Type Support" on page 1-3
- "Data Retrieval Restrictions" on page 1-5

Inserting Data Using Command Line

You can insert data from MATLAB into a database using the command line. The `datainsert`, `fastinsert`, and `insert` functions insert data from the MATLAB workspace into a database.

The MATLAB interface to SQLite supports the `insert` function only. For details about this interface, see “Working with MATLAB Interface to SQLite” on page 2-6.

The three functions behave differently depending on the database connection type.

- For ODBC connections, all three functions have identical functionality.
- For JDBC connections:
  - The `datainsert` function has faster performance.
  - Both the `fastinsert` and `insert` functions have identical functionality.

All three functions require special formatting of the insert data for dates and timestamps. The `datainsert` function also requires special formatting for `null` and `NaN` values.

All database preference settings, except `NullNumberWrite` and `NullStringWrite`, apply to all three functions. These two settings do not apply to the `datainsert` function. To set database preferences, use the `setdbprefs` function.

If you experience performance issues using these functions, then use the bulk insert functionality of your database. For details, see “Export Data Using Bulk Insert” on page 5-31.

To import data into MATLAB from your database, use the `select` function or the `exec` and `fetch` functions.

See Also

`database` | `update`

More About

- “Export Data to New Record in Database” on page 5-20

- “Export Multiple Records from MATLAB Workspace” on page 5-26
- “Export Data Using Bulk Insert” on page 5-31
- “Import Data from Databases into MATLAB” on page 5-2
- “Import Data Using MATLAB® Interface to SQLite” on page 5-67

Working with Large Data Sets

In this section...

Connect to a Database with Maximum Performance

When you are using MATLAB with a database containing large volumes of data, you can experience out-of-memory issues or slow processing. To achieve the fastest performance, connect to your database using the native ODBC interface. For details, see “Connecting to Database Using Native ODBC Interface” on page 3-17. If the native ODBC interface does not work, connect to your database using a JDBC driver. For details, see “Connecting to Database” on page 2-140.

Import Large Data Sets into MATLAB

If you are selecting large volumes of data in a database to import into MATLAB, you can experience out-of-memory issues or slow processing. To achieve the fastest performance, you can import the data in batches.

When working with a native ODBC connection, the amount of memory available to MATLAB can restrict you from processing your whole set of data at once. To manage the MATLAB memory, process your data in parts. Use the `fetch` function to limit the number of rows your query returns by using the row limit argument. Using a MATLAB script, you can fetch data in increments using the row limit until all data is retrieved. For an example, see `fetch`.

If you do not have access to a database and want to import large data sets, you can use the MATLAB interface to SQLite. For details, see “Working with MATLAB Interface to SQLite” on page 2-6.

Export Large Data Sets from MATLAB

When inserting large volumes of data into a database, you can experience slow processing. To achieve the fastest performance, use the `datainsert` function to export your data from MATLAB.

If you do not have access to a database and want to export large data sets, you can use `insert` with the MATLAB interface to SQLite. For details, see "Working with MATLAB Interface to SQLite" on page 2-6.

Access Large Data Using a DatabaseDatastore

An alternative for importing large data sets stored in a database into MATLAB is using a `DatabaseDatastore`. A `DatabaseDatastore` is a datastore that contains a collection of data stored in a database.

You can analyze data in a `DatabaseDatastore` using tall arrays with common MATLAB functions, such as `mean` and `histogram`. For details, see "Analyze Large Data in Database Using Tall Arrays". Or, for more control, you can also write your own algorithms using MapReduce. For details, see "Analyze Large Data in Database Using MapReduce".

See Also

More About

- "Choosing Between ODBC and JDBC Drivers" on page 2-13
- "Data Import Using Database Explorer App or Command Line" on page 2-143
- "Import Data from Databases into MATLAB" on page 5-2
- "Export Data to New Record in Database" on page 5-20

Deploying Database Application with MATLAB Compiler

In this section...

If you want to share your MATLAB code with others in your organization, then you must create a standalone database application using MATLAB Compiler™. After compiling the database application, you can deploy it to the target machines. Use this procedure and driver-specific information to create and deploy a database application.

Create and Deploy Database Application

1. Write your database application code and save it as a MATLAB function in a file. Do not save the code as a MATLAB script file. Write the code in function form for database application deployment. Further, you must keep certain things in mind as you write your database application code. For details, see “Write Deployable MATLAB Code” (MATLAB Compiler).
2. Compile your database application with MATLAB Compiler using the standalone application packaging process. For details, see “Package Standalone Application with Application Compiler App” (MATLAB Compiler).
3. The generated output from the compilation process contains a folder called `for_testing`. Conduct a test on a target machine using the files found in this folder.
4. After the test is successful, you can distribute the database application to the target machines in your organization.

About Driver Configurations

Ensure the target machines have the correct driver configuration for your database application. See the following driver-specific tasks to configure data sources and drivers.

Native ODBC and ODBC Drivers

After compiling your database application, you must define the data sources referenced in your code on the target machine using the ODBC Data Source Administrator. Then, you can run your database application on the target machine.

JDBC Drivers

For applications that use JDBC drivers, use either option to specify the JDBC driver on the target machine:

- Use `javaaddpath` in your function code to add your JDBC driver JAR file. Do not include the JAR file in the `javaclasspath.txt` file.
- Add the JDBC driver JAR file to your `javaclasspath.txt` file. Do not use `javaaddpath` in your function code. For Microsoft SQL Server operating system authentication, add the full path of the library file to the `javalibrarypath.txt` file. For details, see "Microsoft SQL Server JDBC for Windows" on page 2-31.

Caution: Do not add driver JAR files using `javaclasspath` as this might cause issues on the target machine. For details, see "Java Class Path" (MATLAB).

See Also

`javaaddpath`

More About

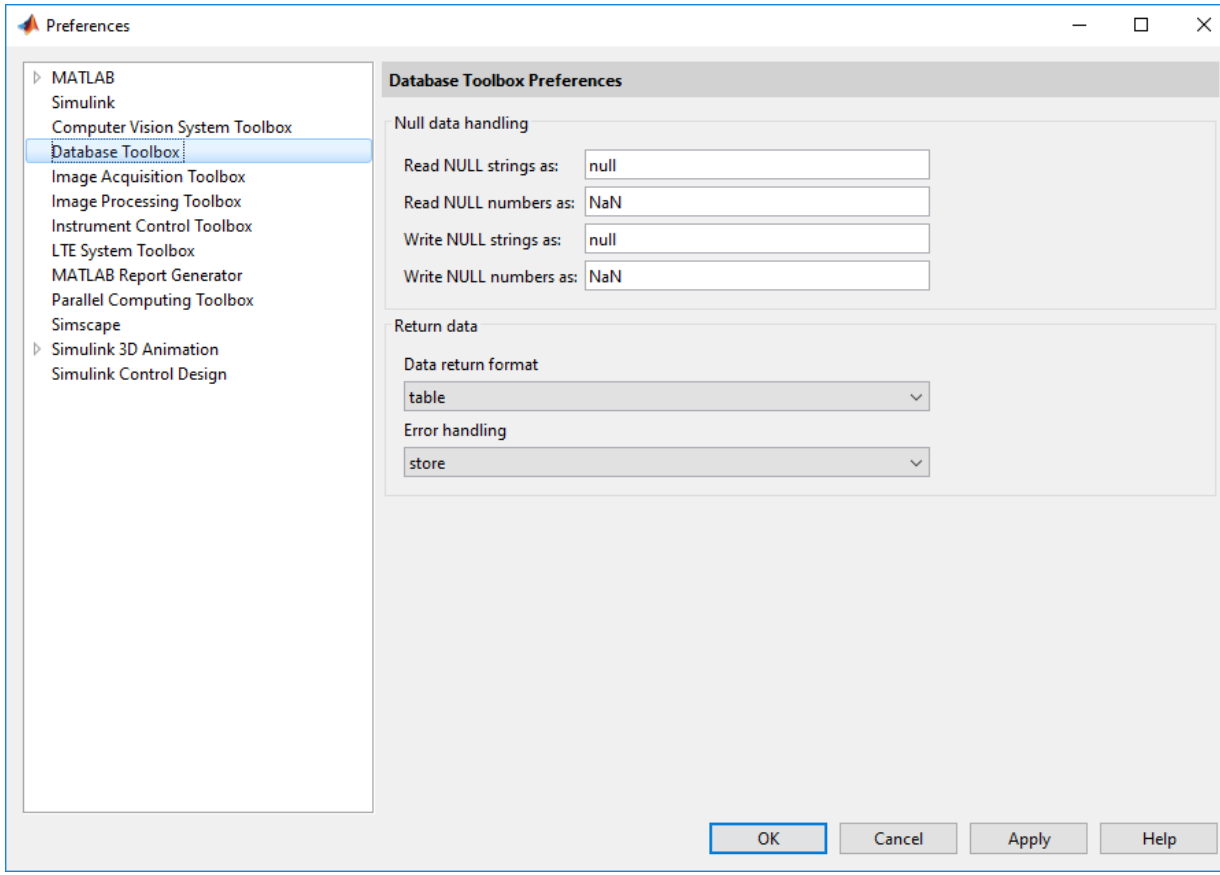
- "Write Deployable MATLAB Code" (MATLAB Compiler)
- "Create Functions in Files" (MATLAB)
- "Package Standalone Application with Application Compiler App" (MATLAB Compiler)
- "Java Class Path" (MATLAB)

Working with Database Toolbox Preferences

Database Toolbox preferences enable you to specify:

- How `NULL` data in a database is represented after you import it into or export it from the MATLAB workspace
- The data return format of imported data
- The method of error notification
- How to import data in batches

On the MATLAB Toolstrip, in the **Environment** section, click **Preferences** and select **Database Toolbox**.



Specify preferences as described in this table, and click **OK**. For details, see the `setdbprefs` function.

Preference	Acceptable Values	Description
Read NULL strings as	`null` (default), any text value	Specifies how `NULL` strings appear in MATLAB after being imported from a database.
Read NULL numbers as	`NaN` (default), any numeric value	Specifies how `NULL` numbers appear in MATLAB after being imported from a database. If you accept the default value for this preference, `NULL` numbers appear as `NaN`. Setting this preference to `0` causes `NULL` numbers to appear as `0` in the MATLAB workspace.
Write NULL strings as	`null` (default), any text value	Specifies how empty character vectors or string scalars appear in a database after being exported from MATLAB.
Write NULL numbers as	`NaN` (default), any numeric value	Specifies how `NULL` numbers appear in a database after being exported from MATLAB.
Data return format	`cellarray` (default), `table`, `numeric`, or `structure`	Specifies a data format based on the type of data you are importing, memory considerations, and your preferred method of working with imported data. • `cellarray` — Imports nonnumeric data into MATLAB cell arrays. • `table` — Imports data into a MATLAB table. Use this value for all database data types. • `numeric` — Imports data into a MATLAB matrix of doubles. Nonnumeric data types are considered `NULL`. The preference setting **Read NULL numbers as** controls the appearance of this data. Use this value only when the format of the data to import is numeric, or when nonnumeric data to import is not relevant. • `structure` — Imports data into a MATLAB structure. Use this value for all database data types.

Preference	Acceptable Values	Description
Error handling	`store` (default) or `report`	Specifies where error messages appear after connecting to a database or importing data. • `store` — Directs errors to the `Message` properties of the `connection` and `cursor` objects when you use the command line. • `report` — Displays query errors in the Command Window.

See Also

`database` | `exec` | `fetch`

More About

- "Configuring Driver and Data Source" on page 2-15
- "Connecting to Database" on page 2-140
- "Import Data from Databases into MATLAB" on page 5-2
- "Export Data to New Record in Database" on page 5-20

Working with Data Sources

Fetching Data Common Errors

This table describes how to address common errors you might encounter while working with Database Toolbox. These errors might occur in either Database Explorer or the command line when using `exec` or `fetch`.

Vendor	Error Message	Probable Causes	Resolution
Microsoft SQL Server	The statement did not return a result set.	There are other SQL statements in the middle of the stored procedure. This error happens after executing `exec` but before executing `fetch`. This error happens only with the command line.	Add `'SET NOCOUNT ON'` at the beginning of your stored procedure. For details, see `exec`.
Microsoft SQL Server	JDBC Driver 3.0 returns incorrect date values when used with JRE™ 1.7 by a Java application.	There is an issue with the Microsoft SQL Server JDBC Driver 3.0. This error happens after executing `fetch`. This error happens either with Database Explorer or the command line.	Install a hotfix from Microsoft for JDBC Driver 3.0. Alternatively, upgrade your Microsoft SQL Server JDBC driver to version 4.0.
Microsoft SQL Server	Connection is busy with results for another command.	You are connecting to Microsoft SQL Server using a driver that `preview` does not support.	Connect to Microsoft SQL Server using the JDBC driver.

Vendor	Error Message	Probable Causes	Resolution
Oracle	Stored procedures and functions return result sets as cursor types.	The JDBC driver returns stored procedure and function result sets as custom Java objects. This error happens after executing `fetch`. This error happens only with the command line.	Write custom MATLAB code to process the Java objects into MATLAB variables.

Vendor	Error Message	Probable Causes	Resolution

PostgreSQL	Java exception occurred: java.lang.OutOfMemoryError: Java heap space	The JDBC driver caches results in the memory. There is not enough memory in the Java heap to store the large amount of data fetched from your database. This error happens after executing `exec` but before executing `fetch`. This error happens either with Database Explorer or the command line.	Write custom code. Write the code for connecting to your database via the command line. Then write the following.
			
			`set(conn,'AutoCommit','off');`
			
			`h = conn.Handle;`
			
			`stmt = h.createStatement();`
			
			`stmt.setFetchSize(50);`
			
			`rs = stmt.executeQuery(java.lang.String('SELECT * FROM largeData where productnumber <= 3000000'));`
			
			Modify the previous statement to include your SQL query instead.
			
			Then process the result set object `rs` in batches.

See Also

`exec` | `fetch`

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11
- “Data Import Using Database Explorer App or Command Line” on page 2-143
- “Call Stored Procedure That Returns Data” on page 5-40

Database Connection Error Messages

This table describes how to address common errors you might encounter while connecting to the Database Toolbox using Database Explorer or the command line.

Connection Error Messages and Probable Causes

Vendor	Error Message	Probable Causes	Resolution
All	Undefined variable 'database' or class 'database.ODBCConnection'.	• Database Toolbox software is not installed. • You are connecting using the native ODBC interface with MATLAB R2013a or earlier.	• Ensure that Database Toolbox software is installed. • If you want to use the native ODBC interface, ensure that MATLAB R2013b or later is installed.
All ODBC-Compliant Databases	[Microsoft][ODBC Driver Manager] Data source name not found and no default driver specified	Data source name is not spelled correctly.	Verify your data source name.
All JDBC-Compliant Databases	Unable to find JDBC driver file on MATLAB Java class path.	• Path to the JDBC driver JAR file is not on the static or dynamic class path. • Incorrect driver name provided while using the `'driver'` and `'url'` syntax.	Verify that you added the path to your JDBC driver to the static or dynamic path. For an example, see “MySQL JDBC for Windows” on page 2-60. Ensure that you provide the correct JDBC driver name for the `driver` and `url` input arguments. For an example, see “SQLite JDBC for Windows” on page 2-76.

Vendor	Error Message	Probable Causes	Resolution
All ODBC-Compliant Databases	[Microsoft][ODBC Driver Manager] The specified DSN contains an architecture mismatch between Driver and Application	There is a difference in the bitness (32-bit or 64-bit) between the database, driver, and MATLAB.	Use a 64-bit driver. If you have issues working with the ODBC driver, use the JDBC driver instead. For details about driver installation, see “Configuring Driver and Data Source” on page 2-15. To address differences in bitness for Microsoft Access, see “Microsoft Access ODBC for Windows” on page 2-18.
Microsoft Access	[Microsoft][ODBC Microsoft Access Driver] ‘(unknown)’ is not a valid path. make sure that the path name is spelled correctly and that you are connected to the server on which the file resides	Error occurs in the Connection Failure dialog box after clicking **Connect** in the Connect to a Data Source dialog box. The file location of the Microsoft Access database is incorrect.	Verify the location of the database file. If the database file is on a network drive, map to the network drive. Modify the existing file location by selecting **New > ODBC** and selecting the existing database name from the ODBC Data Source Administrator dialog box. Then select **Configure** to change the database file location.

Vendor	Error Message	Probable Causes	Resolution
Microsoft SQL Server	The TCP/IP connection to the host *hostname*, port *portnumber* has failed. Error: "null. Verify the connection properties, check that an instance of SQL Server is running on the host and accepting TCP/IP connections at the port, and that no firewall is blocking TCP connections to the port."	Incorrect server name or port number.	Verify your database server name and your port number. Microsoft SQL Server uses a dynamic port for JDBC. Verify the value using Microsoft SQL Server Configuration Manager. For details, see "Step 2. Verify the port number." on page 2-31
Microsoft SQL Server	This driver is not configured for integrated authentication.	The Microsoft SQL Server Windows authentication library is not added to `javalibrarypath.txt`.	Add the Microsoft SQL Server Windows authentication library to `javalibrarypath.txt`. For details about configuring a Microsoft SQL Server Authenticated Database Connection, see "Microsoft SQL Server JDBC for Windows" on page 2-31.
Microsoft SQL Server	Invalid string or buffer length.	64-bit ODBC driver error.	Use a JDBC driver or the native ODBC interface instead.

Vendor	Error Message	Probable Causes	Resolution
Microsoft SQL Server	JDBC Driver Error: com.microsoft.sqlserver.jdbc.SQLServerDriver.Driver Not Found/Loaded.	The full path to the JAR file was not added to the `javaclasspath.txt` file, or it was added using the `javaaddpath` command. Alternatively, the path to the JAR file is incorrect.	Ensure that the path to the JAR file is not misspelled. Ensure that you add the path to the static class path.
Microsoft SQL Server	com.microsoft.sqlserver.jdbc.AuthenticationJNI <clinit> WARNING: Failed to load the sqljdbc_auth.dll	The path to the folder containing the file `sqljdbc_auth.dll` was not added to the `javalibrarypath.txt` file. Or, the full path to the file was added instead of the path to the folder. This error also occurs when you add the path to the 32-bit version of the DLL using a 64-bit version of MATLAB.	Add the path to the folder containing the file `sqljdbc_auth.dll` to the `javalibrarypath.txt` file. For details about configuring a Microsoft SQL Server Authenticated Database Connection, see “Microsoft SQL Server JDBC for Windows” on page 2-31.

Vendor	Error Message	Probable Causes	Resolution
Microsoft SQL Server	Login failed for user 'DOMAIN\username'.	Either the login credentials you are using are incorrect or your user account does not have enough rights to access the remote machine. This error also occurs when the database server is not configured to accept Integrated Windows Authentication login credentials.	Ensure that your user name and password are correct. Refer to your system administrator for appropriate access rights to your machines. Contact your database administrator to see if your database is set up with Windows Authentication.
Microsoft SQL Server	`MSSQLSERVER_`*`number`*	The Microsoft SQL Server driver returns a numbered error message.	Find more information about the specific error in System Error Messages.
MySQL	Access denied for user `'user'@'machinename'` (using password: YES)	Incorrect user name and password combination.	Verify your user name and password.
MySQL	Communications link failure. The last packet sent successfully to the server was 0 milliseconds ago. The driver has not received any packets from the server.	Incorrect server name or port number.	Verify your database server name and port number.
MySQL	Unknown database `'databasename'`.	Provided database name is incorrect.	Verify your database name.

Vendor	Error Message	Probable Causes	Resolution
MySQL	`ERROR number (SQLSTATE): errormessage`	The MySQL driver returns an error that contains an error number, a `SQLSTATE` value, and an error message.	Navigate to the latest database documentation in the MySQL Documentation, and search for the specific error.
Oracle	Error when connecting to Oracle `oci8` database using JDBC driver: `Error using com.mathworks.toolbox.database.databaseConnect/makeDatabaseConnection Java exception occurred: java.lang.UnsatisfiedLinkError: no ocijdbc11 in java.library.pathat java.lang.ClassLoader.loadLibrary(Unknown Source)at java.lang.Runtime.loadLibrary0.....`	MATLAB cannot find the Oracle DLL that the `oci8` drivers need.	Add the path for the location of the Oracle DLLs to `javalibrarypath.txt`. For details, see “Oracle JDBC for Windows” on page 2-47.
Oracle	Invalid Oracle URL specified: `OracleDataSource.makeURL`	The `DriverType` parameter is not specified.	Specify the `DriverType` parameter as either `thin` for connecting without Windows authentication or `oci` for connecting with Windows authentication.
Oracle	The Network Adapter could not establish the connection.	Either `Server` or `Portnumber` is not specified or has an incorrect value.	Verify the server name and port number for your Oracle database.
Oracle	TNS:listener does not currently know of SID given in connect descriptor: Incorrect database name or incorrect URL.	The service name for your database is incorrect.	Verify the service name for your Oracle database.

Vendor	Error Message	Probable Causes	Resolution
Oracle	`ORA-`*`number`*	The Oracle driver returns a numbered error message.	Navigate to the latest database documentation in the Oracle Documentation, and search for the specific error.

See Also

`database`

More About

- “Configuring Driver and Data Source” on page 2-15
- “Connecting to Database Using Native ODBC Interface” on page 3-17

Database Explorer App Error Messages

This table describes how to address common errors you can encounter while working with the **Database Explorer** app. For Database Toolbox connection errors, see "Database Connection Error Messages" on page 3-6.

Error Category	Error Message	Probable Causes	Resolution
Database connection	No data sources found. Configure a data source before creating a new query.	You clicked **New Query** before configuring any data sources.	Configure at least one ODBC or JDBC data source. For details, see "Configuring Driver and Data Source" on page 2-15.
Configure JDBC data source	Unable to find the JDBC driver file on the MATLAB Java class path.	The JDBC Data Source Configuration dialog box displays this message at the bottom of the dialog box. This message is displayed when the JDBC driver for the database, or the driver specified for the **Driver** option when the **Vendor** option is set to `OTHER`, is not found on the MATLAB Java class path.	Add the JDBC driver to the MATLAB Java class path. For details, see "MySQL JDBC for Windows" on page 2-60.

Error Category	Error Message	Probable Causes	Resolution
SQL statements	Database Explorer supports one SELECT SQL statement only.	You entered an incompatible SQL query. The Database Explorer app accepts a single `SELECT` statement only. Other SQL statements are not supported.	Create one valid SQL `SELECT` statement in the **SQL Query** pane.
Data preview	Received the following message from the database:	If an error occurs on the database server when it executes the SQL query, an error message appears in the **Data Preview** pane. This text precedes the exact error message from the database server.	Refer to the error message to determine the issue. Consult your database administrator for further details.
Data preview	Error occurred while executing the query on the database.	The Database Explorer app returned a MATLAB error while trying to execute the SQL query.	Click the button to view the stack trace. For questions, contact technical support.

Error Category	Error Message	Probable Causes	Resolution
Data preview	No data was returned for this SQL Query.	The SQL query executed successfully but did not return any data. The Database Explorer app displays this error message in the **Data Preview** pane when previewing data or in a dialog box when importing data.	Use the Database Explorer app to modify the SQL query. Ensure the selected table contains data by clicking it in the **Data Browser** pane.
Data import	*`variable`* not a valid MATLAB variable name.	You entered an invalid MATLAB variable name.	Enter a valid MATLAB variable name, such as `data`.

See Also

Apps

Database Explorer

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Data Preview Using Database Explorer App” on page 4-11

Connecting to Database Using Native ODBC Interface

In this section...

About Native ODBC Interface

When you create a database connection using an ODBC driver, Database Toolbox uses the native ODBC interface to establish the database connection. The native ODBC interface is a C++ library that allows direct communication with the ODBC driver. The native ODBC interface supports importing and exporting large amounts of data.

Native ODBC Interface Workflow

This example shows how to connect to a database using the native ODBC interface, import and export data, and close the connection.

Connect to Database Using Native ODBC Interface

Connect to the database with the ODBC data source name `dbdemo` and leave the user name and password blank.

```
conn = database('dbdemo','','');
```

`conn` is a `connection` object.

Import Data Using Native ODBC Interface

Select data in the column `productDescription` from `productTable` using the database connection. Assign the returned `cursor` object to the variable `curs`.

```
sqlquery = 'SELECT productDescription FROM productTable';
curs = exec(conn,sqlquery);
```

With the native ODBC interface, `exec` returns `curs` as an `ODBCCursor Object` instead of a `Database Cursor Object`.

Use `fetch` to import all data into the `cursor` object, and store the data in a cell array contained in the `cursor` object property `Data`.

```
curs = fetch(curs);
```

View the contents of the `Data` property in the `cursor` object.

```
curs.Data
```

```
ans =

    'Victorian Doll'
    'Train Set'
    'Engine Kit'
    'Painting Set'
    'Space Cruiser'
    'Building Blocks'
    'Tin Soldier'
    'Sail Boat'
    'Slinky'
    'Teddy Bear'
```

Export Data Using Native ODBC Interface

Define the columns of data to insert in the cell array `colnames`.

```
colnames = {'productNumber','stockNumber','supplierNumber', ...
    'unitCost','productDescription'}
```

```
colnames =

  Columns 1 through 3

    'productNumber'    'stockNumber'    'supplierNumber'

  Columns 4 through 5

    'unitCost'    'productDescription'
```

Define the data for the row to insert in the cell array `coldata`.

```
coldata = {11,800999,1006,9.00,'Toy Car'}
```

```
coldata =

    [11]    [800999]    [1006]    [9]    'Toy Car'
```

Insert the data in `coldata` into the table `productTable` with the defined column names.

```
datainsert(conn,'productTable',colnames,coldata)
```

Caution: The Microsoft Access ODBC driver demonstrates unexpected behavior during large inserts. When you insert a large amount of data with Microsoft Access, insert the data in batches. For example, if you want to insert 100,000 rows of data, insert 10,000 rows at a time.

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Database Connection Type Comparison

You can connect to a database using an ODBC or JDBC driver with the `database` function. This table highlights the differences between using these connection types to access and manipulate data in a database.

Driver	Actions	Underlying Technology	Memory Performance
ODBC driver	Supports all actions except the `runstoredprocedure` function	C++	Restricted by MATLAB memory
JDBC driver	Supports all actions	Java	Restricted by both JVM™ heap memory and MATLAB memory

For details about choosing which connection type is best for your situation, see “Choosing Between ODBC and JDBC Drivers” on page 2-13.

See Also

More About

- “Connection Options” on page 2-9
- “Data Import Using Database Explorer App or Command Line” on page 2-143
- “Data Type Support” on page 1-3

Using Database Explorer

Create SQL Queries Using Database Explorer App

Using the **Database Explorer** app, you can open one or multiple database connections simultaneously by clicking **New Query** in the toolstrip. The Database Explorer app creates a data source tab for each connection.

On each data source tab, you can write an SQL query in one of two ways. If you are unfamiliar with the SQL query language or want to explore data in your database, then use the **Data Browser** pane along with the buttons in the toolstrip. Or, if you are already familiar with SQL, then enter an SQL query manually. When you enter a query, you can use more advanced SQL statements (for example, `AS`, `GROUP BY`, `HAVING`). You can also enter SQL code that is proprietary to the database and does not comply with the ANSI standard.

Create SQL Query Using Toolstrip Buttons

Use these steps as a general workflow for creating an SQL query by using buttons in the toolstrip.

- Connect to a data source in the Database Explorer app. For an example, see “MySQL ODBC for Windows” on page 2-54.
- Click a table in the **Data Browser** pane. The **SQL Query** pane in the data source tab updates with an SQL query that selects all columns and rows of the table. The **Data Preview** pane updates with a preview of the first 10 rows of data in the table.
- In the **Join** section, click **Join** to display the **Join** tab in the toolstrip. In the **Add** section, the name of the table selected in the **Data Browser** pane appears in the left **Table** list. From the left **Column** list, select the name of the shared column. Then, select the name of the table to join in the right **Table** list and select the name of the shared column in the right **Column** list. Click **Add Join**. The Database Explorer app creates an inner join by default. Close the **Join** tab. For details about joining tables, see “Join Tables Using Database Explorer App” on page 4-6.
- In the **Data Browser** pane, expand the table name node of the joined table and select specific check boxes to choose the table columns. The **SQL Query** and **Data Preview** panes update with the chosen columns.
- In the **Criteria** section, click **Where** to display the **Where** tab in the toolstrip. In the **Add** section, select an operator and value to enter an SQL `WHERE` condition. Click **Add Filter**. To represent strings in values, enclose text in single quotes. Close the **Where** tab.

- In the **Criteria** section, click **Order By** to display the **Order By** tab in the toolstrip. In the **Add** section, select the column to sort and click **Add Sort**. Close the **Order By** tab.
- In the **Import** section, click  to import all SQL query results into the MATLAB workspace as a table.
- In the **Edit** section, click **Clear Query** to clear the current SQL query and create a new one.
- To close the database connection, close all tabs whose names contain the data source name.

For detailed examples, see the **Database Explorer** app.

Enter SQL Query Manually

Use these steps as a general workflow for entering an SQL query manually.

- Connect to a data source in the Database Explorer app. For an example, see "MySQL ODBC for Windows" on page 2-54.
- In the **Edit** section, click **Manual** to open a new data source tab. The tab has the same data source name as the prior active tab, but the Database Explorer app appends the suffix `_manual` to the tab name. The manual data source tab keeps the same database connection as the prior active tab.
- Enter or paste an SQL query into the **SQL Query** pane.

  Note If you click **Manual** when the active data source tab contains an SQL query in the **SQL Query** pane, then you can modify the existing SQL query manually. Or, you can click **Clear Query** to clear the existing SQL query in the new tab and enter a new query.

  For each subsequent time you click **Manual**, the new tab contains a numbered suffix.
- In the **Preview** section, click **Preview Query**. The Database Explorer app executes the SQL query and updates the **Data Preview** pane with the results. If the SQL query is valid, the **Data Preview** pane displays the first 10 rows of data by default. To see more rows, adjust the value in the **Preview Size** box.
- Modify the SQL query and click **Preview Query**. The **Data Preview** pane shows the updated results.

- In the **Import** section, click  to import all SQL query results into the MATLAB workspace as a table.
- To close the database connection, close all tabs whose names contain the data source name.

For a detailed example of entering an SQL query manually, see the **Database Explorer** app.

Work with Multiple SQL Queries

To create different SQL queries using the same database, follow these steps:

1. Click **New Query** in the toolstrip. The Connect to a Data Source dialog box opens.
2. Select the data source name from the **Data Source** list. Enter the user name and password for your database, and click **Connect**.
3. Select the catalog and schema in the Catalog and Schema dialog box, and click **OK**. If only one catalog or schema is available in the database, the Catalog and Schema dialog box does not open.

   The Database Explorer app opens a new tab with the data source name as the tab name.

Repeat these steps to connect to the same database again and create a different SQL query. The Database Explorer app appends a numbered suffix to the data source tab name. The number increases by one for each subsequent database connection to the same data source.

Note The Microsoft Access database does not support multiple database connections.

Or, you can connect to different catalogs or schemas. Repeat these steps and select a different catalog or schema in the Catalog and Schema dialog box.

The database server settings control the maximum number of database connections you can create at a time. To increase the maximum number of database connections, contact your database administrator.

You can connect to different databases by repeating these steps and selecting a different data source name from the **Data Source** list.

SQL Query Limitations

The Database Explorer app has these limitations, which you can avoid by using the command line instead.

- You can connect to relational databases only.
- You can enter a single SQL `SELECT` statement only. You cannot enter other SQL statements or multiple SQL statements in the **SQL Query** pane.
- You cannot modify the database structure or the database data.
- You cannot execute stored procedures.

See Also

Functions

`database`

Apps

Database Explorer

More About

- "Configuring Driver and Data Source" on page 2-15
- "Connecting to Database" on page 2-140
- "Join Tables Using Database Explorer App" on page 4-6
- "Data Preview Using Database Explorer App" on page 4-11
- "Generate SQL Query and MATLAB Script" on page 4-17
- "Database Explorer App Error Messages" on page 3-14

External Websites

- SQL Tutorial

Join Tables Using Database Explorer App

You can select and import data from multiple tables using the **Database Explorer** app. First, you must join tables, and then select the data to import. You can join tables using different join types that depend on the database.

Different Join Types

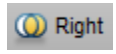
The Database Explorer app creates an inner join by default. To use another join type, click the corresponding button in the **Edit** section of the **Join** tab.

There are four join types:

- 

— An inner join retrieves records that have matching values in the selected column of both tables.
- 

— A full join retrieves records that have matching values in the selected column of both tables, and unmatched records from both the left and right tables.
- 

— A left join retrieves records that have matching values in the selected column of both tables, and unmatched records from the left table only.
- 

— A right join retrieves records that have matching values in the selected column of both tables, and unmatched records from the right table only.

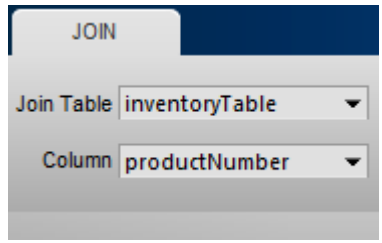
Join Tables

To join tables, you must know the names of each table and the names of the shared columns in the tables (that is, the primary keys). Use these steps as a general workflow for joining tables.

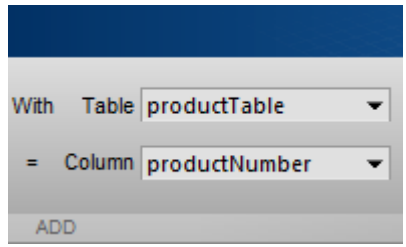
1 After connecting to a database, select a table in the **Data Browser** pane. In the **Join** section, click **Join** to display the **Join** tab in the toolstrip. In the **Add** section,

the name of the table selected in the **Data Browser** pane appears in the left **Table** list.

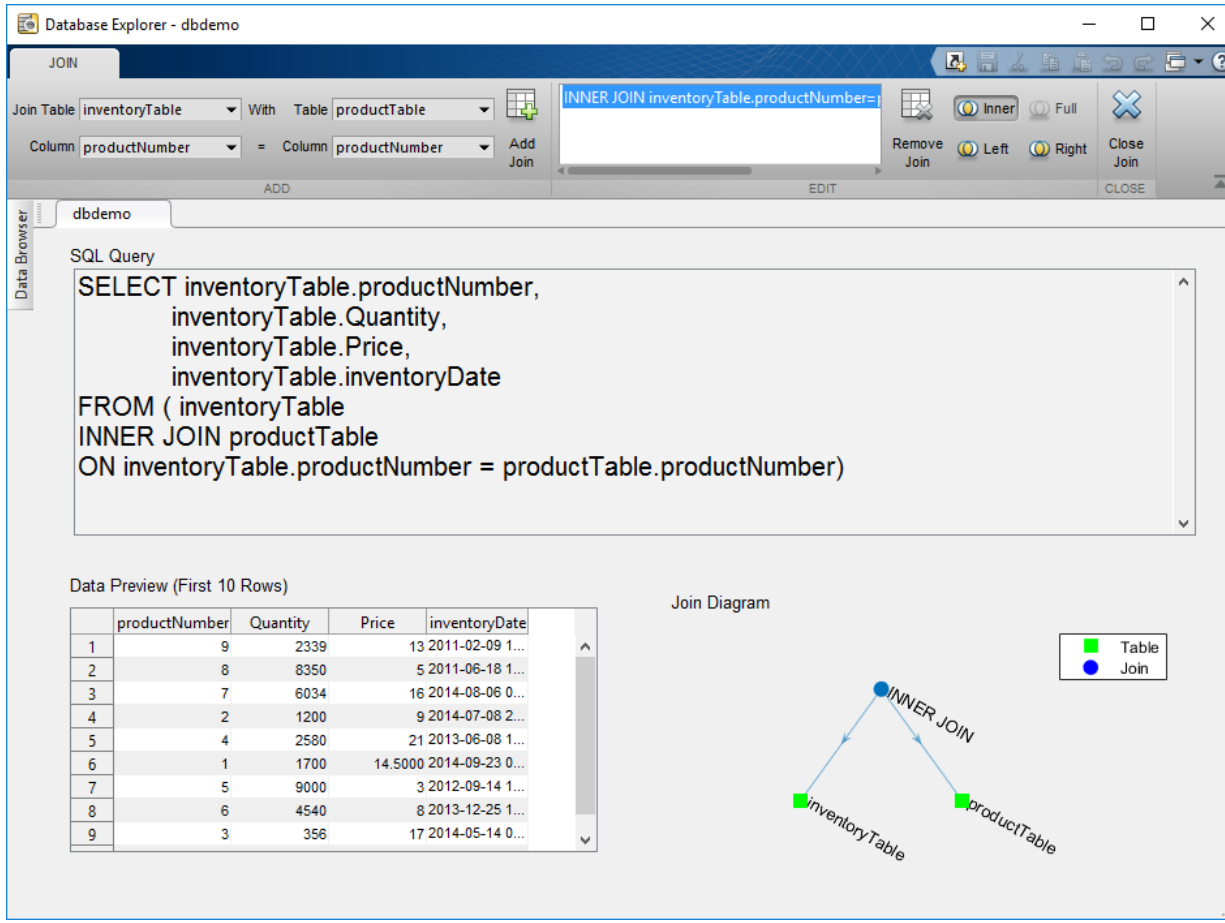
From the left **Column** list, select the name of the shared column.



2 From the right **Table** list, select the name of the table to join. From the right **Column** list, select the name of the shared column for this table.



3 In the **Add** section, click **Add Join**. The **SQL Query** pane updates the SQL query with the new join. If the **Automatic Preview** button (located in the **Preview** section of the **Database Explorer** tab) is toggled on, the **Data Preview** pane displays the updated SQL query results automatically. The **Join Diagram** pane displays a pictorial representation of the join between the selected tables.



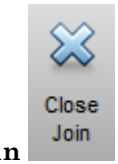
4 To add another join, select another table and column name combination in the left and right lists. Then, click **Add Join** again.

5 In the **Edit** section, click one of the join types (for example, 

) to specify a different join type, if necessary.

6 To remove a join, select it in the list of joins in the **Edit** section, and click **Remove Join**.

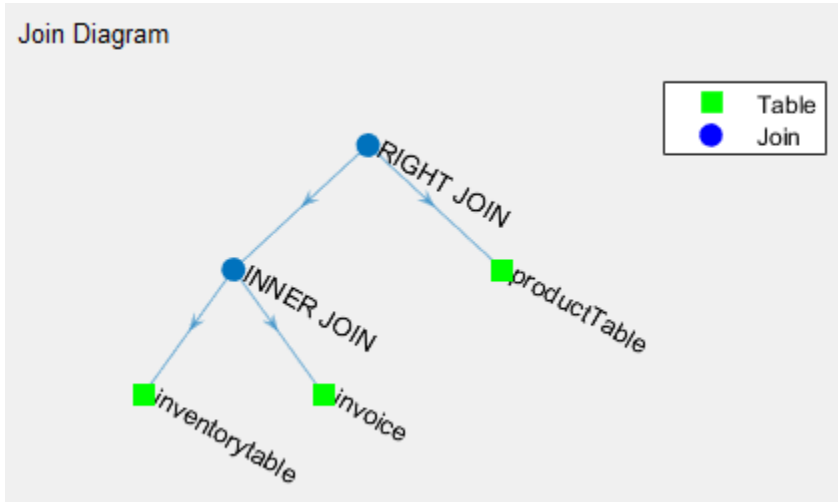
Note To change the order of joins, remove existing joins and create joins in another order.

7 In the **Close** section, click **Close Join** 

to close the **Join** tab.

Join Diagram

After you join at least two tables, the **Join Diagram** pane displays a pictorial representation of the joins between tables. Each blue circle shows the join type. Each green square shows a table in the join.



When working with multiple joins, use this diagram to see the hierarchy of joins. Ensure that you are using the correct join types for your data. As you modify join types, the diagram updates to reflect the new join types.

Join Type Limitations

Some database vendors do not support all join types. The Database Explorer app enables the corresponding buttons in the **Join** tab for the supported join types in these databases:

- SQLite supports only inner and left join types.
- Microsoft Access and MySQL support only inner, left, and right join types.

See Also

Apps

Database Explorer

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Data Preview Using Database Explorer App” on page 4-11
- “Generate SQL Query and MATLAB Script” on page 4-17
- “Database Explorer App Error Messages” on page 3-14

External Websites

- SQL Tutorial

Data Preview Using Database Explorer App

Using the **Database Explorer** app, you can preview data in the **Data Preview** pane when you:

- Select tables and columns in the **Data Browser** pane.
- Create an SQL query using the buttons in the toolstrip.
- Enter an SQL query manually.

After previewing the data, you can modify the SQL query or import the data into the MATLAB workspace.

Automatic Preview

The Database Explorer app previews data automatically, by default. With the **Automatic Preview** button toggled on in the **Preview** section and a valid SQL query in the **SQL Query** pane, the Database Explorer app executes the SQL query and previews the data in the **Data Preview** pane. You can control the number of rows displayed in this pane by entering a value in the **Preview Size** box in the toolstrip.

As you create an SQL query, the **Data Preview** pane updates the preview of the query results for each change you make to the query. When you change selections in the **Data Browser** pane, or add or remove a join, filter, or sort, the **SQL Query** pane updates along with the **Data Preview** pane.

If your SQL query takes a long time to execute or you know that the query results contain a large amount of data, you can stop the automatic preview of data. Click the **Automatic Preview** button in the **Preview** section of the toolstrip. When this button is toggled off, you can modify the query in the **SQL Query** pane without updating the preview of data. After you finish modifying the query, click **Preview Query** in the **Preview** section to see the updated query results in the **Data Preview** pane.

Preview Size

To see more rows in the **Data Preview** pane, enter a larger value in the **Preview Size** box in the **Preview** section. The number of rows in the **Data Preview** pane matches the entered value. However, if the number of rows in the SQL query results is less than the entered value, then all rows are displayed in the **Data Preview** pane.

Preview Data by Creating SQL Query

After you connect to a database, the tables in the database are displayed in the **Data Browser** pane. Use this pane along with buttons in the toolstrip to view the database structure and create an SQL query.

- Expand and collapse the tables to see the columns in each table.
- Click the box next to a table name to see a quick preview of the data in the table. If the **Automatic Preview** button is toggled on, the **Data Preview** pane displays the first 10 rows of data automatically.
- Click boxes next to column names to see a quick preview of data in those columns only.
- Use the buttons in the toolstrip to exclude duplicate rows, join tables, filter data, and sort data.

After you create a valid SQL query in the **SQL Query** pane, the Database Explorer app executes the query and previews the results as described earlier in Automatic Preview.

Preview Data by Entering SQL Query Manually

You can enter an SQL query manually or by pasting text into the **SQL Query** pane. Or, you can modify an existing SQL query in the **SQL Query** pane. To enter or modify an SQL query, click **Manual** in the **Edit** section.

Note When you enter or modify an SQL query manually, the Database Explorer app stops the automatic preview of data.

After you enter the SQL query, click **Preview Query** in the **Preview** section. The **Data Preview** pane displays the first 10 rows of data only after you click this button. If you modify the SQL query, then click **Preview Query** again to refresh the SQL query results.

See Also

Apps

Database Explorer

More About

- “Create SQL Queries Using Database Explorer App” on page 4-2
- “Join Tables Using Database Explorer App” on page 4-6
- “Generate SQL Query and MATLAB Script” on page 4-17
- “Database Explorer App Error Messages” on page 3-14

Modify and Delete Data Sources

You can modify and delete data sources using the **Database Explorer** app. For ODBC drivers, you create data sources using the ODBC Data Source Administrator dialog box. For JDBC drivers, you create data sources using the JDBC Data Source Configuration dialog box. You can modify and delete data sources using the same dialog boxes.

Modify Data Sources

Use the Database Explorer app to modify data sources by following these steps.

ODBC Data Sources

1. After opening the Database Explorer app, select **Configure Data Source** > **Configure ODBC data source**. The ODBC Data Source Administrator dialog box opens. For details about locating this dialog box on your computer, see Driver Installation.

   Alternatively, run the `configureODBCDataSource` function.
2. In the ODBC Data Source Administrator dialog box, select the data source to modify. Click **Configure**.
3. Modify the settings as needed, and close this dialog box.

JDBC Data Sources

1. After opening the Database Explorer app, select **Configure Data Source** > **Configure JDBC data source**. The JDBC Data Source Configuration dialog box opens.
2. Click **Edit**. In the list, select the data source to modify. Click **OK**.
3. Modify the settings in the JDBC Data Source Configuration dialog box. If you do not change the data source name, the Database Explorer app overwrites the existing data source with the new settings. To avoid overwriting the existing data source, enter a new data source name.
4. Click **Test**. The Test Connection dialog box opens. Enter the user name and password for your database. Click **Test**.

   If your connection succeeds, the Database Explorer dialog box opens and displays a message indicating a successful connection. Otherwise, it displays an error message.

5 Click **Save**. The JDBC Data Source Configuration dialog box displays a message indicating the data source is saved. Close this dialog box.

Delete Data Sources

Use the Database Explorer app to delete data sources by following these steps.

ODBC Data Sources

1 After opening the Database Explorer app, select **Configure Data Source** > **Configure ODBC data source**. The ODBC Data Source Administrator dialog box opens.
2 Select the data source to delete.
3 Click **Remove** and close this dialog box.

JDBC Data Sources

1 After opening the Database Explorer app, select **Configure Data Source** > **Configure JDBC data source**. The JDBC Data Source Configuration dialog box opens.
2 Click **Edit**.
3 In the list, select the name of the data source to delete. Click **OK**.
4 Click **Delete** and click **Yes**.

   The JDBC Data Source Configuration dialog box displays a message indicating a successful deletion.
5 Close this dialog box.

See Also

Apps
Database Explorer

More About

- “Choosing Between ODBC and JDBC Drivers” on page 2-13
- “Configuring Driver and Data Source” on page 2-15

- “Connecting to Database” on page 2-140

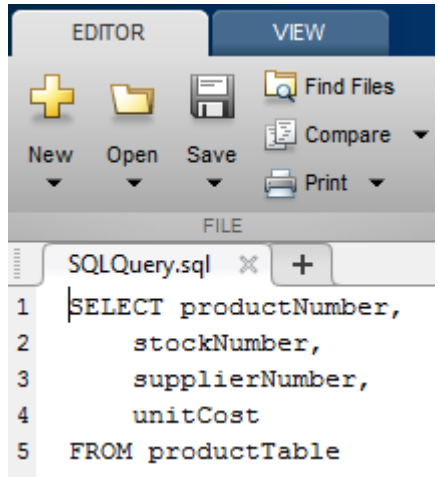
Generate SQL Query and MATLAB Script

You can generate SQL code from an SQL query or create a MATLAB script by using the **Database Explorer** app. After defining an SQL query in the **SQL Query** pane, you can generate the SQL code for running an SQL script. You can also generate a MATLAB script to automate connecting to a database, running an SQL query, and performing data analysis on the imported data.

Generate SQL Query

To generate SQL code from an SQL query, follow these steps:

1. Connect to a data source and create an SQL query. For details about creating SQL queries, see "Create SQL Queries Using Database Explorer App" on page 4-2.
2. Select **Import Data** > **Generate SQL Query**.
3. Save the SQL code to a `.txt` or `.sql` file. The MATLAB Editor opens the saved SQL code file.



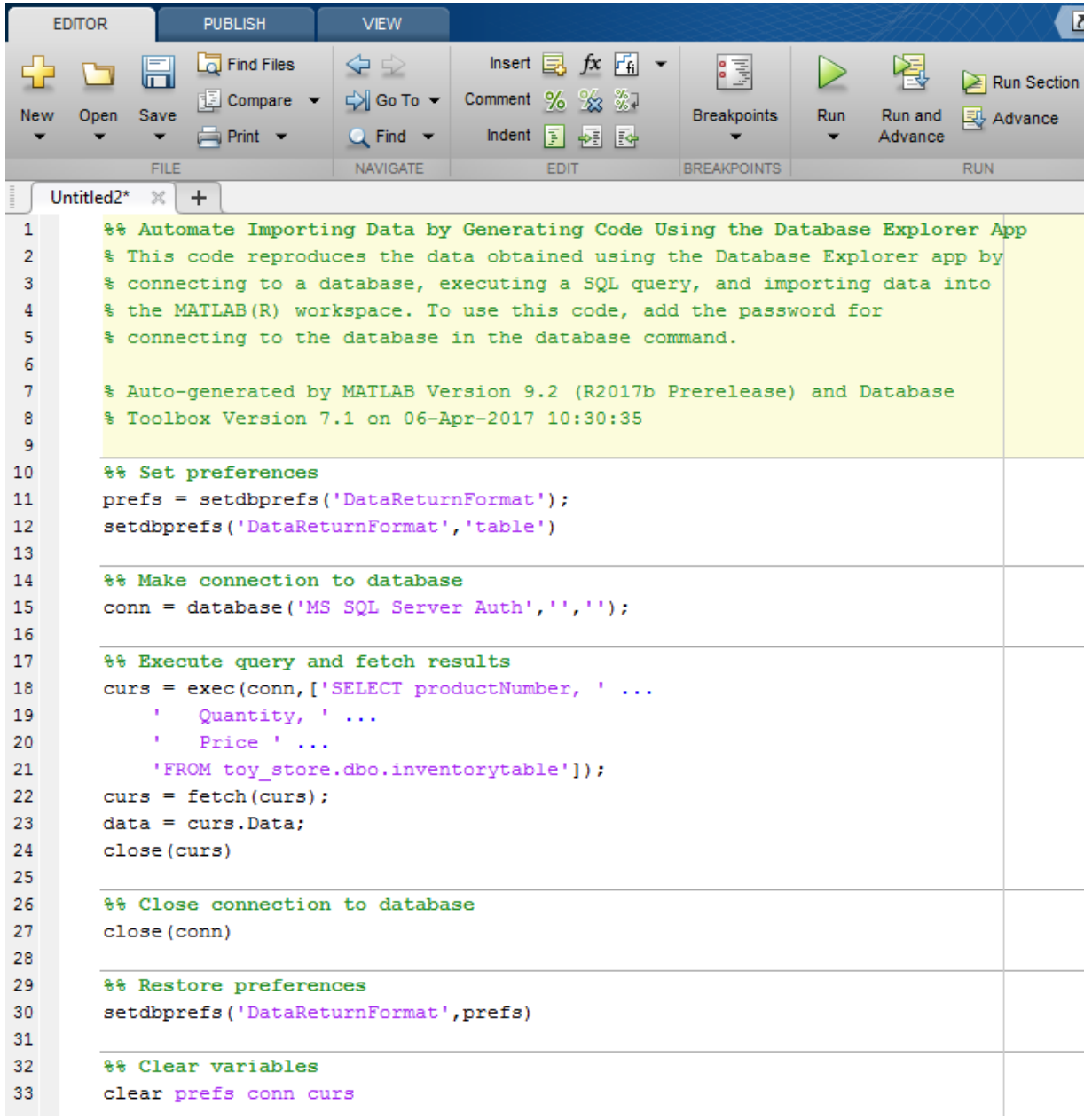
You can use the SQL code to rebuild a query by using the **SQL Query** pane by entering the SQL code manually.

Alternatively, you can use the `.sql` file to import data programmatically into MATLAB by using the `runsqlscript` function.

Generate MATLAB Script

To generate a MATLAB script that automates connecting to a data source, running an SQL query, and importing the SQL query results, follow these steps:

1. Connect to a data source and create an SQL query. For details about creating SQL queries, see “Create SQL Queries Using Database Explorer App” on page 4-2.
2. Select **Import Data** > **Generate MATLAB Script** to display a MATLAB script in the MATLAB Editor.


EDITOR
PUBLISH
VIEW
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
Untitled2*
%% Automate Importing Data by Generating Code Using the Database Explorer App
% This code reproduces the data obtained using the Database Explorer app by
% connecting to a database, executing a SQL query, and importing data into
% the MATLAB(R) workspace. To use this code, add the password for
% connecting to the database in the database command.
% Auto-generated by MATLAB Version 9.2 (R2017b Prerelease) and Database
% Toolbox Version 7.1 on 06-Apr-2017 10:30:35
%% Set preferences
prefs = setdbprefs('DataReturnFormat');
setdbprefs('DataReturnFormat','table')
%% Make connection to database
conn = database('MS SQL Server Auth','','');
%% Execute query and fetch results
curs = exec(conn,['SELECT productNumber, ' ...
' Quantity, ' ...
' Price ' ...
'FROM toy_store.dbo.inventorytable']);
curs = fetch(curs);
data = curs.Data;
close(curs)
%% Close connection to database
close(conn)
%% Restore preferences
setdbprefs('DataReturnFormat',prefs)
%% Clear variables
clear prefs conn curs

3 Save the MATLAB script. You can run this script at the command line.

> **Note** To run the script, enter the database password as an input argument of the `database` function in the script.

For details about editing and running scripts, see "Scripts" (MATLAB).

See Also

Functions

`runsqlscript`

Apps

Database Explorer

More About

- "Create SQL Queries Using Database Explorer App" on page 4-2
- "Join Tables Using Database Explorer App" on page 4-6
- "Data Preview Using Database Explorer App" on page 4-11

Using Database Toolbox Functions

Import Data from Databases into MATLAB

This example shows how to import data from a Microsoft Access database called `dbdemo` into the MATLAB workspace.

Connect to Database

Connect to the Microsoft Access database with the data source name `dbdemo` using an ODBC driver.

```
conn = database('dbdemo','','');
```

If you are connecting to a database using a JDBC connection, then specify a different syntax for the `database` function.

Import Data Using Simple SQL Query

Select the product number `productNumber` and description `productDescription` from the product table `productTable`. Create an SQL query to select this data. Then, use the `exec` function to execute the SQL query using the database connection.

```
sqlquery = 'SELECT productNumber,productDescription FROM productTable';
curs = exec(conn,sqlquery);
```

The data contains text. Set the data return format to support text. Specify the format `cellarray` using `setdbprefs`.

```
setdbprefs('DataReturnFormat','cellarray')
```

Display the data. Import the data from the executed SQL query using `fetch`. The `Data` property of the `cursor` object `curs` contains the data.

```
curs = fetch(curs);
curs.Data

ans =

    [ 9]    'Victorian Doll'
    [ 8]    'Train Set'
    [ 7]    'Engine Kit'
    [ 2]    'Painting Set'
    [ 4]    'Space Cruiser'
    [ 1]    'Building Blocks'
```

```
    [ 5]    'Tin Soldier'
    [ 6]    'Sail Boat'
    [ 3]    'Slinky'
    [10]    'Teddy Bear'
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Import Data Using Multiple Joins in SQL Query

Connect to the Microsoft Access database with the data source name `dbdemo` using an ODBC driver.

```
conn = database('dbdemo','','');
```

Create an SQL script file named `salesvolume.sql` with this SQL query. This SQL query uses multiple joins to join these tables in the `dbdemo` database:

- `producttable`
- `salesvolume`
- `suppliers`

The purpose of the query is to import sales volume data for suppliers located in the United States.

```
SELECT  salesvolume.January
,   salesvolume.February
,   salesvolume.March
,   salesvolume.April
,   salesvolume.May
,   salesvolume.June
,   salesvolume.July
,   salesvolume.August
,   salesvolume.September
,   salesvolume.October
,   salesvolume.November
,   salesvolume.December
,   suppliers.Country
FROM     ((producttable
INNER JOIN salesvolume
ON  producttable.stockNumber = salesvolume.StockNumber)
INNER JOIN suppliers
```

```
ON  producttable.supplierNumber = suppliers.SupplierNumber)
WHERE suppliers.Country LIKE 'United States%'
```

Run the SQL script file named `salesvolume.sql` using the `runsqlscript` function.

```
results = runsqlscript(conn,'salesvolume.sql');
```

`results` is a `cursor` object array with the returned data from running the SQL query in the SQL script file.

Display the data in the `cursor` object containing the returned data.

```
results(1).Data
```

```
ans =

  Columns 1 through 8

    [5000.00]    [3500.00]    [2800.00]    [2300.00]    [1700.00]    [1400.00]    [1000.00]    [900.00]
    [2400.00]    [1721.00]    [1414.00]    [1191.00]    [ 983.00]    [ 825.00]    [ 731.00]    [653.00]
    [1200.00]    [ 900.00]    [ 800.00]    [ 500.00]    [ 399.00]    [ 345.00]    [ 300.00]    [175.00]
    ...

  Columns 9 through 13

    [1600.00]    [3300.00]    [12000.00]    [20000.00]    'United States'
    [ 723.00]    [ 790.00]    [ 1400.00]    [ 5000.00]    'United States'
    [ 760.00]    [1500.00]    [ 5500.00]    [17000.00]    'United States'
    ...
```

Display the column names for the returned data.

```
columnnames(results(1))
```

```
ans =

'January','February','March','April','May','June','July','August',...
'September','October','November','December','Country'
```

Close Database Connection

Close the `cursor` object array and database connection.

```
close(results)
close(conn)
```

See Also

`close` | `database` | `exec` | `fetch` | `runsqlscript` | `setdbprefs`

Related Examples

- “Create Queries with Characters and Variables” on page 5-6

More About

- “Configuring Driver and Data Source” on page 2-15
- “Connecting to Database Using Native ODBC Interface” on page 3-17

External Websites

- SQL Tutorial

Create Queries with Characters and Variables

The following examples show how to create queries using a date, text, a MATLAB variable, and special characters. Construct these queries using the command line.

Create Query Using Date

This example shows how to format a date in an SQL query.

When you want to write an SQL statement that selects data from your database using a date, format the date according to your database specifications. Consult your database documentation for the right formatting. This example shows date formatting for an Oracle database.

Create the database connection `conn` to an Oracle database using an ODBC driver. For example, the following code assumes that you are connecting to a data source named `Oracle` with user name `username` and password `pwd`.

```
conn = database('Oracle','username','pwd');
```

Create an SQL statement `sqlquery` that contains the full query. Execute the query using `conn`. The following code uses the table `test_types` and the column `test_dt`. The `WHERE` clause contains Oracle SQL code for filtering the records based on the date. The `test_dt` column data type is an Oracle date type. Filter records for the dates after June 9, 2013 using the `test_dt` column. To convert your date to an Oracle date type, enter this date in the Oracle function `to_date`. For a date `'2013-06-09'`, specify the format as `'YYYY-MM-DD'`. `'YYYY-MM-DD'` is one way to format a date in Oracle. Consult your Oracle documentation for alternatives.

```
sqlquery = ['SELECT * FROM test_types ' ...
    'where test_dt > to_date(''2013-06-09'',''YYYY-MM-DD'')'];
curs = exec(conn,sqlquery);
```

Import the data using the `cursor` object `curs`. The `Data` property of `curs` contains the imported data. Display the data.

```
curs = fetch(curs);
curs.Data

ans =
```

```
    '2013-06-10 15:11:00'    '2013-06-10 15:11:22.500000'
    '2013-06-10 15:13:00'    '2013-06-10 15:13:21.870003'
    '2013-06-10 15:16:00'    '2013-06-10 15:16:45.099998'
    ...
```

The query returns the records where the date in the column `test_dt` is after June 9, 2013.

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Create Query Using Text

This example shows how to include text in your SQL query using a Microsoft Access database.

Create the database connection `conn` to a Microsoft Access database using an ODBC driver. For example, the following code assumes that you are connecting to a data source named `dbdemo` with a blank user name and password.

```
conn = database('dbdemo','','');
```

Select all records from the table `productTable` where the product description is `'Slinky'`. Create an SQL query `sqlquery` that embeds the product description into the SQL query by using an extra pair of single quotes.

```
sqlquery = ['SELECT * FROM productTable ' ...
    'where productDescription = ''Slinky'''];
```

Or, you can write the SQL query as a concatenation of two character vectors using brackets.

```
sqlquery = ['SELECT * FROM productTable ' ...
    'where productDescription = ' '''Slinky'''];
```

Execute the SQL query `sqlquery` using `conn`. The `cursor` object `curs` contains the executed query. Import the data from the executed query using the `fetch` function. The `Data` property of `curs` contains the imported data. Display the data.

```
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data

ans =

    [3.00]    [400999.00]    [1009.00]    [17.00]    'Slinky'
```

`Data` contains the product record where the product description is `'Slinky'`.

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Create Query Using MATLAB Variable

This example shows how to include a MATLAB variable in your SQL query. This example uses a Microsoft SQL Server database.

Create the database connection `conn` to a Microsoft SQL Server database using a JDBC driver without operating system authentication. For example, this code assumes that you are connecting to a database named `dbname` with the user name `username`, password `pwd`, database server name `sname`, and port number `123456`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server','Server','sname', ...
    'AuthType','Server','PortNumber',123456);
```

Suppose that you want to select all invoice data for the first product. Create a MATLAB variable `productID` and set it to the first product number.

```
productId = 1;
```

Select all records from the table `invoice` where the product number is equal to the first product. Create an SQL query `sqlquery` that concatenates the SQL query with the MATLAB variable `productID` by using brackets. `productID` is a numeric variable but the SQL query is a character vector. You need convert the number to a character vector by using the `num2str` function.

```
sqlquery = ['SELECT * FROM invoice ' ...
    'where ProductNumber = ' num2str(productId)];
```

Execute the SQL query `sqlquery` using `conn`. The `cursor` object `curs` contains the executed query. Import the data from the executed query using the `fetch` function. The `Data` property of `curs` contains the imported data. Display the data.

```
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data
```

```
ans =

    [2101.00]    '2010-08-01 00:00...'    [1.00]    [0]    [1948410x1 int8]
```

`Data` contains the invoice data record for the first product.

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Create Query Using Special Characters

This example shows how to write an SQL query for table names or columns names with special characters.

These characters require using escape characters that are specific to your database. Consult your database documentation for the right escape characters. This example uses a Microsoft SQL Server database.

Create the database connection `conn` to a Microsoft SQL Server database using a JDBC driver without operating system authentication. For example, this code assumes that you are connecting to a database named `dbname` with the user name `username`, password `pwd`, database server name `sname`, and port number `123456`.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server','Server','sname', ...
    'AuthType','Server','PortNumber',123456);
```

Suppose that you want to select all data in a column with a column name that contains spaces. This column resides in a table with a table name that contains spaces. A space is a special character. Enclose spaces with escape characters so that the SQL query executes. Brackets are the escape characters for a Microsoft SQL Server database. Create an SQL query `sqlquery` that contains the column name and table name enclosed by brackets.

```
sqlquery = 'SELECT [column with spaces] FROM [table with spaces]';
```

Execute the SQL query `sqlquery` using `conn`. The `cursor` object `curs` contains the executed query. Import the data from the executed query using the `fetch` function. The `Data` property of `curs` contains the imported data. Display the data.

```
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data
```

```
ans =

    'some text'
    'some text'
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

See Also

`close` | `database` | `exec` | `fetch` | `num2str`

Related Examples

- “Import Data from Databases into MATLAB” on page 5-2

More About

- “Connecting to Database Using Native ODBC Interface” on page 3-17

External Websites

- SQL Tutorial

Roll Back and Commit Data in Database

This example assumes that you have established a connection to the database named `conn`. Use `exec` to roll back and commit data after running `datainsert`, `fastinsert`, `insert`, or `update` for which the `AutoCommit` flag is `off`.

Roll back data for the database connection `conn`.

```
sqlquery = 'rollback';
exec(conn,sqlquery)
```

When you do not specify an output argument, MATLAB returns the results of calling `exec` into `cursor` object `ans`. Assign `ans` to variable `curs` so that MATLAB does not overwrite the `cursor` object. After you finish working with the `cursor` object, close it.

```
curs = ans;
close(curs)
```

Commit the data.

```
sqlquery = 'commit';
exec(conn,sqlquery)
```

After you finish working with the `cursor` object, close it.

```
curs = ans;
close(curs)
```

See Also

`close` | `database` | `exec`

Related Examples

- “Export Data to New Record in Database” on page 5-20
- “Replace Existing Data in Database” on page 5-24

Change Database Connection Catalog

This example assumes that you have established a connection to the database named `conn`. You can work with data in a different catalog within the same database using `exec`.

Change the catalog for the database connection `conn` to `intlprice`. The `cursor` object `curs` contains the executed query.

```
sqlquery = 'Use intlprice';

curs = exec(conn,sqlquery);
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

See Also

`close` | `database` | `exec`

Related Examples

- “Display Database Metadata” on page 5-37

External Websites

- SQL Tutorial

Create Table and Add Column

This example assumes that you have established a connection to the database named `conn`. You can manipulate the database structure using `exec`.

Use the SQL `CREATE` statement to create the table `Person`.

```
sqlquery = ['CREATE TABLE Person(LastName varchar, '...
        'FirstName varchar,Address varchar,Age int)'];
```

Create the table in the database using the database connection. The `cursor` object contains the executed query.

```
curs = exec(conn,sqlquery);
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Use the SQL `ALTER` statement to add the column `City` to the table `Person`.

```
sqlquery = 'ALTER TABLE Person ADD City varchar(30)';

curs = exec(conn,sqlquery);
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

See Also

`close` | `database` | `exec`

Related Examples

- “Display Database Metadata” on page 5-37

External Websites

- SQL Tutorial

Delete Data from Databases

This example shows how to delete data from your database using MATLAB.

Create the SQL statement with your deletion SQL syntax. Consult your database documentation for the correct SQL syntax. Execute the delete operation on your database using `exec` with your SQL statement. This example demonstrates deleting data records in a Microsoft Access database.

Connect to Database

Create the database connection `conn` to a Microsoft Access database using an ODBC driver and the data source name `dbdemo`. This database contains the table `inventoryTable` with the column `productNumber`.

```
conn = database('dbdemo','','');
```

The SQL query `sqlquery` selects all rows of data in the table `inventoryTable`. Execute this SQL query using `conn`. The `cursor` object `curs` contains the executed query. Import the data from the executed query using the `fetch` function. The `Data` property of `curs` contains the imported data. Display the data.

```
sqlquery = 'SELECT * FROM inventoryTable';

curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data

ans =

    ...
    [11]    [ 567]    [      0]    '2012-09-11 00:30...'
    [12]    [1278]    [      0]    '2010-10-29 18:17...'
    [13]    [1700]    [14.5000]    '2009-05-24 10:58...'
```

Delete Specific Record

Delete the data for the product number `13` from the table `inventoryTable`. Specify the product number using the `WHERE` clause in the SQL statement `sqlquery`.

```
sqlquery = 'DELETE * FROM inventoryTable WHERE productNumber = 13';

curs = exec(conn,sqlquery);
```

Display the data in the table `inventoryTable` after the deletion.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    ...
    [10]    [ 723]    [     24]    '2012-03-14 13:13...'
    [11]    [ 567]    [      0]    '2012-09-11 00:30...'
    [12]    [1278]    [      0]    '2010-10-29 18:17...'
```

The record with product number `13` is missing.

Delete Record Using MATLAB Variable

Define a MATLAB variable `productID` by setting it to the product number `12`.

```
productID = 12;
```

Delete the data using the MATLAB variable `productID`. Build an SQL statement `sqlquery` that combines the SQL for the delete operation with the MATLAB variable. Since the variable is numeric and the SQL statement is a character vector, convert the number to a character vector. Use the `num2str` function for the conversion. Concatenate the delete SQL statement and the numeric conversion using the square brackets.

```
sqlquery = ['DELETE * FROM inventoryTable WHERE ' ...
    'productNumber = ' num2str(productID)];

curs = exec(conn,sqlquery);
```

Display the data in the table `inventoryTable` after the deletion.

```
sqlquery = 'SELECT * FROM inventoryTable';
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data

ans =

    ...
    [ 9]    [2339]    [     13]    '2011-02-09 12:50...'
    [10]    [ 723]    [     24]    '2012-03-14 13:13...'
    [11]    [ 567]    [      0]    '2012-09-11 00:30...'
```

The record with product number `12` is missing.

Close Cursor and Database Connection

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

See Also

`exec` | `fetch` | `num2str`

Related Examples

- “Import Data from Databases into MATLAB” on page 5-2

More About

- “Connecting to Database Using Native ODBC Interface” on page 3-17

External Websites

- SQL Tutorial

Roll Back Data After Updating Record

This example shows how to update data in a database and roll back the changes. Rolling back the changes reinstates the data as it appears before running the update.

Create a database connection `conn`. For example, the following code uses the database `toy_store`, user name `username`, password `pwd`, server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database. This database contains the table `inventoryTable` that contains these columns: `productNumber`, `Quantity`, and `Price`.

```
conn = database('toy_store','username','pwd',...
                'Vendor','Microsoft SQL Server',...
                'Server','sname',...
                'PortNumber',123456);
```

Set the `AutoCommit` flag to `off`. Any updates you make after turning off this flag do not commit to the database automatically.

```
set(conn,'AutoCommit','off')
```

Display the data in the `inventoryTable` table before making updates. The `cursor` object `curs` contains the executed query. Import the data from the executed query using the `fetch` function.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [ 1]    [ 1700]    [14.5000]    '2014-10-20 00:00...'
    [ 2]    [ 1200]    [ 9.3000]    '2014-10-20 00:00...'
    [ 3]    [  356]    [17.2000]    '2014-10-20 00:00...'
    ...
```

Define a cell array for the new price of the first product.

```
data(1,1) = {30.00};
```

Define the `WHERE` clause for the first product.

```
whereclause = 'where productNumber = 1';
```

Update the `Price` column in the `inventoryTable` for the first product.

```
tablename = 'inventoryTable';
colname = {'Price'};

update(conn,tablename,colname,data,whereclause)
```

Display the data in the `inventoryTable` table after making the update.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [ 1]    [ 1700]    [     30]    '2014-10-20 00:00...'
    [ 2]    [ 1200]    [ 9.3000]    '2014-10-20 00:00...'
    [ 3]    [  356]    [17.2000]    '2014-10-20 00:00...'
    ...
```

The first product has an updated price of `30`. Though the data is updated, the change has not committed to the database.

Roll back the update.

```
rollback(conn)
```

Alternatively, you can roll back the update using an SQL `ROLLBACK` statement with the `exec` function.

Display the data in the `inventoryTable` table after rolling back the update.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [ 1]    [ 1700]    [14.5000]    '2014-10-20 00:00...'
    [ 2]    [ 1200]    [ 9.3000]    '2014-10-20 00:00...'
    [ 3]    [  356]    [17.2000]    '2014-10-20 00:00...'
    ...
```

The first product has the old price of `14.50`.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

See Also

`close` | `database` | `exec` | `fetch` | `rollback` | `set`

Related Examples

- “Export Data to New Record in Database” on page 5-20
- “Replace Existing Data in Database” on page 5-24

External Websites

- SQL Tutorial

Export Data to New Record in Database

This example does the following:

1. Retrieves sales data from a `salesVolume` table.
2. Calculates the sum of sales for 1 month.
3. Stores this data in a cell array.
4. Exports this data to a `yearlySales` table.

This example assumes that you are connecting to a Microsoft Access database that contains tables named `salesVolume` and `yearlySales`. The table `salesVolume` contains the column names for each month. The table `yearlySales` contains the column names `Month` and `salesTotal`.

To access the code for this example, see `matlab\toolbox\database\dbdemos\dbinsertdemo.m`.

1. Create a database connection `conn` to the Microsoft Access database. For example, the following code assumes that you are connecting to a data source named `dbdemo` with blank user name and password.

```
conn = database('dbdemo','','');
```

2. Set the format for retrieved data to `numeric` by using `setdbprefs`.

```
setdbprefs('DataReturnFormat','numeric')
```

3. Execute the SQL query `sqlquery` using `conn` to import data for the `March` column from the `salesVolume` table. The `cursor` object `curs` contains the executed query. Import the data from the executed query using the `fetch` function.

```
sqlquery = 'SELECT March FROM salesVolume';

curs = exec(conn,sqlquery);
curs = fetch(curs);
```

4. The `Data` property of `curs` contains the imported data. Assign the data to the MATLAB workspace variable `AA`. Display the data.

```
AA = curs.Data

AA =
```

```
981
1414
890
1800
2600
2800
800
1500
1000
821
```

5 Calculate the sum of the March sales. Assign the result to the MATLAB workspace variable `sumA`. Display the sum.

```
sumA = sum(AA(:))

sumA =

   14606
```

6 To export the data to the database, assign the month and sum of sales to a cell array. Put the month in the first cell of cell array `exdata`. Put the sum in the second cell of `exdata`.

```
exdata(1,1) = {'March'};
exdata(1,2) = {sumA}

exdata =
    'March'    [14606]
```

7 Define the names of the columns. Assign the cell array containing the column names to the MATLAB workspace variable `colnames`.

```
colnames = {'Month','salesTotal'};
```

8 Determine the status of the `AutoCommit` database flag using `get`. This status determines if the exported data automatically commits to the database. If the flag is `off`, you can undo an insert. If the flag is `on`, data automatically commits to the database.

```
get(conn,'AutoCommit')

ans =
    on
```

The `AutoCommit` flag is set to `on`. The exported data automatically commits to the database.

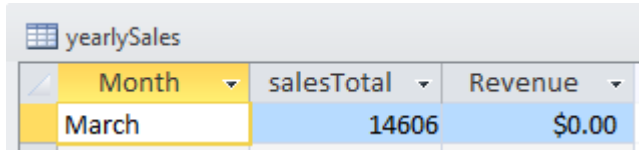
9 Export the data into the `yearlySales` table using these arguments:

- Database connection `conn`
- Table name `yearlySales`
- Column names `colnames`
- Export data `exdata`

```
datainsert(conn,'yearlySales',colnames,exdata)
```

`datainsert` appends the data as a new record at the end of the `yearlySales` table.

10 In Microsoft Access, view the `yearlySales` table to verify the results.



11 After you finish working with the `cursor` object, close it.

```
close(curs)
```

12 Close the database connection.

```
close(conn)
```

See Also

`datainsert` | `get` | `setdbprefs`

Related Examples

- “Export Multiple Records from MATLAB Workspace” on page 5-26
- “Export Data Using Bulk Insert” on page 5-31
- “Replace Existing Data in Database” on page 5-24

More About

- “Inserting Data Using Command Line” on page 2-146

External Websites

- SQL Tutorial

Replace Existing Data in Database

This example shows how to update a value of the `Month` column in the table `yearlySales` using the data source named `dbdemo`. To access the example where you import the values of the `Month` column, see “Export Data to New Record in Database” on page 5-20.

To access the code for this example, see `matlab\toolbox\database\dbdemos\dbupdatedemo.m`.

Create a database connection `conn` to the Microsoft Access database using the ODBC driver. Here, this code assumes that you are connecting to a data source named `dbdemo` with blank user name and password.

```
conn = database('dbdemo','','');
```

To update the month, specify the `Month` column that contains the months in the cell array `colnames`.

```
colnames = {'Month'};
```

Assign the month value `March2010` to the MATLAB variable `data` for the update. The data type of `data` is a table.

```
data = table({'March2010'},'VariableNames',{'Month'});
```

Specify the record to update in the database by defining an SQL `WHERE` statement `whereclause`. The record to update is the record whose `Month` is `March`. Embed `March` in two single quotation marks so that MATLAB interprets `March` as a character vector in the SQL `WHERE` statement.

```
whereclause = 'WHERE Month = ''March'''
```

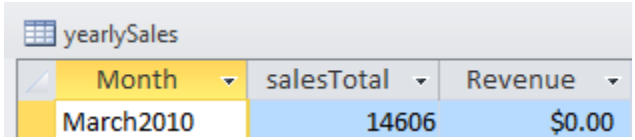
```
whereclause =

    WHERE Month = 'March'
```

Update the data for the record whose `Month` is `March` in the database table `yearlySales`.

```
update(conn,'yearlySales',colnames,data,whereclause)
```

In Microsoft Access, view the `yearlySales` table to verify the results.



After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

See Also

`close` | `database` | `update`

Related Examples

- "Export Data to New Record in Database" on page 5-20
- "Export Multiple Records from MATLAB Workspace" on page 5-26

External Websites

- SQL Tutorial

Export Multiple Records from MATLAB Workspace

This example does the following:

1. Imports monthly sales figures for all products from the `dbdemo` data source into the MATLAB workspace.
2. Computes total sales for each month.
3. Exports the totals to a new table.

This example assumes that you are connecting to a Microsoft Access database that contains tables named `salesVolume` and `yearlySales`. The table `salesVolume` contains the column names for each month. The table `yearlySales` contains the column named `salesTotal`.

To access the code for this example, see `matlab\toolbox\database\dbdemos\dbinsert2demo.m`.

1. Create a database connection `conn` to the Microsoft Access database using the ODBC driver. Here, this code assumes that you are connecting to a data source named `dbdemo` with blank user name and password.

   ```
   conn = database('dbdemo','','');
   ```

2. Ensure that the database is writable using `conn`.

   ```
   a = isreadonly(conn)

   a =
       0
   ```

   When the `isreadonly` function returns `0`, the database is writable.

3. Specify preferences for the retrieved data. Set the data return format to `numeric`. Specify that `NULL` values read from the database are converted to `0` in the MATLAB workspace.

   ```
   setdbprefs...
   ({'NullNumberRead';'DataReturnFormat'},{'0';'numeric'})
   ```

   When you specify `DataReturnFormat` as `numeric`, the value for `NullNumberRead` must be numeric.

4 Execute the SQL query `sqlquery` using `conn` to import all data from the `salesVolume` table. The `cursor` object `curs` contains the executed query. Import the data from the executed query using the `fetch` function.

```
sqlquery = 'SELECT * FROM salesVolume';

curs = exec(conn,sqlquery);
curs = fetch(curs);
```

5 Display the names of the columns in the fetched data set.

```
columnnames(curs)

ans =

    'StockNumber', 'January', 'February', 'March', 'April',
    'May', 'June', 'July', 'August', 'September', 'October',
    'November', 'December'
```

6 Display the data for January. January data is in the second column of the fetched data set.

```
curs.Data(:,2)

ans =

        1400
        2400
        1800
        3000
        4300
        5000
        1200
        3000
        3000
           0
```

7 Assign the dimensions of the matrix containing the fetched data set to `m` and `n`.

```
[m,n] = size(curs.Data)

m =
    10
n =
    13
```

8 Calculate monthly totals using `m` and `n`. The variable `tmp` is the sales volume for all products in a given month `c`. The variable `monthly` is the total sales volume of all

products for that month. For example, if `c` is `2`, row `1` of `monthly` is the total of all rows in column `2` of `curs.Data`, where column `2` is the sales volume for January.

```
for c = 2:n
    tmp = curs.Data(:,c);
    monthly(c-1,1) = sum(tmp(:));
end
```

9 Display the monthly totals.

```
monthly
```

```
ans =

 25100
 15621
 14606
 11944
 9965
 8643
 6525
 5899
 8632
 13170
 48345
 172000
```

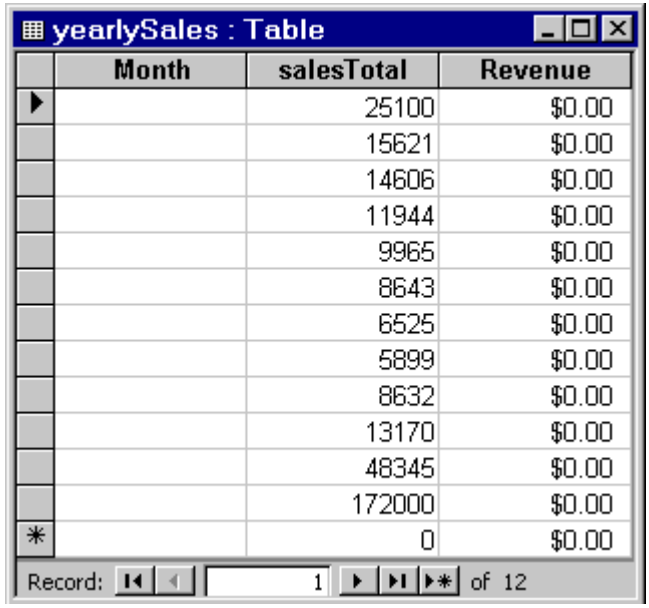
10 Create a cell array `colnames` containing the column name for inserting the data.

```
colnames{1,1} = 'salesTotal';
```

11 Insert the data into the `yearlySales` table using `conn`, `colnames`, and the monthly totals `monthly`.

```
datainsert(conn,'yearlySales',colnames,monthly)
```

12 To verify the data import in Microsoft Access, view the `yearlySales` table from the `tutorial` database.



13 After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

See Also

`database` | `datainsert` | `exec` | `fetch` | `isreadonly` | `setdbprefs`

Related Examples

- “Export Data to New Record in Database” on page 5-20

More About

- “Inserting Data Using Command Line” on page 2-146

External Websites

- SQL Tutorial

Export Data Using Bulk Insert

Bulk Insert Functionality

You can insert data into your database using any one of these functions at the command line: `datainsert`, `fastinsert`, or `insert`. However, for best performance with large volumes of data, use `datainsert` or `fastinsert`. For differences between these functions, see "Inserting Data Using Command Line" on page 2-146.

If you still experience performance issues, create a data file with every record in your data set. Then, you can use this data file as input into the bulk insert functionality of your database to process the large data set. Also, with this file, you can insert data with special characters such as double quotes. A bulk insert provides performance gains by using the bulk insert utilities that are native to different database systems. For details, see "Working with Large Data Sets" on page 2-148.

Bulk Insert into Oracle

This example uses a data file on the local machine where Oracle is installed and exports data to the Oracle server using bulk insert functionality.

1 Connect to the Oracle database.

```
javaaddpath 'path\ojdbc5.jar';
conn = database('databasename','user','password', ...
    'oracle.jdbc.driver.OracleDriver', ...
    'jdbc:oracle:thin:@machine:port:databasename');
```

2 Create a table named `BULKTEST`.

```
curs = exec(conn,['CREATE TABLE BULKTEST (salary number, ' ...
    'player varchar2(25), signed varchar2(25), ' ...
    'team varchar2(25))']);
close(curs)
```

3 Create a data record.

```
A = {100000.00,'KGreen','06/22/2011','Challengers'};
```

4 Expand `A` to a 10,000-record data set.

```
A = A(ones(10000,1),:);
```

5 Write data to a file for bulk insert functionality.

Tip When connecting to a database on a remote machine, you must write this file to the remote machine. Oracle has difficulty reading files that are not on the same machine as the instance of the database.

```
fid = fopen('c:\temp\tmp.txt','wt');
for i = 1:size(A,1)
    fprintf(fid,'%10.2f \t %s \t %s \t %s \n',A{i,1}, ...
    A{i,2},A{i,3},A{i,4});
end
fclose(fid);
```

6 Set the folder location.

```
curs = exec(conn, ...
    'CREATE OR REPLACE DIRECTORY ext AS ''C:\\Temp''');
close(curs)
```

7 Delete the temporary table, if it exists.

```
curs = exec(conn,'DROP TABLE testinsert');
try,close(curs),end
```

8 Create a temporary table and use bulk insert functionality to insert it into the table `BULKTEST`.

```
curs = exec(conn,['CREATE TABLE testinsert (salary number, ' ...
    'player varchar2(25), signed varchar2(25), ' ...
    'team varchar2(25)) ORGANIZATION EXTERNAL ' ...
    '( TYPE ORACLE_LOADER DEFAULT DIRECTORY ext ACCESS ' ...
    'PARAMETERS ( RECORDS DELIMITED BY NEWLINE FIELDS ' ...
    'TERMINATED BY ''\t'') LOCATION (''tmp.txt'')) ' ...
    'REJECT LIMIT 10000']);
close(curs)
curs = exec(conn,'INSERT INTO BULKTEST SELECT * FROM testinsert');
close(curs)
```

9 Confirm the number of rows and columns in `BULKTEST`.

```
curs = exec(conn,'SELECT * FROM BULKTEST');
curs = fetch(curs);
columnnames(curs)

ans =

'SALARY','PLAYER','SIGNED','TEAM'
```

10 After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Bulk Insert into Microsoft SQL Server 2005

This example uses a data file on the local machine where Microsoft SQL Server is installed and exports data to the Microsoft SQL Server using bulk insert functionality.

1 Connect to the Microsoft SQL Server. For JDBC driver use, add the JAR file to the MATLAB Java class path.

```
javaaddpath 'path\sqljdbc4.jar';
conn = database('databasename','user','password', ...
    'com.microsoft.sqlserver.jdbc.SQLServerDriver', ...
    'jdbc:sqlserver://machine:port;database=databasename');
```

2 Create a table named `BULKTEST`.

```
curs = exec(conn,['CREATE TABLE BULKTEST (salary ' ...
    'decimal(10,2), player varchar(25), signed_date ' ...
    'datetime, team varchar(25))']);
close(curs)
```

3 Create a data record.

```
A = {100000.00,'KGreen','06/22/2011','Challengers'};
```

4 Expand `A` to a 10,000-record data set.

```
A = A(ones(10000,1),:);
```

5 Write data to a file for bulk insert functionality.

Tip When connecting to a database on a remote machine, you must write this file to the remote machine. Microsoft SQL Server has difficulty reading files that are not on the same machine as the instance of the database.

```
fid = fopen('c:\temp\tmp.txt','wt');
for i = 1:size(A,1)
   fprintf(fid,'%10.2f \t %s \t %s \t %s \n',A{i,1}, ...
   A{i,2},A{i,3},A{i,4});
end
fclose(fid);
```

6 Run the bulk insert functionality.

```
curs = exec(conn,['BULK INSERT BULKTEST FROM ' ...
    '''c:\temp\tmp.txt'' WITH (FIELDTERMINATOR = ''\t'', ' ...
    'ROWTERMINATOR = ''\n'')']);
close(curs)
```

7 Confirm the number of rows and columns in `BULKTEST`.

```
curs = exec(conn,'SELECT * FROM BULKTEST');
curs = fetch(curs);
columnnames(curs)

ans =

'salary','player','signed_date','team'
```

8 After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Bulk Insert into MySQL

This example uses a data file on the local machine where MySQL is installed and exports data to a MySQL database using bulk insert functionality.

1 Connect to the MySQL server. For JDBC driver use, add the JAR file to the MATLAB Java class path.

```
javaaddpath 'path\mysql-connector-java-5.1.13-bin.jar';
conn = database('databasename', 'user', 'password', ...
    'com.mysql.jdbc.Driver', ...
    'jdbc:mysql://machine:port/databasename');
```

2 Create a table named `BULKTEST`.

```
curs = exec(conn,['CREATE TABLE BULKTEST (salary decimal, ' ...
    'player varchar(25), signed_date varchar(25), ' ...
    'team varchar(25))']);
close(curs)
```

3 Create a data record.

```
A = {100000.00,'KGreen','06/22/2011','Challengers'};
```

4 Expand `A` to be a 10,000-record data set.

```
A = A(ones(10000,1),:);
```

5 Write data to a file for bulk insert functionality.

Note MySQL reads files saved locally, even if you are connecting to a remote machine.

```
fid = fopen('c:\temp\tmp.txt','wt');
for i = 1:size(A,1)
   fprintf(fid,'%10.2f \t %s \t %s \t %s \n', ...
   A{i,1},A{i,2},A{i,3},A{i,4});
end
fclose(fid);
```

6 Run the bulk insert functionality. Note the use of the SQL statement `LOCAL INFILE`.

```
curs = exec(conn,['LOAD DATA LOCAL INFILE ' ...
    ' ''C:\\temp\\tmp.txt'' INTO TABLE BULKTEST ' ...
    'FIELDS TERMINATED BY ''\t'' LINES TERMINATED ' ...
    'BY ''\n''']);
close(curs)
```

7 Confirm the number of rows and columns in `BULKTEST`.

```
curs = exec(conn, 'SELECT * FROM BULKTEST');
results = fetch(curs)
columnnames(curs)

ans =

'salary','player','signed_date','team'
```

8 After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

See Also

`close` | `database` | `exec` | `fetch`

Related Examples

- “Export Data to New Record in Database” on page 5-20

More About

- “Inserting Data Using Command Line” on page 2-146

External Websites

- SQL Tutorial

Display Database Metadata

This example shows how to display database information for `connection` objects using the command line. To view the database structure quickly, use the **Database Explorer** app to explore the tables and column names. Here, metadata refers to the information about the database structure and various database properties.

Create Database Connection

Create a database connection `conn` using the `dbdemo` data source.

```
conn = database('dbdemo','admin','admin');
```

Determine if the database connection `conn` is open.

```
o = isopen(conn)
```

```
o =

     1
```

`o` returns as the scalar `1` that denotes the database connection is open.

Create Database Metadata Object

Create a database metadata object `dbmeta` using `conn`.

```
dbmeta = dmd(conn)
```

```
dbmeta =

  dmd with properties:

    DMDHandle: [1×1 database.internal.ODBCDatabaseMetadataHandle]
```

Display Database Properties

Display the database properties `dbprops` of the database metadata object `dbmeta`.

```
dbprops = get(dbmeta)
```

```
dbprops =

              AllProceduresAreCallable: 1
```

```
               AllTablesAreSelectable: 1
 DataDefinitionCausesTransactionCommit: 1
 ...
```

For details about the database metadata properties returned by `get`, see the methods of the `DatabaseMetaData` object on the Oracle Java website:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

Retrieve Catalog Metadata

Retrieve the names and types of tables in a catalog in the database using `dbmeta` and the catalog name `tutorial`.

```
t = tables(dbmeta,'tutorial')
```

```
t =

    'MSysAccessObjects'    'SYSTEM TABLE'
    'MSysIMEXColumns'      'SYSTEM TABLE'
    'MSysIMEXSpecs'        'SYSTEM TABLE'
    'MSysObjects'          'SYSTEM TABLE'
    'MSysQueries'          'SYSTEM TABLE'
    'MSysRelationships'    'SYSTEM TABLE'
    'inventoryTable'       'TABLE'
    'productTable'         'TABLE'
    'salesVolume'          'TABLE'
    'suppliers'            'TABLE'
    'yearlySales'          'TABLE'
    'display'              'VIEW'
```

`t` contains the list of table names in the catalog in the first column and list of table types in the second column.

Close Database Connection

```
close(conn)
```

See Also

`dmd` | `get` | `supports` | `tables`

Related Examples

- “Display Information About Imported Data” on page 5-49

Call Stored Procedure That Returns Data

This example shows how to call a stored procedure that returns data using the `exec` function. Use the JDBC interface to connect to a Microsoft SQL Server database, call a stored procedure, and return data. For this example, the Microsoft SQL Server database contains the stored procedure `getSupplierInfo`. This stored procedure returns the supplier information for suppliers of a given city. This code defines the procedure.

```
CREATE PROCEDURE dbo.getSupplierInfo
    (@cityName varchar(20))
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON

    SELECT * FROM dbo.suppliers WHERE City = @cityName
END
```

For Microsoft SQL Server, the statement `'SET NOCOUNT ON'` suppresses the results of `INSERT`, `UPDATE`, or any non-`SELECT` statements that might be before the final `SELECT` query, so you can fetch the results of the `SELECT` query.

Use `exec` when the stored procedure returns one or more result sets. For procedures that return output parameters, use `runstoredprocedure`.

Create Database Connection

Using the JDBC interface, connect to the Microsoft SQL Server database called `'test_db'` with a user name and password using port number `1234`. This example assumes that your database server is located on the machine `servername`.

```
conn = database('test_db','username','pwd', ...
    'Vendor','Microsoft SQL Server', ...
    'Server','servername','PortNumber',1234);
```

Call Stored Procedure

Return the result set in table format by using `setdbprefs` to set `'DataReturnFormat'` to `'table'`.

```
setdbprefs('DataReturnFormat','table')
```

Call the stored procedure, `getSupplierInfo`, to return supplier information for `New York` city using `exec` and the database connection.

```
sqlquery = '{call getSupplierInfo(''New York'')}';
curs = exec(conn,sqlquery)
```

```
curs =

  cursor with properties:

       Attributes: []
             Data: 0
   DatabaseObject: [1×1 database.jdbc.connection]
         RowLimit: 0
         SQLQuery: '{call getSupplierInfo('New York')}'
          Message: []
             Type: 'Database Cursor Object'
        ResultSet: [1×1 com.microsoft.sqlserver.jdbc.SQLServerResultSet]
           Cursor: [1×1 com.mathworks.toolbox.database.sqlExec]
        Statement: [1×1 com.microsoft.sqlserver.jdbc.SQLServerStatement]
            Fetch: 0
```

`exec` returns a `cursor` object that contains the supplier information.

Retrieve Output Data from Stored Procedure

Retrieve supplier data from the `cursor` object using the `fetch` function.

```
curs = fetch(curs)
```

```
curs =

  cursor with properties:

       Attributes: []
             Data: [3×5 table]
   DatabaseObject: [1×1 database.jdbc.connection]
         RowLimit: 0
         SQLQuery: '{call getSupplierInfo('New York')}'
          Message: []
             Type: 'Database Cursor Object'
        ResultSet: [1×1 com.microsoft.sqlserver.jdbc.SQLServerResultSet]
           Cursor: [1×1 com.mathworks.toolbox.database.sqlExec]
        Statement: [1×1 com.microsoft.sqlserver.jdbc.SQLServerStatement]
            Fetch: [1×1 com.mathworks.toolbox.database.fetchTheData]
```

`curs` contains the supplier data obtained from calling the stored procedure, `getSupplierInfo`.

Display the supplier data in table format by accessing the contents of the `Data` property of the `cursor` object.

```
curs.Data
```

```
ans =

  3×5 table

    SupplierNumber       SupplierName          City          Country          FaxNumber
    ______________    ___________________    _________    _____________    _____________

    1001              'Wonder Products'      'New York'    'United States'    '212 435 1617'
    1006              'ACME Toy Company'     'New York'    'United States'    '212 435 1618'
    1012              'Aunt Jemimas'         'New York'    'USA'              '14678923104'
```

Close Database Connection

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

See Also

`database` | `exec` | `fetch` | `runstoredprocedure` | `setdbprefs`

External Websites

- SQL Tutorial

Run Custom Database Function

This example shows how to run a custom database function on Microsoft SQL Server.

Consider a database function `get_prodCount` that retrieves row counts in the table `productTable`. The table `productTable` contains 30 rows where each row represents a product. This code defines this database function and assumes a schema name `dbo`.

```
CREATE FUNCTION dbo.get_prodCount()
RETURNS int
AS
BEGIN
     DECLARE @PROD_COUNT int
     SELECT @PROD_COUNT = count(*) FROM productTable
     RETURN(@PROD_COUNT)
END
GO
```

Create Database Connection

Connect to Microsoft SQL Server using an ODBC driver. For example, this code assumes you are connecting to a data source named `MS SQL Server` with user name `username` and password `pwd`.

```
conn = database('MS SQL Server','username','pwd');
```

Execute Custom Function

Construct an SQL query `sqlquery` that executes the custom function code. Execute the custom function by running `exec`. The `cursor` object `curs` contains the results from executing the custom function. Import the data from the custom function using the `fetch` function.

```
sqlquery = 'SELECT dbo.get_prodCount() as num_products';

curs = exec(conn,sqlquery);
curs = fetch(curs);
```

Display the result.

```
curs.Data
```

```
ans =

    [30.00]
```

The custom function `get_prodCount` returns the product count `30`.

Close Database Connection

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

See Also

`close` | `database` | `exec` | `fetch`

External Websites

- SQL Tutorial

Data Import Approaches and Memory Management

To import data with simple queries, you can use the **Database Explorer** app. For more complex queries and managing memory issues, use the command line to import data into the MATLAB workspace. To understand the differences between these two approaches, see “Data Import Using Database Explorer App or Command Line” on page 2-143.

The way you import data has a different impact on memory use. You can import data in one or two steps. Also, you can import large data by limiting the number of rows.

Data Import in One Step

For maximum memory savings, you can import and access data in one step using the `select` function. With this function, you save memory by importing data using data types specified in a database. The table definitions in a database specify the data type for each column. The `select` function maps the data type in the database to a corresponding MATLAB data type for each variable during data import. Instead of importing every numeric value as a `double` in MATLAB, the `select` function allows the import of different integer data types. You no longer need to convert the data type of a numeric value to a specific numeric type after data import. The MATLAB memory size used by integer or unsigned integer data types is less than double precision. Therefore, using the `select` function affords maximum memory savings.

This table shows the numeric data types in a database and their MATLAB equivalents when using the `select` function.

Database Data Type	MATLAB Data Type
`SIGNED TINYINT`	`int8`
`UNSIGNED TINYINT`	`uint8`
`SIGNED SMALLINT`	`int16`
`UNSIGNED SMALLINT`	`uint16`
`SIGNED INT`	`int32`
`UNSIGNED INT`	`uint32`
`SIGNED BIGINT`	`int64`
`UNSIGNED BIGINT`	`uint64`
`REAL`	`single`

Database Data Type	MATLAB Data Type
FLOAT	single
DOUBLE	double
DECIMAL	double
NUMERIC	double
Boolean	logical
Date, time, or text	char

For example, create a table `Patients` with this database table definition:

```
CREATE TABLE Patients(
    LastName VARCHAR(50),
    Gender VARCHAR(10),
    Age TINYINT,
    Location VARCHAR(300),
    Height SMALLINT,
    Weight SMALLINT,
    Smoker BIT,
    Systolic FLOAT,
    Diastolic NUMERIC,
    SelfAssessedHealthStatus VARCHAR(20))
```

These table columns have numeric data types in the database:

- `Age`
- `Height`
- `Weight`
- `Systolic`
- `Diastolic`

The `fetch` function imports the columns of numeric data with double precision. However, the `select` function imports the columns into their matching integer data type. When you import using the `select` function, the corresponding MATLAB data types for these columns are:

- `uint8`
- `uint16`

- `uint16`
- `single`
- `double`

The `fetch` function imports the `Smoker` column as a `double` in MATLAB. However, the `select` function imports the `Smoker` column as a `logical` variable.

To see data types after data import, use the `select` function with the `metadata` output argument.

Data Import in Two Steps

You can import data in two steps using the `exec` and `fetch` functions. Running `exec` executes the SQL query.

- If you are using the native ODBC interface, then `exec` moves the results of the query from the database server into the main computer memory, or RAM.
- If you are using a JDBC driver, then `exec` moves the results into the Java heap.

The `fetch` function imports all numeric values from the database, and then stores them in a double-precision array in the MATLAB workspace. Double-precision arrays consume more memory than commensurate arrays containing integer data types. To save memory, use the `select` function to import integer values from the database into the MATLAB workspace as the matching integer data types.

Large Data Import Using Row Limits

To manage memory by limiting the number of rows that are imported from an executed query, use one of these options:

- Manage RAM or Java heap memory depending on the driver:
  - Use the input argument `rowlimit` in the `exec` function.
  - Modify the query by adding LIMIT or a similar SQL syntax at the end of the SQL statement. For example, this SQL statement assumes a MySQL database connection.

    ```
    sqlquery = 'SELECT * FROM productTable LIMIT 5';
    ```

- Manage MATLAB memory:
  - Use the input argument `rowlimit` in the `fetch` function.
  - For a SQL script, use the name-value pair argument `'RowInc'` in the `runsqlscript` function.
  - For the MATLAB interface to SQLite, use the input argument `rowlimit` in the `fetch` function.

See Also

`exec` | `fetch` | `runsqlscript` | `select`

More About

- “Data Import Using Database Explorer App or Command Line” on page 2-143
- “Import Data from Databases into MATLAB” on page 5-2
- “Using Scrollable Cursors” on page 5-52
- “Working with Large Data Sets” on page 2-148

Display Information About Imported Data

This example shows how to import data and display information about the imported data using a `cursor` object. Here, metadata refers to the information about the `cursor` object that contains the imported data after running `exec`.

Create Database Connection and Import Data

Create the database connection `conn` using the `dbdemo` data source. `dbdemo` contains the table `productTable` with the column `productDescription`.

```
conn = database('dbdemo','admin','admin');
```

Create the `cursor` object `curs` by selecting data in `productDescription` from `productTable` using `conn`. `sqlquery` contains the SQL `SELECT` statement for this query.

```
sqlquery = 'SELECT productDescription FROM productTable';
```

```
curs = exec(conn,sqlquery);
```

Determine if the `cursor` object `curs` is open.

```
o = isopen(curs)
```

```
o =

     1
```

`o` returns as the scalar `1` that denotes the `cursor` object is open.

Import the first 10 rows of product description data using `curs`.

```
curs = fetch(curs,10);
```

`fetch` stores the imported data in the `cursor` object property `curs.Data`.

Retrieve Number of Rows in Imported Data

Retrieve the number of rows `numrows` using `curs`.

```
numrows = rows(curs)
```

```
numrows =

    10
```

Retrieve Number of Columns in Imported Data

Retrieve the number of columns `numcols` using `curs`.

```
numcols = cols(curs)

numcols =

     1
```

Retrieve Column Name in Imported Data

Retrieve the column name `colname` using `curs`.

```
colname = columnnames(curs)

colname =

    'productDescription'
```

Retrieve Column Width in Imported Data

Retrieve the column width `colsize`, or size of the field, for the first column using `curs`.

```
colsize = width(curs,1)

colsize =

    50
```

Display Attributes in Imported Data

Display the attributes for the product description column using `curs`.

```
attributes = attr(curs)

attributes =

      fieldName: 'productDescription'
       typeName: 'VARCHAR'
      typeValue: 12
    columnWidth: 50
```

```
      precision: []
          scale: []
       currency: 'false'
       readOnly: 'false'
       nullable: 'true'
        Message: []
```

Close `cursor` Object

After you finish working with the `cursor` object, close it.

```
close(curs)
```

See Also

`attr` | `cols` | `columnnames` | `database` | `fetch` | `rows` | `setdbprefs` | `width`

Related Examples

- “Import Data from Databases into MATLAB” on page 5-2

External Websites

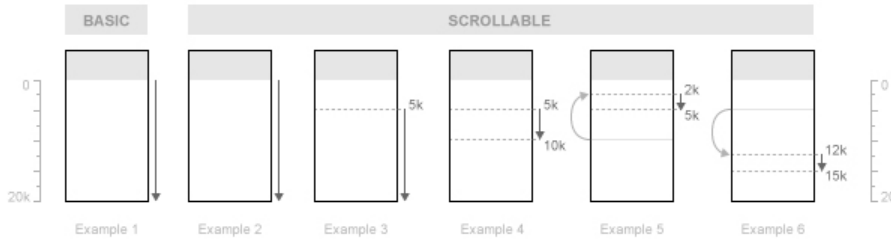
- SQL Tutorial

Using Scrollable Cursors

Scrollable Cursors

A basic cursor lets you fetch the data in your SQL query sequentially. With a scrollable cursor, you can fetch data sequentially or scroll up or down in the data without rerunning the query. The cursor changes position based on an absolute or relative offset value. Scrolling within the data offers advantages when you are working with a large data set.

This diagram shows the differences between the basic and scrollable cursors. Each example in the diagram shows fetching data in the same table that contains 20,000 records.



As shown in Example 1, the basic cursor lets you fetch data sequentially. As shown by Examples 2 through 6, the scrollable cursor lets you do this and fetch data from an absolute or relative cursor position. Examples 3 and 4 use an absolute position offset and Examples 5 and 6 use a relative position offset.

Scrollable cursors let you fetch data from a specific position. Example 3 fetches all records starting from the absolute cursor position of 5000. Example 4 fetches 5000 records starting from the absolute cursor position of 5000.

Further, scrollable cursors let you fetch data relative to your current cursor position. Assuming your current cursor position is 10,000, Example 5 fetches 3000 records using a relative cursor position offset of -8000. A negative position offset moves the scrollable cursor backwards in the data set. The `fetch` function adds -8000 to the current cursor position of 10,000 to start fetching data from 2000. Assuming your cursor stays at the position of 5000 after fetching data in Example 5, Example 6 fetches 3000 records using a relative cursor position offset of 7000. A positive position offset moves the scrollable cursor forward in the data set. The `fetch` function adds 7000 to the current cursor position of 5000 to start fetching data from 12,000.

To use a scrollable cursor, first you need to create it by using the `exec` function. This code creates a scrollable `cursor` object `curs` using a database connection `conn` and an SQL query `sqlquery`.

```
curs = exec(conn,sqlquery,'CursorType','scrollable');
```

Then, you can use `fetch` to retrieve data in the cursor with an offset. The offset lets you retrieve data starting from the middle of the data set. You cannot retrieve data with an offset using a basic `cursor` object. As you continue to fetch, the position of the cursor changes. You can enter `curs.Position` to see the current position of the `cursor` object `curs`, or you can use `get`.

The database driver for your database determines if scrollable cursor functionality is available. Consult your database documentation to ensure your database driver supports scrollable cursors.

Differences Between Native ODBC and JDBC Scrollable Cursors

Native ODBC and JDBC drivers implement scrollable cursor functionality differently. Further, database drivers implement scrollable cursor functionality differently. Both tables illustrate the differences in scrollable cursor behavior across drivers. The rows depict examples of using a scrollable cursor with native ODBC and JDBC connections. For each row, the full data set has 15 records. Each table row shows the values for the input arguments in a specific call of the `fetch` function. The column descriptions show that:

- The Initial Scrollable Cursor Position column captures the value of the cursor position before calling `fetch`.
- The Row Limit column shows values for the `rowlimit` input argument in `fetch`.
- The Scrollable Cursor Position Type column specifies the name in the name-value pair argument for the cursor position offset.
- The Offset column specifies the value in the name-value pair argument for the cursor position offset.
- The Ending Scrollable Cursor Position column captures the value of the cursor position after calling `fetch`.
- The `fetch` Action column describes the rows of data to retrieve based on the specified input arguments.

For example, this code demonstrates the syntax for calling `fetch` shown in the second row of either table.

```
curs = fetch(curs,2,'AbsolutePosition',1);
```

Native ODBC

Initial Scrollable Cursor Position	Row Limit	Scrollable Cursor Position Type	Offset	Ending Scrollable Cursor Position	`fetch` Action
Any	Not specified	`'AbsolutePosition'`	1	After the result set	Retrieves all rows in the cursor starting from the first row in the data set
Any	2	`'AbsolutePosition'`	1	1	Retrieves two rows in the cursor starting from the first row in the data set
Any	2	`'AbsolutePosition'`	5	5	Retrieves two rows in the cursor starting from the fifth row in the data set
Any	3	`'AbsolutePosition'`	-5	11	Retrieves three rows in the cursor starting from the fifth row from the end of the data set

Initial Scrollable Cursor Position	Row Limit	Scrollable Cursor Position Type	Offset	Ending Scrollable Cursor Position	`fetch` Action
Before result set	Not specified	`'RelativePosition'`	1	After the result set	Retrieves all rows in the cursor starting from the first row in the data set
Before result set	Any	`'RelativePosition'`	Any	Varies	Retrieving with a relative position that starts before the result set causes behavior to vary based on the driver
5	2	`'RelativePosition'`	5	10	Retrieves two rows in the cursor starting from the tenth row in the data set
11	3	`'RelativePosition'`	-5	6	Retrieves three rows in the cursor starting from the sixth row in the data set

JDBC

Initial Scrollable Cursor Position	Row Limit	Scrollable Cursor Position Type	Offset	Ending Scrollable Cursor Position	`fetch` Action
Any	Not specified	`'AbsolutePosition'`	1	0	Retrieves all rows in the cursor starting from the first row in the data set
Any	2	`'AbsolutePosition'`	1	2	Retrieves two rows in the cursor starting from the first row in the data set
Any	2	`'AbsolutePosition'`	5	6	Retrieves two rows in the cursor starting from the fifth row in the data set

Initial Scrollable Cursor Position	Row Limit	Scrollable Cursor Position Type	Offset	Ending Scrollable Cursor Position	`fetch` Action
Any	3	`'AbsolutePosition'`	-5	13	Retrieves three rows in the cursor starting with the fifth row from the end of the data set. This assumes there are 15 records in the data set.
0	Not specified	`'RelativePosition'`	1	0	Retrieves all rows in the cursor starting from the first row in the data set
0	2	`'RelativePosition'`	1	2	Retrieves the first two rows in the data set
5	2	`'RelativePosition'`	5	11	Retrieves two rows in the data set starting from five rows from the initial position of five, which is nine

Initial Scrollable Cursor Position	Row Limit	Scrollable Cursor Position Type	Offset	Ending Scrollable Cursor Position	`fetch` Action
11	3	`'RelativePosition'`	-5	8	Retrieves three rows in the cursor starting from five rows before the eleventh row in the data set

See Also

`exec` | `fetch` | `get`

Related Examples

- “Import Data from Databases into MATLAB” on page 5-2

More About

- “Import Data Using Scrollable Cursor with Relative Position Offset” on page 5-60

Import Data Using Scrollable Cursor with Relative Position Offset

This example shows how to use a scrollable cursor to import data using both absolute and relative position offsets. This example assumes you are connecting to a MySQL database that contains a table called `productTable`. This table contains 15 records, where each record represents one product. The scrollable cursor functionality behaves differently depending on your database driver. For details about the scrollable cursor functionality in your database, consult your database documentation.

Connect to Database

Connect to the MySQL database using an ODBC driver. This code assumes you are connecting to a data source named `MySQL` with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Create Scrollable Cursor

Select all products from the `productTable` table and sort them in ascending order by product number. Create a scrollable cursor using the name-value pair argument `'CursorType'`.

```
sqlquery = 'SELECT * FROM productTable ORDER BY productNumber';
curs = exec(conn,sqlquery,'CursorType','scrollable');
```

Retrieve Data Using Absolute Position Offset

Import the data for two products in the middle of the data set. Use the row limit `2` to import data for two products. Use the absolute position offset `5` to import data starting from the fifth product in the data set.

```
curs = fetch(curs,2,'AbsolutePosition',5);
```

Display the data for the two products.

```
curs.Data
```

```
ans =

    [5]    [400455]    [1005]    [3]    'Tin Soldier'
    [6]    [400876]    [1004]    [8]    'Sail Boat'
```

The columns in `curs.Data` are:

- Product number
- Stock number
- Supplier number
- Unit cost
- Product description

Display the position of the cursor.

```
curs.Position
```

```
ans =

     5
```

The position of the cursor stays at the absolute position offset `5`.

Retrieve Data Using Relative Position Offset

Import the data for three products in the data set using the relative position offset `5`. A scrollable cursor adds the current position offset `5` to the specified relative position offset `5`. The scrollable cursor advances to cursor position `10` and imports data.

```
curs = fetch(curs,3,'RelativePosition',5);
```

Display the data for the three products.

```
curs.Data
```

```
ans =

    [10]    [888652]    [1006]    [24]    'Teddy Bear'
    [11]    [408143]    [1004]    [11]    'Convertible'
    [12]    [210456]    [1010]    [22]    'Hugsy'
```

Display the position of the cursor.

```
curs.Position
```

```
ans =

    10
```

Close `cursor` Object

After you finish working with the `cursor` object, close it.

```
close(curs)
```

See Also

`close` | `database` | `exec` | `fetch`

Related Examples

- “Import Data from Databases into MATLAB” on page 5-2

More About

- “Using Scrollable Cursors” on page 5-52

External Websites

- SQL Tutorial

Import Large Data Using DatabaseDatastore Object

This example shows how to create a `DatabaseDatastore` object for accessing collections of data stored in a relational database. After creating a `DatabaseDatastore` object, you can preview data, read data in chunks, and read every record in the data set.

To analyze large data, you can run algorithms on large data sets using a tall array.

Alternatively, you can write a MapReduce algorithm that defines the chunking and reduction of the data.

Create `DatabaseDatastore` Object

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. Here, the code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server',...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using the database connection and SQL query. This SQL query retrieves all data from the table.

```
sqlquery = 'select * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery);
```

Preview Data in `DatabaseDatastore` Object

Preview the first eight records in the data set returned by executing `sqlquery`.

```
preview(dbds)


ans =

    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1990    9        22            6            1801       1750          2005       193
    1990    9        11            2             908        910          1613       155
    1990    9         2            7             NaN       1805           NaN       190
```

```
    1990     9        29           6          1434       1435         1615       163
    1990     9         3           1           925        755         1258       114
    1990     9        22           6           900        900         1241       122
    1990     9        20           4          1338       1335         1853       190
    1990     9         3           1           710        711          837        84
```

Read Data in `DatabaseDatastore` Object

Read the first 10 records.

```
dbds.ReadSize = 10;

read(dbds)
```

```
ans =

    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1987    10       28            3            1140       1140          1212       121
    1987    10        9            5            1155       1155          1250       130
    1987    10       22            4             715        715           807        80
    1987    10       16            5            1553       1555          1641       164
    1987    10       30            5            1821       1815          1956       195
    1987    10       12            1            1300       1300          1529       152
    1987    10        7            3             810        810           904        90
    1987    10       19            1             733        735           827        83
    1987    10       15            4             828        830           916        92
    1987    10        4            7            1750       1735          1837       181
```

Read the `DatabaseDatastore` object two more times by using counter `n`. Read 10 records at a time.

```
n = 0;

while(hasdata(dbds) && n~=2)
     read(dbds)
     n = n+1;
end
```

```
ans =
```

```
    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1987    10       16            5             959       1000          1212       121
    1987    10       17            6            2020       2020          2100       205
    1987    10        6            2            1132       1135          1426       141
    1987    10       24            6             944        945          1211       121
    1987    10       18            7             833        835          1003       101
    1987    10       26            1            2356       2355           730        72
    1987    10       29            4            1056       1055          1208       121
    1987    10        1            4            2304       2255          2340       232
    1987    10       30            5            1329       1329          1434       143
    1987    10        3            6            1040       1040          1125       112


ans =

    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1987    10       23            5            1855       1855          2158       220
    1987    10       30            5            1055       1055          1302       131
    1987    10       28            3             NaN       1850           NaN       205
    1987    10       26            1            1600       1600          1649       164
    1987    10        6            2             745        745           833        82
    1987    10       31            6            1350       1350          1612       161
    1987    10       12            1            1253       1200          1359       131
    1987    10       19            1             650        645           852        81
    1987    10       10            6            1640       1640          1712       172
    1987    10        2            5            2030       2030          2127       213
```

Reset `DatabaseDatastore` Object

Reset the `DatabaseDatastore` object to the state where no data has been read from it. Resetting allows rereading from the same `DatabaseDatastore` object.

```
reset(dbds)
```

Read Every Record in `DatabaseDatastore` Object

Read every record in the `DatabaseDatastore` object in increments of 50,000 records at a time.

```
dbds.ReadSize = 50000;
data = readall(dbds);
```

Display the first three records of the full data set.

```
data(1:3,:)
```

```
ans =

    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1987    10       28            3            1140       1140          1212       121
    1987    10        9            5            1155       1155          1250       130
    1987    10       22            4             715        715           807        80
```

Close `DatabaseDatastore` Object and Database Connection

```
close(dbds)
```

See Also

`close` | `database` | `databaseDatastore` | `hasdata` | `preview` | `read` | `readall` | `reset`

Related Examples

- “Analyze Large Data in Database Using Tall Arrays”
- “Analyze Large Data in Database Using MapReduce”
- Building Effective Algorithms with MapReduce (MATLAB)

External Websites

- SQL Tutorial

Import Data Using MATLAB® Interface to SQLite

This example shows how to move data between MATLAB® and the MATLAB® interface to SQLite. Suppose that you have product data that you want to import into MATLAB®. You can load this data quickly into a SQLite database file. You do not need to install a database or driver. For details about the MATLAB® interface to SQLite, see "Working with MATLAB Interface to SQLite" on page 2-6. For more functionality, connect to the SQLite database file using the JDBC driver. For details, see "Configuring Driver and Data Source" on page 2-15.

To access the code for this example, enter `edit SQLiteWorkflow.m`.

Create SQLite Connection

Create a SQLite connection `conn` to a new SQLite database file `tutorial.db`. Specify the file name in the current working folder.

```
dbfile = fullfile(pwd,'tutorial.db');

conn = sqlite(dbfile,'create');
```

Create Tables in SQLite Database File

Create the tables `inventoryTable`, `suppliers`, `salesVolume`, and `productTable` using `exec`. Clear the MATLAB® workspace variables.

```
createInventoryTable = ['create table inventoryTable ' ...
    '(productNumber NUMERIC, Quantity NUMERIC, ' ...
    'Price NUMERIC, inventoryDate VARCHAR)'];
exec(conn,createInventoryTable)

createSuppliers = ['create table suppliers ' ...
    '(SupplierNumber NUMERIC, SupplierName varchar(50), ' ...
    'City varchar(20), Country varchar(20), ' ...
    'FaxNumber varchar(20))'];
exec(conn,createSuppliers)

createSalesVolume = ['create table salesVolume ' ...
    '(StockNumber NUMERIC, January NUMERIC, ' ...
    'February NUMERIC, March NUMERIC, April NUMERIC, ' ...
    'May NUMERIC, June NUMERIC, July NUMERIC, ' ...
    'August NUMERIC, September NUMERIC, October NUMERIC, ' ...
    'November NUMERIC, December NUMERIC)'];
```

```
exec(conn,createSalesVolume)

createProductTable = ['create table productTable ' ...
    '(productNumber NUMERIC, stockNumber NUMERIC, ' ...
    'supplierNumber NUMERIC, unitCost NUMERIC, ' ...
    'productDescription varchar(20))'];
exec(conn,createProductTable)

clear createInventoryTable createSuppliers createSalesVolume ...
    createProductTable
```

`tutorial.db` contains four empty tables.

Load Data into SQLite Database File

Load the MAT-file named `sqliteworkflowdata.mat`. The variables `CinvTable`, `Csuppliers`, `CsalesVol`, and `CprodTable` contain data for export. Export data into the tables in `tutorial.db` using `insert`. Clear the MATLAB® workspace variables.

```
load('sqliteworkflowdata.mat')

insert(conn,'inventoryTable', ...
    {'productNumber','Quantity','Price','inventoryDate'},CinvTable)

insert(conn,'suppliers', ...
    {'SupplierNumber','SupplierName','City','Country','FaxNumber'}, ...
    Csuppliers)

insert(conn,'salesVolume', ...
    {'StockNumber','January','February','March','April','May','June', ...
    'July','August','September','October','November','December'}, ...
    CsalesVol)

insert(conn,'productTable', ...
    {'productNumber','stockNumber','supplierNumber','unitCost', ...
    'productDescription'},CprodTable)

clear CinvTable Csuppliers CsalesVol CprodTable
```

Close the SQLite connection. Clear the MATLAB® workspace variable.

```
close(conn)

clear conn
```

Create a read-only SQLite connection to `tutorial.db`.

```
conn = sqlite('tutorial.db','readonly');
```

Import Data into MATLAB®

Import the product data into the MATLAB® workspace using `fetch`. Variables `inventoryTable_data`, `suppliers_data`, `salesVolume_data`, and `productTable_data` contain data from the tables `inventoryTable`, `suppliers`, `salesVolume`, and `productTable`.

```
inventoryTable_data = fetch(conn,'SELECT * FROM inventoryTable');

suppliers_data = fetch(conn,'SELECT * FROM suppliers');

salesVolume_data = fetch(conn,'SELECT * FROM salesVolume');

productTable_data = fetch(conn,'SELECT * FROM productTable');
```

Display the first three rows of data in each table.

```
inventoryTable_data(1:3,:)

suppliers_data(1:3,:)

salesVolume_data(1:3,:)

productTable_data(1:3,:)
```

```
ans =

  3x4 cell array

    {[1]}    {[1700]}    {[14.5000]}    {'9/23/2014 9:38...'}
    {[2]}    {[1200]}    {[ 9.3000]}    {'7/8/2014 10:50...'}
    {[3]}    {[ 356]}    {[17.2000]}    {'5/14/2014 7:14...'}


ans =

  3x5 cell array

  Columns 1 through 4
```

```
    {[1001]}    {'Wonder Products'}    {'New York'}    {'United States' }
    {[1002]}    {'Terrific Toys'  }    {'London'  }    {'United Kingdom'}
    {[1003]}    {'Wacky Widgets'  }    {'Adelaide'}    {'Australia'     }

  Column 5

    {'212 435 1617' }
    {'44 456 9345'  }
    {'618 8490 2211'}


ans =

  3x13 cell array

  Columns 1 through 6

    {[125970]}    {[1400]}    {[1100]}    {[ 981]}    {[ 882]}    {[794]}
    {[212569]}    {[2400]}    {[1721]}    {[1414]}    {[1191]}    {[983]}
    {[389123]}    {[1800]}    {[1200]}    {[ 890]}    {[ 670]}    {[550]}

  Columns 7 through 12

    {[752]}    {[654]}    {[773]}    {[809]}    {[980]}    {[3045]}
    {[825]}    {[731]}    {[653]}    {[723]}    {[790]}    {[1400]}
    {[450]}    {[400]}    {[410]}    {[402]}    {[450]}    {[1200]}

  Column 13

    {[19000]}
    {[ 5000]}
    {[16000]}


ans =

  3x5 cell array

    {[9]}    {[125970]}    {[1003]}    {[13]}    {'Victorian Doll'}
    {[8]}    {[212569]}    {[1001]}    {[ 5]}    {'Train Set'     }
    {[7]}    {[389123]}    {[1007]}    {[16]}    {'Engine Kit'    }
```

Close SQLite Connection

```
close(conn)
```

Clear the MATLAB® workspace variable.

```
clear conn
```

See Also

`close` | `exec` | `fetch` | `insert` | `sqlite`

More About

- “Access Relational Database Data in MATLAB” on page 2-3
- “Working with MATLAB Interface to SQLite” on page 2-6
- “Configuring Driver and Data Source” on page 2-15

External Websites

- SQL Tutorial

Retrieve Image Data Types

This example shows how to retrieve images from a Microsoft Access database. To run this example, define the function `parsebinary` using this code.

```
function [x,map] = parsebinary(o,f)
%PARSEBINARY Write binary object to disk and display if image.
%   [X,MAP] = PARSEBINARY(O,F) writes the binary object in O to disk
%   in the format specified by F. If the object is an image,
%   display the image. This file was released for demonstration
%   purposes only. A Microsoft(R) Access(TM) database contains image data.
%   Use an ODBC driver to read the data. This function writes
%   any temporary files to the current working directory.
%
%   Valid file formats are:
%
%   BMP     Bitmap
%   DOC     Microsoft(R) Word document
%   GIF     GIF file
%   PPT     Microsoft(R) Powerpoint(R) file
%   TIF     TIF file
%   XLS     Microsoft(R) Excel(R) spreadsheet
%   PNG     Portable Network Graphics

% Transform object into vector of data
v = java.util.Vector;
v.addElement(o);
bdata = v.elementAt(0);

% Open file to write data to disk
fid = fopen(['testfile.' lower(f)],'wb');

% n specifies the end point of data written to disk
n = length(bdata);

% File type determines how many bytes of header data that
% the ODBC driver prepended to the data.

switch lower(f)

    case 'bmp'
      m = 79;

    case 'doc'
      m = 86;

    case 'gif'
      m = 5722;

    case 'png'

      m = 182;
      n = length(bdata)-285;

    case 'ppt'
      m = 94;

    case 'tif'
      m = 6472;
```

```
    case 'xls'
      m = 83;

    otherwise
      error(message('database:parsebinary:unknownFormat'))

end

% Write data to disk
fwrite(fid,bdata(m:n),'int8');
fclose(fid);

% Display if image
switch lower(f)

  case {'bmp','tif','gif','png'}

    [x,map] = imread(['testfile.' lower(f)]);
    imagesc(x)
    colormap(map)

  case {'doc','xls','ppt'}

    % Microsoft(R) Office formats
    % Insert path to Microsoft(R) Word or Microsoft(R) Excel(R)
    % executable here to run from MATLAB(R) prompt.
    % For example:
    % !d:\msoffice\winword testfile.doc
end
```

1. Connect to the Microsoft Access data source using the ODBC driver. The database contains the table `Invoice`.

   ```
   conn = database('datasource','','');
   ```

2. Specify the data return format to be a cell array.

   ```
   setdbprefs('DataReturnFormat','cellarray')
   ```

3. Import the `InvoiceNumber` and `Receipt` columns of data from `Invoice`.

   ```
   sqlquery = 'SELECT InvoiceNumber,Receipt FROM Invoice';
   curs = exec(conn,sqlquery);
   curs = fetch(curs);
   ```

4. View the imported data.

   ```
   curs.Data

   ans =

       [  2101]    [1948410x1 int8]
       [  3546]    [2059994x1 int8]
       [ 33116]    [ 487034x1 int8]
       [ 34155]    [2059994x1 int8]
   ```

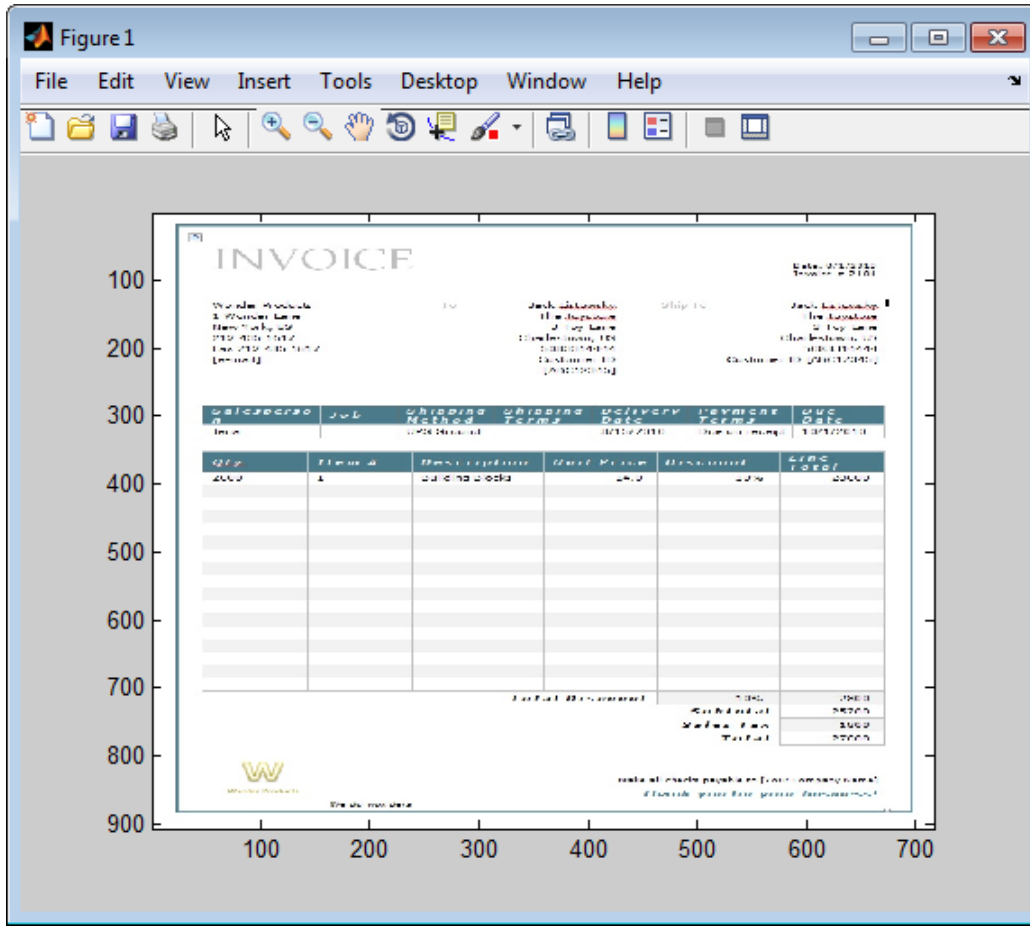
```
[ 34267]    [2454554x1 int8]
[ 37197]    [1926362x1 int8]
[ 37281]    [2403674x1 int8]
[ 41011]    [1920474x1 int8]
[ 61178]    [2378330x1 int8]
[ 62145]    [ 492314x1 int8]
[456789]                  []
[987654]                  []
```

5 Assign the image element you want to the variable `receipt`.

```
receipt = curs.Data{1,2};
```

6 Run the `parsebinary` function. The function writes retrieved data to a file, strips ODBC header information from it, and displays `receipt` as a bitmap image in a figure window. Ensure that your current folder is writable so that the `parsebinary` function can write the output data.

```
cd 'I:\MATLABFiles\myfiles'
parsebinary(receipt,'BMP');
```



See Also

`database` | `exec` | `fetch` | `setdbprefs`

Related Examples

- “Import Data from Databases into MATLAB” on page 5-2

External Websites

- SQL Tutorial

Import Boolean Data from Database

Import Boolean data from a database table into the MATLAB® workspace. MATLAB® imports Boolean data from databases into the MATLAB® workspace as data type `logical`. This data has values of `true` or `false`. You can store Boolean data in a table, structure, or cell array. Perform a simple data analysis on the imported data.

The code assumes that you have a database table `Invoice` stored in a Microsoft® SQL Server® database. Here, connect to a Microsoft® SQL Server® Version 11.00.2100 database using the Microsoft® SQL Server® Driver 11.00.5058.

Create Database Connection

Create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Import Boolean Data

Select the paid data from the `Invoice` table using a SQL `SELECT` statement. The database stores paid data as a Boolean to specify whether or not an invoice has been paid. Import and display the data using the `select` function.

```
selectquery = 'SELECT Paid FROM Invoice';
data = select(conn,selectquery)
```

```
data =

  11×1 table

    Paid
    _____

    false
    true
    true
    false
    true
    true
    false
```

```
    true
    false
    true
    false
```

Database Toolbox™ imports the data into the workspace variable `data`. The MATLAB® table `data` contains `Paid` as a `logical` variable.

Perform Data Analysis

Count the number of unpaid invoices.

```
unpaid = data.Paid == false;
sum(unpaid)
```

```
ans =

     5
```

Close Database Connection

```
close(conn)
```

See Also

`close` | `database` | `select`

Related Examples

- “Import Data from Databases into MATLAB” on page 5-2
- “Export Data to New Record in Database” on page 5-20

External Websites

- SQL Tutorial

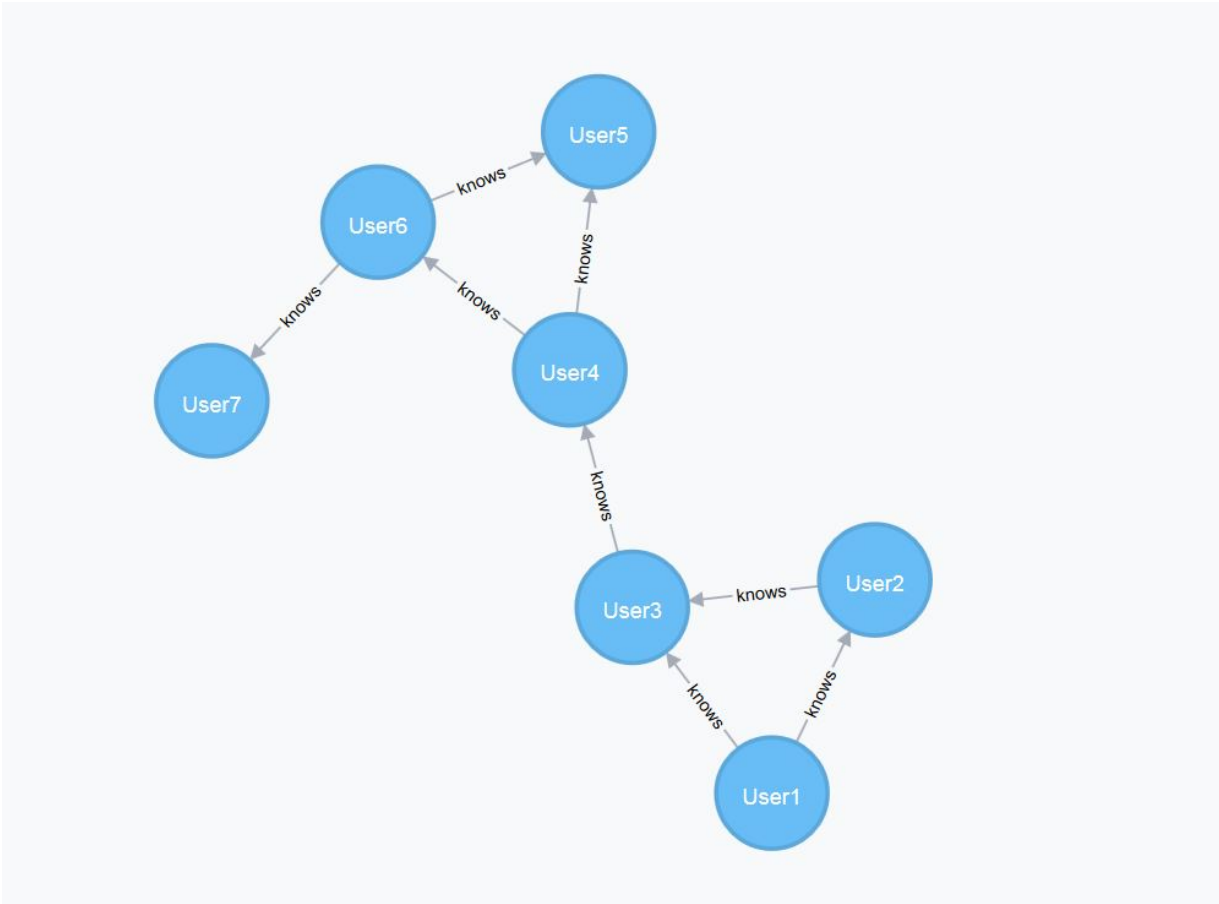
Neo4j Topics

Explore Graph Database Structure

This example shows how to traverse a graph and explore its structure using the MATLAB® interface to Neo4j®. For details about the MATLAB® interface to Neo4j®, see “Working with the MATLAB Interface to Neo4j” on page 6-8.

Assume that you have graph data that is stored on a Neo4j® database which represents a social neighborhood. This database has seven nodes and eight relationships. Each node has only one unique property key `name` with values `User1` through `User7`. Each relationship has type `knows`.

The local machine hosts the Neo4j® database with port number `7474`, user name `neo4j`, and password `matlab`. For a visual representation of the data in the database, see this figure.



Connect to Neo4j® Database

Create a Neo4j® connection object `neo4jconn` using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message
```

```
ans =
```

```
     []
```

The blank `Message` property indicates a successful connection.

Explore Structure of Entire Graph

Find all the node labels in the Neo4j® database using the Neo4j® connection object `neo4jconn`.

```
nlabels = nodeLabels(neo4jconn)
```

```
nlabels =
```

```
  cell
```

```
    'Person'
```

Find all the relationship types in the Neo4j® database.

```
reltypes = relationTypes(neo4jconn)
```

```
reltypes =
```

```
  cell
```

```
    'knows'
```

Find the property keys in the Neo4j® database.

```
propkeys = propertyKeys(neo4jconn)
```

```
propkeys =
```

```
  2×1 cell array
```

```
    'name'
    'property'
```

Search for Nodes

Search for all the nodes with the node label `Person`.

```
nlabel = 'Person';

nodesinfo = searchNode(neo4jconn,nlabel)
```

```
nodesinfo =

         NodeLabels      NodeData                NodeObject
         __________    ____________    ____________________________________

    0    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    1    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    2    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    3    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    4    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    5    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    6    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
```

`nodesinfo` contains node labels, node data, and the `Neo4jNode` objects for each matched node.

Search for the node that has the node identifier `2`.

```
nodeid = 2;

nodeinfo = searchNodeByID(neo4jconn,nodeid)
```

```
nodeinfo =

  Neo4jNode with properties:

        NodeID: 2
      NodeData: [1×1 struct]
```

```
    NodeLabels: 'Person'
```

`nodeinfo` contains the node identifier, node data, and node labels for the node with node identifier `2`.

Search for Relationships

Search for incoming relationship types that belong to the node `nodeinfo`.

```
nodereltypes = nodeRelationTypes(nodeinfo,'in')
```

```
nodereltypes =

  cell

    'knows'
```

Search for the degree of all incoming relationships that belong to the node `nodeinfo`.

```
degree = nodeDegree(nodeinfo,'in')
```

```
degree =

  struct with fields:

    knows: 1
```

Search for all incoming relationships that belong to the node `nodeinfo`.

```
relinfo = searchRelation(neo4jconn,nodeinfo,'in')
```

```
relinfo =

  struct with fields:

      Origin: 2
       Nodes: [2×3 table]
   Relations: [1×4 table]
```

`relinfo` contains data about the starting and ending nodes and all matched relationships from the origin node.

Retrieve Entire Graph

Retrieve the entire graph using node labels `nlabels`.

```
graphinfo = searchGraph(neo4jconn,nlabels)
```

```
graphinfo =

  struct with fields:

        Nodes: [7×3 table]
    Relations: [8×4 table]
```

`graphinfo` contains node data for all starting and ending nodes for each matched relationship. `graphinfo` also contains relationship data for each matched relationship.

See Also

`neo4j` | `nodeDegree` | `nodeLabels` | `nodeRelationTypes` | `propertyKeys` | `relationTypes` | `searchNode` | `searchNodeByID` | `searchRelation`

More About

- “Searching Graph Database Using MATLAB Interface to Neo4j” on page 6-10
- “Working with the MATLAB Interface to Neo4j” on page 6-8

Working with the MATLAB Interface to Neo4j

The MATLAB interface to Neo4j lets you connect to a Neo4j graph database and import graph data into MATLAB. You can perform graph network analysis by creating a directed graph from the imported graph data. Or, if you are familiar with the Cypher® query language, you can execute Cypher queries on the Neo4j database.

About Neo4j Graph Databases

A graph database stores data using a graph data model. This model consists of nodes and relationships. A relationship describes how two or more nodes are related to each other.

Nodes can have zero or more node labels and property keys. Neo4j assigns unique identifiers to nodes and relationships.

Relationships are always directed and have a relationship type. A relationship always has a start and end node. A node can have incoming and outgoing relationships. Two nodes can have multiple relationships between them of different relationship types.

For details about graphs, see “Directed and Undirected Graphs” (MATLAB). For details about the Neo4j database, see Why Graph Databases?

MATLAB Interface to Neo4j Workflow

This workflow shows how to connect to a Neo4j database, search the graph database, and perform graph network analysis.

1. Connect to a Neo4j database using `neo4j`.
2. Search the graph database.

   Conduct a general search in the graph database with any of these functions:

   - `nodeLabels`
   - `propertyKeys`
   - `relationTypes`
   - `searchGraph`

   Or, conduct a targeted search in the graph database with any of these functions:

- `searchNode`
- `searchNodeByID`
- `searchRelation`
- `nodeDegree`
- `nodeRelationTypes`

3 To perform graph network analysis, you can convert output structures to `digraph` objects using `neo4jStruct2Digraph`. For details, see "Directed and Undirected Graphs" (MATLAB).

Or, if you know the Cypher query language, you can execute a Cypher query using `executeCypher`. For details, see Cypher Query Language.

See Also

`digraph` | `neo4j` | `neo4jStruct2Digraph`

Related Examples

- "Find Friends of Friends in Social Neighborhood"
- "Visualize Breadth-First and Depth-First Search" (MATLAB)

More About

- "Directed and Undirected Graphs" (MATLAB)
- "Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10
- "MATLAB Interface to Neo4j Error Messages" on page 6-13

External Websites

- Neo4j Documentation
- Cypher Query Language

Searching Graph Database Using MATLAB Interface to Neo4j

Search the Neo4j graph database using functions provided by the MATLAB interface to Neo4j. You can explore the graph data or perform graph network analysis using MATLAB directed graphs.

MATLAB Interface to Neo4j Search Functions

Search graph data in the Neo4j graph database using different parts of the graph:

- To search for nodes, use one of two functions. Search for one or more nodes using `searchNode`. Search for a node with a specific identifier using `searchNodeByID`.
- Search for relationships from an origin node using `searchRelation`.
- Search for the entire graph database or a subgraph using `searchGraph`.

To access the part of the graph database that you want to analyze, combine these functions and explore the graph data in the output arguments.

General and Targeted Search Workflows

You can search the Neo4j graph database in a general or targeted way. A general search starts from a subgraph or the entire graph. A targeted search starts from an origin node and traverses its relationships.

After finding a part of the graph, you can create a MATLAB directed graph and perform graph network analysis.

Conduct General Search

1. Conduct a general search for a subgraph using `searchGraph`.

   For example, to find the subgraph `graphinfo`, enter this code, which assumes a successful Neo4j database connection `neo4jconn`.

   ```
   nlabel = {'Person'};

   graphinfo = searchGraph(neo4jconn,nlabel);
   ```

2. Convert the output structure `graphinfo` into a `digraph` object `G` using `neo4jStruct2Digraph`.

```
G = neo4jStruct2Digraph(graphinfo);
```

3 Perform graph network analysis using `G`. For details, see "Directed and Undirected Graphs" (MATLAB).

For example, determine the shortest path between nodes using `distances`.

```
d = distances(G);
```

Or, explore the graph data by accessing the output structure `graphinfo`.

Conduct Targeted Search

1 To start your search, find the origin node using `searchNode` or `searchNodeByID`.

For example, to find the origin node `nodeinfo`, enter this code, which assumes a successful Neo4j database connection `neo4jconn` and the node identifier `2`.

```
nodeinfo = searchNodeByID(neo4jconn,2);
```

2 Search for graph data by using the origin node and `searchRelation`.

For example, this code assumes that you are searching for incoming relationships.

```
relinfo = searchRelation(neo4jconn,nodeinfo,'in');
```

3 Convert the output structure `relinfo` into a `digraph` object `G` using `neo4jStruct2Digraph`.

```
G = neo4jStruct2Digraph(relinfo);
```

4 Perform graph network analysis using the `digraph` object `G`. For details, see "Directed and Undirected Graphs" (MATLAB).

For example, determine the shortest path between nodes using `distances`.

```
d = distances(G);
```

Or, explore the graph data by accessing the output structures `nodeinfo` and `relinfo`.

See Also

`nodeDegree` | `searchGraph` | `searchNode` | `searchNodeByID` | `searchRelation`

Related Examples

- “Explore Graph Database Structure” on page 6-2
- “Find Shortest Path Between People in Social Neighborhood”

More About

- “Working with the MATLAB Interface to Neo4j” on page 6-8
- “MATLAB Interface to Neo4j Error Messages” on page 6-13

MATLAB Interface to Neo4j Error Messages

Both the MATLAB interface to Neo4j and the Neo4j database return error messages.

The Neo4j database error messages always have a status code that starts with: `Neo.ClientError`. To troubleshoot these errors, consult the Neo4j Documentation.

The MATLAB interface to Neo4j returns error messages in plain text. This table describes how to address common errors you can encounter while working with the MATLAB interface to Neo4j.

Error Message	Probable Causes	Resolution
Invalid connection.	The Neo4j database connection is invalid.	Connect to the Neo4j database using `neo4j`.
Unable to connect. Please try again.	The Neo4j database connection is invalid.	Connect to the Neo4j database using `neo4j`.
No Nodes found with matching criteria.	The search cannot find nodes for the specified node label or property keys and values.	Verify the node label or property keys and values. Then, run `searchNode`.
Unable to find “relationship” relationships for node with id “node identifier” in database.	The search cannot find relationships for the specified relationships and node in the Neo4j database.	Verify the origin node and direction. Then, run `searchRelation`.
No node labels found.	The Neo4j database has no node labels.	Open the Neo4j database and add node labels. For details, see the Neo4j Operations Manual in the Neo4j Documentation. Then, run `nodeLabels`.
No relationship types found.	The Neo4j database has no relationship types.	Open the Neo4j database and add relationship types. For details, see the Neo4j Operations Manual in the Neo4j Documentation. Then, run `relationTypes`.

Error Message	Probable Causes	Resolution
No property keys found.	The Neo4j database has no property keys.	Open the Neo4j database and add property keys. For details, see the Neo4j Operations Manual in the Neo4j Documentation. Then, run `propertyKeys`.
Unable to execute Cypher query.	The Cypher query is invalid.	Verify the Cypher query. Then, run `executeCypher`. For details about writing Cypher queries, see Cypher Query Language.

See Also

`neo4j` | `searchGraph`

Related Examples

- “Find Friends of Friends in Social Neighborhood”
- “Explore Graph Database Structure” on page 6-2

More About

- “Working with the MATLAB Interface to Neo4j” on page 6-8
- “Searching Graph Database Using MATLAB Interface to Neo4j” on page 6-10

External Websites

- Neo4j Documentation
- Cypher Query Language

Database Toolbox Interface For MongoDB Topics

Import and Analyze Data from MongoDB

This example shows how to import employee data from a collection in MongoDB into the MATLAB workspace using the Database Toolbox interface for MongoDB. The example then shows how to conduct a simple data analysis based on the imported data.

To run this example, you must first install the Database Toolbox interface for MongoDB. For details, see “Database Toolbox Interface for MongoDB Installation” on page 7-19.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =
```

```
  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Specify the `employee` collection for document retrieval. Retrieve all documents in the collection by using the MongoDB connection. `documents` is a structure array.

```
collection = "employee";
documents = find(conn,collection);
```

Using all documents, determine the unique department names. `deplist` contains a cell array of character vectors for the department names. The `employee` collection contains seven departments.

```
departments = {documents(:).department};
deplist = unique(departments)'

deplist =

  7×1 cell array

    {'Application Engineering'}
    {'Consulting'              }
    {'Development'             }
    {'Marketing'               }
    {'Sales'                   }
    {'Support'                 }
    {'Training'                }
```

Determine the maximum salary among all employees.

```
salaries = [documents(:).salary];
max(salaries)

ans =

      150000
```

Close the MongoDB connection.

```
close(conn)
```

See Also

`close` | `find` | `isopen` | `max` | `mongo` | `unique`

More About

- “Import Filtered Data from MongoDB” on page 7-5
- “Import Large Data from MongoDB” on page 7-8
- “Export MATLAB Data into MongoDB” on page 7-11
- “Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

- MongoDB Manual

Import Filtered Data from MongoDB

This example shows how to import flight data from a MongoDB collection into the MATLAB workspace using the Database Toolbox interface for MongoDB. The example then shows how to use a MongoDB query with filter criteria and a field list, and how to perform a simple data analysis based on the filtered flight data.

To run this example, you must first install the Database Toolbox interface for MongoDB. For details, see “Database Toolbox Interface for MongoDB Installation” on page 7-19.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Specify the `airlinesmall` collection. Define the MongoDB query to filter the flight data for the years 1998 through 1999. Specify fields to retrieve from the collection.

```
collection = "airlinesmall";
mongoquery = '{"Year":{$gte:1998,$lt:2000}}';
fields = ['{"Year":1.0,"Month":1.0,"DayofMonth":1.0,"DayOfWeek":1.0,' ...
    '"DepTime":1.0,"ArrTime":1.0}'];
```

Retrieve flight data using the MongoDB connection. `documents` is a structure array with fields that correspond to the specified fields.

```
documents = find(conn,collection,'Query',mongoquery,'Projection',fields)

documents =

  10911×1 struct array with fields:

    x_id
    Year
    Month
    DayofMonth
    DayOfWeek
    DepTime
    ArrTime
```

Determine the unique years in the data.

```
years = [documents(:).Year];
unique(years)

ans =

        1998        1999
```

Close the MongoDB connection.

```
close(conn)
```

See Also

`close` | `find` | `isopen` | `mongo` | `unique`

More About

- “Import and Analyze Data from MongoDB” on page 7-2
- “Import Large Data from MongoDB” on page 7-8
- “Export MATLAB Data into MongoDB” on page 7-11
- “Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

- MongoDB Manual

Import Large Data from MongoDB

This example shows how to import a large set of flight data from a MongoDB collection into the MATLAB workspace using the Database Toolbox interface for MongoDB. To avoid out-of-memory issues with the Java heap when retrieving many documents, use a loop to import large data in batches.

To run this example, you must first install the Database Toolbox interface for MongoDB. For details, see “Database Toolbox Interface for MongoDB Installation” on page 7-19.

Connect to MongoDB

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)

ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Determine Number of Documents to Import

Find the total number of documents `totaldocs` in the `airlinesmall` collection for the years 1997 through 2010. Use a MongoDB query to filter the flight data for the specified years.

```
collection = "airlinesmall";
mongoquery = '{"Year":{$gte:1997,$lte:2010}}';
totaldocs = count(conn,collection,'Query',mongoquery);
```

Retrieve Large Data in Batches

Estimate the batch size to be 15,000 documents. Define the MATLAB workspace variable for storing the retrieved data.

```
batchsize = 15000;
flightdata = [];
```

You can change the batch size depending on the performance and memory capacity of your system.

Use a `while` loop to retrieve flight data from the collection. The variable `flightdata` accumulates each batch of retrieved data.

```
% Track number of documents read
index = 0;

while index < totaldocs

    % Retrieve documents in a batch
    localdata = find(conn,collection,'Query',mongoquery, ...
        'Skip',index,'Limit',batchsize);
```

```
    % Store retrieved documents locally
    flightdata = [flightdata; localdata];

    % Move to the next batch
    index = index + batchsize;

end
```

Display information about the `flightdata` variable. The retrieved data is a structure array that contains 75,603 structures. Each structure contains 30 fields of flight data.

```
whos flightdata
```

```
  Name                Size                Bytes  Class     Attributes

  flightdata      75603x1             285102752  struct
```

Close MongoDB Connection

```
close(conn)
```

See Also

`close` | `count` | `find` | `isopen` | `mongo` | `while`

More About

- “Import and Analyze Data from MongoDB” on page 7-2
- “Import Filtered Data from MongoDB” on page 7-5
- “Export MATLAB Data into MongoDB” on page 7-11
- “Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

- MongoDB Manual

Export MATLAB Data into MongoDB

This example shows how to export table and structure data from the MATLAB workspace into new MongoDB collections using the Database Toolbox interface for MongoDB. The example then shows how to count the number of documents in the collections, remove documents from the collections, and drop the collections.

To run this example, you must first install the Database Toolbox interface for MongoDB. For details, see “Database Toolbox Interface for MongoDB Installation” on page 7-19.

The example uses two data sets: `patients.xls`, which contains patient data, and `tsunamis.xlsx`, which contains tsunami data. You can find files for these data sets in the `toolbox/matlab/demos` folder.

Connect to MongoDB

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.

- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)

ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create Collections and Export Data into MongoDB

Load the data sets using the `readtable` function. Convert tsunami data to a structure using the `table2struct` function. The MATLAB workspace contains the `patientdata` table and the `tsunamidata` structure.

```
patientdata = readtable('patients.xls');
data = readtable('tsunamis.xlsx');
tsunamidata = table2struct(data);
```

Create collections to store the patient and tsunami data using the MongoDB connection.

```
patientcoll = "patients";
tsunamicoll = "tsunamis";

createCollection(conn,patientcoll)
createCollection(conn,tsunamicoll)
```

Export table data into the `patients` collection. `n` contains the number of documents inserted.

```
n = insert(conn,patientcoll,patientdata)

n =

   100
```

Export structure data into the `tsunamis` collection. `n` contains the number of documents inserted.

```
n = insert(conn,tsunamicoll,tsunamidata)

n =

   162
```

Count Documents in Collections

Display the names of all the collections in the `mongotest` database. The new collections `patients` and `tsunamis` appear in the cell array of character vectors.

```
conn.CollectionNames'

ans =

  9×1 cell array

    {'airlinesmall'    }
    {'employee'        }
    {'largedata'       }
    {'nyctaxi'         }
    {'patients'        }
    {'product'         }
    {'restaurants'     }
    {'tsunamis'        }
    {'updateCollection'}
```

Count the number of documents in the two new collections.

```
npatients = count(conn,patientcoll)
ntsunamis = count(conn,tsunamicoll)

npatients =

   100


ntsunamis =

   162
```

Remove Documents and Drop Collections

Remove all documents from both collections. `npatients` and `ntsunamis` contain the number of documents removed from each collection.

```
npatients = remove(conn,patientcoll,'{}')
ntsunamis = remove(conn,tsunamicoll,'{}')

npatients =

   100


ntsunamis =

   162
```

Drop both collections from the `mongotest` database.

```
dropCollection(conn,patientcoll)
dropCollection(conn,tsunamicoll)
```

Close MongoDB Connection

```
close(conn)
```

See Also

`close` | `count` | `createCollection` | `dropCollection` | `insert` | `isopen` | `mongo` | `remove`

More About

- “Import and Export MATLAB Objects Using MongoDB” on page 7-15
- “Import and Analyze Data from MongoDB” on page 7-2
- “Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

- MongoDB Manual

Import and Export MATLAB Objects Using MongoDB

This example shows how to export objects from the MATLAB workspace into MongoDB using the Database Toolbox interface for MongoDB. The export serializes the objects in MongoDB. Then, the example shows how to import objects back into the MATLAB workspace. The import deserializes the objects and recreates them in MATLAB for method execution. After the export and import, the example shows how to drop the collection.

To run this example, you must first install the Database Toolbox interface for MongoDB. For details, see "Database Toolbox Interface for MongoDB Installation" on page 7-19.

In this example, the objects belong to the `TensileData` class. This class is a sample class in MATLAB. The data used to create the objects is sample data. For details, see "Class to Represent Structured Data" (MATLAB). To run the code in this example, define the class in the current folder.

The data represents tensile stress or strain measurements. To calculate the elastic modulus of various materials, use this data. In simple terms, stress is the force applied to a material, and strain is the resulting deformation. The ratio of stress to strain defines a characteristic of the material.

Create Objects

Create the `TensileData` objects `tdcs` for carbon steel materials and `tdss` for stainless steel materials.

```
tdcs = TensileData('carbon steel',1, ...
    [2e4 4e4 6e4 8e4],[.12 .20 .31 .40]);
tdss = TensileData('stainless steel',1, ...
    [2e4 4e4 6e4 8e4],[.06 .10 .16 .20]);
```

Connect to MongoDB

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =
```

```
  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create Collection in MongoDB

Create the `TensileData` collection using the MongoDB connection.

```
collection = "TensileData";
createCollection(conn,collection)
```

Export Objects into MongoDB

Export the `TensileData` objects into the collection. The `insert` function serializes the `TensileData` objects into a JSON-style structure. `ntdcs` and `ntdss` contain the number of objects exported into the collection.

```
ntdcs = insert(conn,collection,tdcs);
ntdss = insert(conn,collection,tdss);
```

Import Objects into MATLAB Workspace

Import the `TensileData` objects into the MATLAB workspace. The `find` function deserializes the `TensileData` objects into the `documents` structure array.

```
documents = find(conn,collection);
```

Recreate the objects in the MATLAB workspace.

```
tdcs = TensileData(documents(1).Material,documents(1).SampleNumber, ...
    documents(1).Stress,documents(1).Strain);
tdss = TensileData(documents(2).Material,documents(2).SampleNumber, ...
    documents(2).Stress,documents(2).Strain);
```

You can execute methods of the objects after they appear in the MATLAB workspace.

Remove Documents and Drop Collection

Remove all documents from the collection. `n` contains the number of documents removed from the collection.

```
n = remove(conn,collection,'{}')

n =

     2
```

Drop the collection.

```
dropCollection(conn,collection)
```

Close MongoDB Connection

```
close(conn)
```

See Also

`close` | `createCollection` | `dropCollection` | `find` | `insert` | `isopen` | `mongo` | `remove`

More About

- “Export MATLAB Data into MongoDB” on page 7-11
- “Import and Analyze Data from MongoDB” on page 7-2
- “Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

- MongoDB Manual

Database Toolbox Interface for MongoDB Installation

To use the Database Toolbox interface for MongoDB, you must first install it. Ensure that the interface supports your MongoDB version.

Installation

To install the Database Toolbox interface for MongoDB, follow these steps:

1. In the **Environment** section of the MATLAB toolstrip, select **Add-Ons** > **Get Add-Ons**.
2. In the Add-On Explorer, search for the Database Toolbox interface for MongoDB.
3. Install the Database Toolbox interface for MongoDB.

The installer downloads and installs the MongoDB Java driver. Then, the installer adds the driver to the static Java class path as part of the installation.

For details about installing add-ons, see "Get Add-Ons" (MATLAB). For other information, see "Add-Ons" (MATLAB).

Supported MongoDB Versions

The Database Toolbox interface for MongoDB supports these versions of MongoDB:

- MongoDB 2.4
- MongoDB 2.6
- MongoDB 3.0
- MongoDB 3.2
- MongoDB 3.4

See Also

`close` | `find` | `isopen` | `mongo`

More About

- "Import and Analyze Data from MongoDB" on page 7-2

- "Import Filtered Data from MongoDB" on page 7-5
- "Import Large Data from MongoDB" on page 7-8
- "Database Toolbox Interface for MongoDB Error Messages" on page 7-21

External Websites

- MongoDB Manual

Database Toolbox Interface for MongoDB Error Messages

This table describes how to address common errors you can encounter while working with the Database Toolbox interface for MongoDB.

Error Category	Error Message	Probable Causes	Resolution
Installation and configuration	Unable to verify MongoDB Java driver installation.	The installation did not install the MongoDB Java driver successfully.	Reinstall the Database Toolbox interface for MongoDB. For details, see "Database Toolbox Interface for MongoDB Installation" on page 7-19.
	Unable to configure MATLAB Java class path.	The installation did not create or modify the Java class path in the MATLAB preferences folder.	Reinstall the Database Toolbox interface for MongoDB using administrator privileges. For details, see "Database Toolbox Interface for MongoDB Installation" on page 7-19.
	Unable to find MongoDB Java driver file on MATLAB Java class path. Install the Database Toolbox interface for MongoDB again.	After installation, the MATLAB preferences folder is missing the `javaclasspath.txt` file.	Reinstall the Database Toolbox interface for MongoDB. For details, see "Database Toolbox Interface for MongoDB Installation" on page 7-19.

Error Category	Error Message	Probable Causes	Resolution
MongoDB connection	Invalid Mongo connection.	The MongoDB connection is closed.	Use the `mongo` function to connect to MongoDB.
Input validation	Valid input types for server are string scalars and string array.	In the `mongo` function, the specified data type for the input argument `server` is not a string scalar or string array.	Specify the input argument `server` as a string scalar or string array.
	Each server must have a port.	In the `mongo` function, the number of servers specified in the `mongo` function does not match the number of ports specified.	Ensure that you specify a port number for each specified server in the `mongo` function. For example, if the `server` input argument is set to `{"dbtb01","dbtb02"}`, then the `port` input argument must have two port numbers, such as `[27017,27018]`.
	Valid input type is cell array of structures.	In the `insert` function, the `documents` input argument is specified as a cell array. The cell array contains data types that are not structures.	In the `documents` input argument of the `insert` function, specify only structures in the cell array.
MongoDB Java driver	[Mongo Driver Error]: *`Error message`*.	The MongoDB Java driver throws an error.	Use the MongoDB Manual to search for the MongoDB error message.

Error Category	Error Message	Probable Causes	Resolution
MongoDB CRUD operations	Unable to access MongoDB collection *`collectionname`*.	The database does not contain the specified collection.	Access the `CollectionNames` property of the `mongo` object to retrieve a list of all collections in the database. Then, specify an existing collection name.
	MongoDB collection *`collectionname`* already exists in the database.	The database already contains a collection with the specified name.	Access the `CollectionNames` property of the `mongo` object to retrieve a list of all collections in the database. Then, specify a unique name to create a collection.

See Also

`createCollection` | `dropCollection` | `insert` | `mongo` | `remove` | `update`

More About

- "Database Toolbox Interface for MongoDB Installation" on page 7-19
- "Import and Analyze Data from MongoDB" on page 7-2
- "Export MATLAB Data into MongoDB" on page 7-11

External Websites

- MongoDB Manual

Functions — Alphabetical List

attr

Retrieve attributes of columns in fetched data set

Syntax

```
attributes = attr(curs)
attributes = attr(curs,colnum)
```

Description

`attributes = attr(curs)` retrieves attribute information for all columns in the fetched data set `curs`.

`attributes = attr(curs,colnum)` retrieves attribute information for the column number `colnum` in the fetched data set `curs`.

Examples

Retrieve Attribute Data for a Fetched Data Set

Create a database connection `conn` to an Oracle database using an ODBC connection. This code assumes that you are connecting a data source named `dbname` with user name `username` and password `pwd`. The data source identifies an Oracle database that contains the table `inventoryTable` with these columns: `productNumber`, `Quantity`, `Price`, and `inventoryDate`.

```
conn = database(dbname,username,pwd);
```

Import all the data from the table `inventoryTable`. The `cursor` object `curs` contains the executed query. Import the data from the executed query using the `fetch` function.

```
sqlquery = 'SELECT * FROM inventoryTable';
```

```
curs = exec(conn,sqlquery);
curs = fetch(curs);
```

Retrieve attribute information for all the fetched data using `curs`.

```
attributes = attr(curs)
```

```
attributes =

1x4 struct array with fields:

    fieldName
    typeName
    typeValue
    columnWidth
    precision
    scale
    currency
    readOnly
    nullable
    Message
```

`attributes` contains a structure array for three columns in the table `inventoryTable`.

Display the attribute data for the first column in the table `inventoryTable`.

```
attributes(1)
```

```
ans =

      fieldName: 'PRODUCTNUMBER'
       typeName: 'NUMBER'
      typeValue: 2.00
    columnWidth: 39.00
      precision: 38.00
          scale: 0
       currency: 'true'
       readOnly: 'false'
       nullable: 'true'
        Message: []
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Retrieve Attribute Data for a Specific Column

Create a database connection `conn` to an Oracle database using an ODBC connection. This code assumes that you are connecting a data source named `dbname` with user name `username` and password `pwd`. The data source identifies an Oracle database that contains the table `inventoryTable` with these columns: `productNumber`, `Quantity`, `Price`, and `inventoryDate`.

```
conn = database(dbname,username,pwd);
```

Fetch all the data from the table `inventoryTable`. The `cursor` object `curs` contains the executed query. Import the data from the executed query using the `fetch` function.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
```

Retrieve attribute information for the third column in the table `inventoryTable` using `curs`.

```
attributes = attr(curs,3)
```

```
attributes =

      fieldName: 'PRICE'
       typeName: 'NUMBER'
      typeValue: 2.00
    columnWidth: 39.00
      precision: 126.00
          scale: -127.00
       currency: 'true'
       readOnly: 'false'
       nullable: 'true'
        Message: []
```

`attributes` contains a structure with the attribute data for the third column `PRICE` in the table `inventoryTable`.

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

- “Display Information About Imported Data” on page 5-49

Input Arguments

`curs` — Database cursor

`cursor` object

Database cursor, specified as a `cursor` object created using the `exec` function.

`colnum` — Column number

numeric scalar

Column number, specified as a numeric scalar to denote the column in the fetched data set `curs` for retrieving attribute information.

Data Types: `double`

Output Arguments

`attributes` — Attribute data

structure array

Attribute data, returned as a structure array containing attribute information for each column in the fetch data set `curs`. The following attributes are available.

Attribute	Description
`fieldName`	Name of the column.
`typeName`	Data type.
`typeValue`	Numerical representation of the data type.
`columnWidth`	Size of the field.
`precision`	Precision value for floating and double data types; an empty value is returned for character vectors or string scalars.

Attribute	Description
`scale`	Precision value for real and numeric data types; an empty value is returned for character vectors or string scalars.
`currency`	If this equals `true`, the data format is currency.
`readOnly`	If this equals `true`, the data cannot be overwritten.
`nullable`	If this equals `true`, the data can be `NULL`.
`Message`	Error message returned by `fetch`.

See Also

`close` | `cols` | `columnnames` | `columns` | `database` | `dmd` | `fetch` | `get` | `tables` | `width`

Topics

“Display Information About Imported Data” on page 5-49

Introduced before R2006a

catalogs

(To be removed) Get database catalog names

Note `catalogs` will be removed in a future release. Use the `DefaultCatalog` and `Catalogs` properties of the `connection` object instead.

Syntax

```
cn = catalogs(conn)
```

Description

`cn = catalogs(conn)` returns the catalogs for the database connection `conn`.

Examples

Retrieve Catalog Names in the Database

Create a database connection `conn` to the MySQL database using the JDBC driver. Use the `Vendor` name-value pair argument of `database` to specify a connection to a MySQL database. Here, this code assumes that you are connecting to a database named `dbname` on a database server named `sname` with user name `username` and password `pwd`.

```
conn = database('dbname','username','pwd',...
                'Vendor','MySQL',...
                'Server','sname');
```

Alternatively, use the native ODBC interface for an ODBC connection. For details, see `database`.

Retrieve the catalog names using `conn`.

```
cn = catalogs(conn)
```

```
cn =

    'toy_store'
    'mysql'
    'db'
    ...
```

`cat` returns a cell array of catalog names in the MySQL database.

Close the connection.

```
close(conn)
```

- “Display Database Metadata” on page 5-37

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

Output Arguments

`cn` — Catalog names

cell array

Catalog names, returned as a cell array containing the names of the catalogs in the database. The contents of `cn` that you see depend upon your permission settings in the database.

See Also

`close` | `columns` | `database` | `schemas` | `tables`

Topics

“Display Database Metadata” on page 5-37

Introduced in R2010a

close

Close and invalidate database and driver resource utilizer

Syntax

```
close(object)
```

Description

`close(object)` closes and invalidates the database and driver resource utilizer `object` to free up database and driver resources.

Examples

Close `connection` Object

First, connect to the Microsoft® SQL Server® database. Verify the database connection. Then, import data from the database into MATLAB®. Determine the highest unit cost among the retrieved products in the table. Close the database connection.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message


ans =
```

```
     []
```

Select all data from `productTable` and sort it by the product number. `data` is a table that contains the imported data from executing the SQL `SELECT` statement.

```
selectquery = 'SELECT * FROM productTable ORDER BY productNumber';
data = select(conn,selectquery);
```

Display first three rows of data.

```
data(1:3,:)
```

```
ans =

  3×5 table array

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1                4.0035e+05     1001              14          'Building Blocks'
    2                4.0031e+05     1002               9          'Painting Set'
    3                  4.01e+05     1009              17          'Slinky'
```

Determine the highest unit cost in the table.

```
max(data.unitCost)
```

```
ans =

    24
```

Close the database connection.

```
close(conn)
```

Close SQLite Connection Object

Create a SQLite connection using the MATLAB® interface to SQLite and the existing database file `tutorial.db`, which resides in the current working folder.

```
dbfile = fullfile(pwd,'tutorial.db');

conn = sqlite(dbfile);
```

Close the SQLite connection.

```
close(conn)
```

Close `DatabaseDatastore` Object

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using the database connection and SQL query. This SQL query retrieves all data from the table.

```
sqlquery = 'select * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery);
```

Close the `DatabaseDatastore` object.

```
close(dbds)
```

Close `cursor` Object

First, connect to the Microsoft® SQL Server® database. Verify the database connection. Then, import data from the database into MATLAB®. Determine the highest unit cost among the retrieved products in the table. Close the database cursor and database connection.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select all data from `productTable` and sort it by the product number. `curs` is the `cursor` object that contains the executed SQL query.

```
sqlquery = 'SELECT * FROM productTable ORDER BY productNumber';
curs = exec(conn,sqlquery);
```

Import data from the executed SQL query and display the first three rows.

```
curs = fetch(curs);
curs.Data(1:3,:)
```

```
ans =

  3×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1                4.0035e+05     1001              14          'Building Blocks'
    2                4.0031e+05     1002               9          'Painting Set'
    3                  4.01e+05     1009              17          'Slinky'
```

Determine the highest unit cost in the table.

```
data = curs.Data;
max(data.unitCost)
```

```
ans =

    24
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

After you close the `cursor` object, MATLAB® deletes the object. Use the `clear` function to remove the `curs` variable from the MATLAB® workspace.

```
curs
clear curs
```

```
curs =

  handle to deleted cursor
```

Close the database connection.

```
close(conn)
```

- “Import Data from Databases into MATLAB” on page 5-2
- “Import Large Data Using DatabaseDatastore Object” on page 5-63
- “Export Data to New Record in Database” on page 5-20
- “Display Information About Imported Data” on page 5-49
- “Import Data Using MATLAB® Interface to SQLite” on page 5-67

Input Arguments

`object` — Database and driver resource utilizer

`connection` object | `sqlite` object | `DatabaseDatastore` object | `cursor` object

Database and driver resource utilizer, specified as one of these objects.

Object Argument Name	Object Name	Object Description	Object Creation Function
`conn`	`connection`	Create a connection between installed database and MATLAB. For details, see “Connecting to Database” on page 2-140.	`database`
`conn`	`sqlite`	Create connection to SQLite database file using the MATLAB interface to SQLite. For details, see “Working with MATLAB Interface to SQLite” on page 2-6.	`sqlite`
`dbds`	`DatabaseDatastore`	Create connection to a type of datastore for working with large data.	`databaseDatastore`
`curs`	`cursor`	Store imported data.	`exec`

Note `resultset` has been removed.

- `connection` objects, `sqlite` objects, `DatabaseDatastore` objects, and `cursor` objects remain open until you close them using the `close` function. Always close these objects when you finish using them.
- Close a `cursor` object before closing the connection used for that `cursor` object.
- Executing `close` with a `DatabaseDatastore` object releases the MATLAB resources associated with `connection` and `cursor` objects.

Note The MATLAB session closes open `cursor` objects, `DatabaseDatastore` objects, and connections when exiting. However, the database might not free up the cursors and connections.

See Also

`database` | `databaseDatastore` | `exec` | `fetch` | `sqlite`

Topics

"Import Data from Databases into MATLAB" on page 5-2
"Import Large Data Using DatabaseDatastore Object" on page 5-63
"Export Data to New Record in Database" on page 5-20
"Display Information About Imported Data" on page 5-49
"Import Data Using MATLAB® Interface to SQLite" on page 5-67
"Configuring Driver and Data Source" on page 2-15
"Connecting to Database" on page 2-140
`DatabaseDatastore`
"Working with MATLAB Interface to SQLite" on page 2-6

Introduced before R2006a

cols

Retrieve number of columns in fetched data set

Syntax

```
numcols = cols(curs)
```

Description

`numcols = cols(curs)` returns the number of columns in the fetched data set `curs`.

Examples

Display the Number of Columns in the Data

Create a database connection `conn` using the `dbdemo` data source.

```
conn = database('dbdemo','','');
```

Working with the `dbdemo` data source, use `fetch` to import all data into `Database Cursor Object` `curs`. Store the data in a cell array contained in the `cursor` object field `curs.Data`.

```
curs = exec(conn,'SELECT * FROM productTable');
curs = fetch(curs);
```

View the contents of the `Data` property in the `cursor` object.

```
curs.Data
```

```
ans =

    [ 9]    [125970]    [1003]    [13]    'Victorian Doll'
    [ 8]    [212569]    [1001]    [ 5]    'Train Set'
    [ 7]    [389123]    [1007]    [16]    'Engine Kit'
```

```
    [ 2]    [400314]    [1002]    [ 9]    'Painting Set'
    [ 4]    [400339]    [1008]    [21]    'Space Cruiser'
    [ 1]    [400345]    [1001]    [14]    'Building Blocks'
    [ 5]    [400455]    [1005]    [ 3]    'Tin Soldier'
    [ 6]    [400876]    [1004]    [ 8]    'Sail Boat'
    [ 3]    [400999]    [1009]    [17]    'Slinky'
    [10]    [888652]    [1006]    [24]    'Teddy Bear'
```

`Data` contains the `productTable` data.

Display the number of columns in the `Data` property in the `cursor` object.

```
numcols = cols(curs)
```

```
numcols =

     5
```

The data in the `cursor` object contains five columns.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

- “Display Information About Imported Data” on page 5-49

Input Arguments

`curs` — Database cursor

`cursor` object

Database cursor, specified as a `cursor` object created using the `exec` function.

Output Arguments

`numcols` — Number of columns

numeric scalar

Number of columns in a data set, returned as a numeric scalar.

See Also

`attr` | `close` | `columnnames` | `columnprivileges` | `columns` | `database` | `fetch` | `get` | `rows` | `width`

Topics

"Display Information About Imported Data" on page 5-49
"Connecting to Database Using Native ODBC Interface" on page 3-17

Introduced before R2006a

columnnames

Retrieve names of columns in fetched data set

Syntax

```
columnlist = columnnames(curs)
columnlist = columnnames(curs,returnCellArray)
```

Description

`columnlist = columnnames(curs)` returns the column names of the data selected from a database table in the `cursor` object `curs`. The `columnnames` function is not supported for a `cursor` object returned by the `fetchmulti` function.

`columnlist = columnnames(curs,returnCellArray)` returns the column names as a cell array of character vectors when `returnCellArray` is set to `true`.

Examples

Return Column Names from the Selected Data

Create a database connection `conn` using the `dbdemo` data source.

```
conn = database('dbdemo','','');
```

Working with the `dbdemo` data source, use `fetch` to import all data into `Database Cursor Object` `curs`.

```
curs = exec(conn,'SELECT * FROM suppliers');
curs = fetch(curs);
```

Return the column names in the `suppliers` table.

```
columnlist = columnnames(curs)
```

```
columnlist =

'SupplierNumber','SupplierName','City','Country','FaxNumber'
```

`columnlist` contains one long character vector with the column names in the `suppliers` table in quotes and separated by commas.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Return Column Names as a Cell Array

Create a database connection `conn` using the `dbdemo` data source.

```
conn = database('dbdemo','','');
```

Working with the `dbdemo` data source, use `fetch` to import all data into `Database Cursor Object` `curs`. Store the data in a cell array contained in the `cursor` object field `curs.Data`.

```
curs = exec(conn,'SELECT * FROM productTable');
curs = fetch(curs);
```

Return the column names in the `suppliers` table as a cell array.

```
columnlist = columnnames(curs,true)

columnlist =

    'SupplierNumber'
    'SupplierName'
    'City'
    'Country'
    'FaxNumber'
```

`columnlist` contains a cell array of the column names in the `suppliers` table. The cell array has five rows for each column name.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

• "Display Information About Imported Data" on page 5-49

Input Arguments

`curs` — Database cursor

`cursor` object

Database cursor, specified as a `cursor` object created using the `exec` function.

`returnCellArray` — Return format

`true` | `false`

Return format, specified as Boolean values `true` or `false`. When set to `true`, `columnnames` returns the column names as a cell array of character vectors. When set to `false`, `columnnames` returns the column names as a long character vector.

Data Types: `logical`

Output Arguments

`columnlist` — Column name list

character vector | cell array

Column name list of columns in the selected data, returned as a character vector or a cell array of character vectors. Without the argument `returnCellArray`, `columnnames` returns the list of column names as a long character vector. The character vector encloses the column names in quotes and separates the column names by commas. If you use the argument `returnCellArray` and set it to `true`, then `columnnames` returns the column names as a cell array.

See Also

`attr` | `close` | `cols` | `columnprivileges` | `columns` | `database` | `fetch` | `get` | `width`

Topics

"Display Information About Imported Data" on page 5-49

Introduced before R2006a

columnprivileges

List database column privileges

Syntax

```
lp = columnprivileges(dbmeta,'cata','sch','tab')
lp = columnprivileges(dbmeta,'cata','sch','tab','l')
```

Description

`lp = columnprivileges(dbmeta,'cata','sch','tab')` returns a list of privileges for all columns in the table `tab`, in the schema `sch`, in the catalog `cata` for the database whose database metadata object is `dbmeta`.

`lp = columnprivileges(dbmeta,'cata','sch','tab','l')` returns a list of privileges for column `l` in the table `tab`, in the schema `sch`, in the catalog `cata` for the database whose database metadata object is `dbmeta`.

Examples

Return a list of privileges for the given database, catalog, schema, table, and column name:

```
lp = columnprivileges(dbmeta,'msdb','geck','builds',...
'build_id')
lp =
     'builds'    'build_id'    {1x4 cell}
```

View the contents of the third column in `lp`:

```
lp{1,3}
ans =
     'INSERT'    'REFERENCES'    'SELECT'    'UPDATE'
```

See Also

`cols` | `columnnames` | `columns` | `dmd` | `get`

Topics

"Display Database Metadata" on page 5-37

Introduced before R2006a

columns

Return database table column names

Syntax

```
columnlist = columns(conn,catalog)
columnlist = columns(conn,catalog,schema)
columnlist = columns(conn,catalog,schema,tablename)

columnlist = columns(dbmeta,catalog)
columnlist = columns(dbmeta,catalog,schema)
columnlist = columns(dbmeta,catalog,schema,tablename)
```

Description

`columnlist = columns(conn,catalog)` returns a list of all column names in the catalog `catalog` for the database with the database connection `conn`.

`columnlist = columns(conn,catalog,schema)` returns a list of all column names in the schema `schema`.

`columnlist = columns(conn,catalog,schema,tablename)` returns a list of all column names for the table `tablename`.

`columnlist = columns(dbmeta,catalog)` returns a list of all column names in the catalog `catalog` for the database whose database metadata object is `dbmeta`.

`columnlist = columns(dbmeta,catalog,schema)` returns a list of all column names in the schema `schema`.

`columnlist = columns(dbmeta,catalog,schema,tablename)` returns a list of all column names for the table `tablename`.

Examples

Retrieve Column List for Catalog Using Database Connection

Create a database connection `conn` using the native ODBC interface to the Microsoft SQL Server database. This code assumes that you are connecting to a data source named `MS SQL Server` with user name `username` and password `pwd`.

```
conn = database('MS SQL Server','username','pwd');
```

Retrieve the column names for each table in a catalog. Here, this code assumes that the database contains the catalog name `toy_store`.

```
catalog = 'toy_store';

columnlist = columns(conn,catalog)

columnlist =

    'salesVolume'                                   {1x13  cell}
    'suppliers'                                     {1x5   cell}
    'yearlySales'                                   {1x3   cell}
    ...
```

`columns` returns a cell array. The first column contains the table names as character vectors. The second column contains the corresponding column name lists as cell arrays.

Display the column names for the `suppliers` table.

```
columnlist{2,2}

ans =

    'SupplierNumber'    'SupplierName'    'City'    'Country'    'FaxNumber'
```

Close the database connection.

```
close(conn)
```

Retrieve Column List for Catalog and Schema Using Database Connection

Create a database connection `conn` using the native ODBC interface to the Microsoft SQL Server database. This code assumes that you are connecting to a data source named `MS SQL Server` with user name `username` and password `pwd`.

```
conn = database('MS SQL Server','username','pwd');
```

Retrieve the column names for each table in a schema. Here, this code assumes that the database contains the catalog name `toy_store` and the schema name `sch`.

```
catalog = 'toy_store';
schema = 'sch';

columnlist = columns(conn,catalog,schema)
```

```
columnlist =

    'inserttest'                {1x3  cell}
    'inventoryTable'            {1x4  cell}
    'largedata'                 {1x9  cell}
    ...
```

`columns` returns a cell array. The first column contains the table names as character vectors. The second column contains the corresponding column name lists as cell arrays.

Display the column names for the `inventoryTable` table.

```
columnlist{2,2}
```

```
ans =

    'productNumber'    'Quantity'    'Price'    'inventoryDate'
```

Close the database connection.

```
close(conn)
```

Retrieve Column List for Catalog, Schema, and Table Name Using Database Connection

Create a database connection `conn` using the native ODBC interface to the Microsoft SQL Server database. This code assumes that you are connecting to a data source named `MS SQL Server` with user name `username` and password `pwd`.

```
conn = database('MS SQL Server','username','pwd');
```

Retrieve the column names in a database table. Here, this code assumes that the database contains the catalog name `toy_store`, the schema name `sch`, and the table name `inventoryTable`.

```
catalog = 'toy_store';
schema = 'sch';
tablename = 'inventoryTable';

columnlist = columns(conn,catalog,schema,tablename)

columnlist =

    'productNumber'    'Quantity'    'Price'    'inventoryDate'
```

`columns` returns a cell array with the column names as character vectors.

Close the database connection.

```
close(conn)
```

Retrieve Column List for Catalog Using Database Metadata Object

Create a database connection `conn`. This code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server', ...
    'Server','sname', ...
    'PortNumber',123456);
```

Create the database metadata object `dbmeta`.

```
dbmeta = dmd(conn);
```

Retrieve the column names for each table in a catalog. Here, this code assumes that the database contains the catalog name `toy_store`.

```
catalog = 'toy_store';

columnlist = columns(dbmeta,catalog)
```

```
columnlist =

    'salesVolume'                                   {1x13  cell}
    'suppliers'                                     {1x5   cell}
    'yearlySales'                                   {1x3   cell}
    ...
```

`columns` returns a cell array. The first column contains the table names as character vectors. The second column contains the corresponding column name lists as cell arrays.

Display the column names for the `suppliers` table.

```
columnlist{2,2}
```

```
ans =

    'SupplierNumber'    'SupplierName'    'City'    'Country'    'FaxNumber'
```

Close the database connection.

```
close(conn)
```

Retrieve Column List for Catalog and Schema Using Database Metadata Object

Create a database connection `conn`. This code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server', ...
    'Server','sname', ...
    'PortNumber',123456);
```

Create the database metadata object `dbmeta`.

```
dbmeta = dmd(conn);
```

Retrieve the column names for each table in a schema. Here, this code assumes that the database contains the catalog name `toy_store` and the schema name `sch`.

```
catalog = 'toy_store';
schema = 'sch';

columnlist = columns(dbmeta,catalog,schema)
```

```
columnlist =

    'inventoryTable'              {1x4  cell}
    'invoice'                     {1x5  cell}
    'productTable'                {1x5  cell}
    ...
```

`columns` returns a cell array. The first column contains the table names as character vectors. The second column contains the corresponding column name lists as cell arrays.

Display the column names for the `inventoryTable` table.

```
columnlist{1,2}

ans =

    'productNumber'    'Quantity'    'Price'    'inventoryDate'
```

Close the database connection.

```
close(conn)
```

Retrieve Column List for Catalog, Schema, and Table Name Using Database Metadata Object

Create a database connection `conn`. This code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server', ...
    'Server','sname', ...
    'PortNumber',123456);
```

Create the database metadata object `dbmeta`.

```
dbmeta = dmd(conn);
```

Retrieve the column names in a database table. Here, this code assumes that the database contains the catalog name `toy_store`, the schema name `sch`, and the table name `inventoryTable`.

```
catalog = 'toy_store';
schema = 'sch';
tablename = 'inventoryTable';

columnlist = columns(dbmeta,catalog,schema,tablename)

columnlist =

    'productNumber'    'Quantity'    'Price'    'inventoryDate'
```

`columns` returns a cell array with the column names as character vectors.

Close the database connection.

```
close(conn)
```

- “Display Database Metadata” on page 5-37

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`dbmeta` — Database metadata

database metadata object

Database metadata, specified as a database metadata object created using `dmd`. To use this object, create a database connection using the `database` function first.

`catalog` — Database catalog name

character vector | string scalar

Database catalog name, specified as a character vector or string scalar.

Data Types: `char` | `string`

`schema` — Database schema name

character vector | string scalar

Database schema name, specified as a character vector or string scalar.

Data Types: `char` | `string`

`tablename` — Database table name
character vector | string scalar

Database table name, specified as a character vector or string scalar denoting the name of a table in your database.

Data Types: `char` | `string`

Output Arguments

`columnlist` — List of columns
cell array

List of columns, returned as a cell array.

See Also

`attr` | `close` | `cols` | `columnnames` | `columnprivileges` | `database` | `dmd` | `get`

Topics

"Display Database Metadata" on page 5-37
"Connecting to Database Using Native ODBC Interface" on page 3-17

Introduced in R2010a

commit

Make database changes permanent

Syntax

```
commit(conn)
```

Description

`commit(conn)` makes permanent changes made to the database connection `conn` since the last `commit` or `rollback` function was run. To run this function, the `AutoCommit` flag for `conn` must be `off`.

Examples

Example 1 — Check the Status of the Autocommit Flag

Check that the status of the `AutoCommit` flag for connection `conn` is `off`.

```
get(conn,'AutoCommit')
ans =
    off
```

Example 2 — Commit Data to a Database

1 Insert `exdata` into the columns `DEPTNO`, `DNAME`, and `LOC` in the table `DEPT`, for the data source `conn`.

```
datainsert(conn,'DEPT',...
{'DEPTNO';'DNAME';'LOC'},exdata)
```

2 Commit this data.

```
commit(conn)
```

Tips

For ODBC connections, you can use the `commit` function with the native ODBC interface. For details, see `database`.

See Also

`database` | `datainsert` | `exec` | `get` | `rollback` | `update`

Topics

"Import Data from Databases into MATLAB" on page 5-2
"Export Data to New Record in Database" on page 5-20
"Roll Back Data After Updating Record" on page 5-17

Introduced before R2006a

configureODBCDataSource

Open ODBC Data Source Administrator dialog box

Syntax

```
configureODBCDataSource
```

Description

`configureODBCDataSource` opens the ODBC Data Source Administrator dialog box on Windows systems.

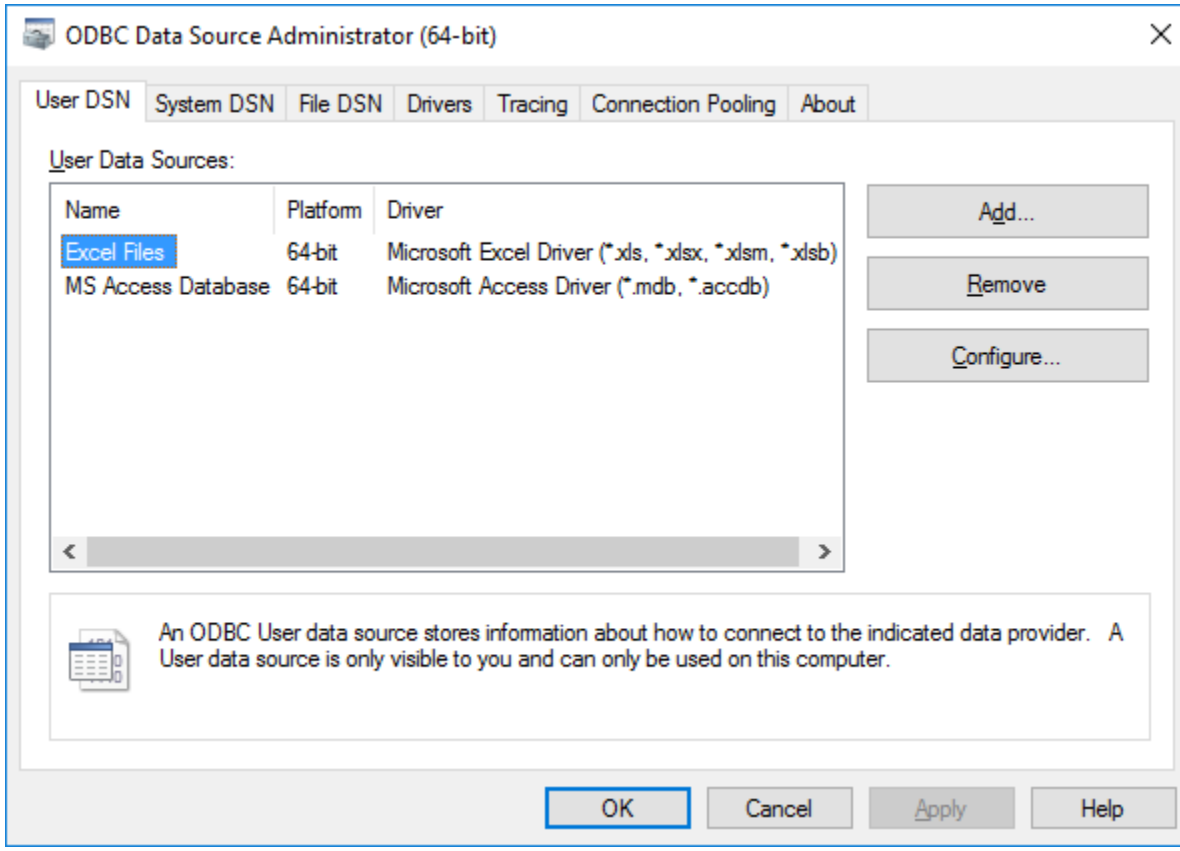
Examples

Open ODBC Data Source Administrator Dialog Box

Use the `configureODBCDataSource` function to open the ODBC Data Source Administrator dialog box on Windows systems.

```
configureODBCDataSource
```

The ODBC Data Source Administrator dialog box opens.



Tips

- Database Toolbox no longer supports connecting to a database using a 32-bit driver. For Microsoft Access, use the 64-bit version. Or, to connect to the 32-bit version of Microsoft Access, see http://www.mathworks.com/matlabcentral/answers/235949-how-to-connect-to-32-bit-microsoft-access-database-from-64-bit-matlab. For details about working with the 64-bit version of Windows, see http://www.mathworks.com/products/matlab/preparing-for-64-bit-windows.html.

Alternative Functionality

App

You can open the ODBC Data Source Administrator dialog box using the **Database Explorer** app. Select **Configure Data Source > Configure ODBC data source**. For configuring ODBC data sources, see “Configuring Driver and Data Source” on page 2-15.

See Also

Apps
Database Explorer

Functions
`database`

Topics
“Configuring Driver and Data Source” on page 2-15

Introduced in R2017b

connection

Relational database connection

Description

Create a database connection using either ODBC or JDBC drivers. For information on which connection option is best in your situation, see “Choosing Between ODBC and JDBC Drivers” on page 2-13. Connecting to a database using an ODBC driver uses the native ODBC interface. For details, see “Connecting to Database Using Native ODBC Interface” on page 3-17.

You can use this object to connect to various databases using different drivers that you install and administer. For details, see “Connecting to Database” on page 2-140.

Creation

Create a `connection` object using the `database` function.

Properties

ODBC and JDBC Connection Properties

`DataSource` — Data source name

`''` (default) | character vector

This property is read-only.

Data source name for ODBC connection or database name for JDBC connection, specified as a character vector. For an ODBC driver, `DataSource` is the name you provide for your data source when you create a data source using the Microsoft ODBC Administrator. For a JDBC driver, `DataSource` is the name of your database. The name differs for different database systems. For example, `DataSource` is the SID or the service name when you are connecting to an Oracle database. Or, `DataSource` is the catalog name when you are connecting to a MySQL database. For details about your database name, contact your database administrator or refer to your database documentation.

The data source name is an empty character vector when the connection is invalid.

Example: `'MS SQL Server'`

Data Types: `char`

`UserName` — User name

`''` (default) | character vector

This property is read-only.

User name required to access the database, specified as a character vector. If no user name is required, specify an empty value `''`.

Example: `'username'`

Data Types: `char`

`Message` — Database connection status message

`''` (default) | character vector

This property is read-only.

Database connection status message, specified as a character vector. The status message is empty when the database connection is successful. Otherwise, this property contains an error message.

Example: `'ODBC Driver Error: [Micro ...'`

Data Types: `char`

`Type` — Database connection type

`'JDBC Connection Object'` | `'ODBC Connection Object'`

This property is read-only.

Database connection type, specified as one of these values:

- `'JDBC Connection Object'` — Database connection is created using a JDBC driver.
- `'ODBC Connection Object'` — Database connection is created using an ODBC driver.

Data Types: `char`

JDBC Connection Properties

`Driver` — JDBC driver

`''` (default) | character vector

This property is read-only.

JDBC driver, specified as a character vector when connecting to a database using a JDBC driver URL. This property depends on the `URL` property.

Example: `'com.mysql.jdbc.jdbc2.opti ...'`

Data Types: `char`

`URL` — Database connection URL

`''` (default) | character vector

This property is read-only.

Database connection URL, specified as a character vector for a vendor-specific string. This property depends on the `Driver` property.

Example: `'jdbc:mysql://sname:1234/ ...'`

Data Types: `char`

Database Properties

`AutoCommit` — Auto-commit transactions

`'on'` (default) | `'off'`

Auto-commit transactions, specified as one of these values:

- `'on'` — Database transactions are automatically committed to the database.
- `'off'` — Database transactions must be committed to the database manually.

Data Types: `char`

`ReadOnly` — Read-only database data

`'off'` (default) | `'on'`

Read-only database data, specified as one of these values:

- `'on'` — Database data is read-only.
- `'off'` — Database data is writable.

Data Types: `char`

`LoginTimeout` — Login timeout
`0` (default) | positive numeric scalar

This property is read-only.

Login timeout, specified as a positive numeric scalar. The login timeout specifies the number of seconds that the driver waits while trying to connect to a database before throwing an error.

When no login timeout for the connection attempt is specified, the value is `0`.

When login timeout is not supported by the database, the value is `-1`.

Data Types: `double`

`MaxDatabaseConnections` — Maximum database connections
`-1` (default) | positive numeric scalar

This property is read-only.

Maximum database connections, specified as a positive, numeric scalar.

The value is `0` when there is no upper limit to the maximum number of database connections.

When the maximum number of database connections is not supported by the database, the value is `-1`.

Data Types: `double`

Catalog and Schema Information

`DefaultCatalog` — Default catalog name
`''` (default) | character vector

This property is read-only.

Default catalog name, specified as a character vector.

When a database does not specify a default catalog, the value is an empty character vector `''`.

Example: `'catalog'`

Data Types: `char`

`Catalogs` — Catalog names

`{}` (default) | cell array of character vectors

This property is read-only.

Catalog names, specified as a cell array of character vectors.

When a database does not contain catalogs, the value is an empty cell array `{}`.

Example: `{'catalog1', 'catalog2'}`

Data Types: `cell`

`Schemas` — Schema names

`{}` (default) | cell array of character vectors

This property is read-only.

Schema names, specified as a cell array of character vectors.

When a database does not contain schemas, the value is an empty cell array `{}`.

Example: `{'schema1', 'schema2', 'schema3'}`

Data Types: `cell`

Database and Driver Information

`DatabaseProductName` — Database product name

`''` (default) | character vector

This property is read-only.

Database product name, specified as a character vector.

When the database connection is invalid, the value is an empty character vector `''`.

Example: `'Microsoft SQL Server'`

Data Types: `char`

`DatabaseProductVersion` — Database product version
`''` (default) | character vector

This property is read-only.

Database product version, specified as a character vector.

When the database connection is invalid, the value is an empty character vector `''`.

Example: `'11.00.2100'`

Data Types: `char`

`DriverName` — Driver name
`''` (default) | character vector

This property is read-only.

Driver name of an ODBC or JDBC driver, specified as a character vector.

When the database connection is invalid, the value is an empty character vector `''`.

Example: `'sqlncli11.dll'`

Data Types: `char`

`DriverVersion` — Driver version
`''` (default) | character vector

This property is read-only.

Driver version of an ODBC or JDBC driver, specified as a character vector.

When the database connection is invalid, the value is an empty character vector `''`.

Example: `'11.00.5058'`

Data Types: `char`

Object Functions

ODBC and JDBC Connection Functions

close	Close and invalidate database and driver resource utilizer
datainsert	Export MATLAB data into database table
fetch	Import data into MATLAB workspace from database cursor or from execution of SQL statement
rollback	Undo database changes
update	Replace data in database table with MATLAB data
columns	Return database table column names
exec	Execute SQL statement and open cursor
insert	Add MATLAB data to database tables
runsqlscript	Run SQL script on database
commit	Make database changes permanent
fastinsert	Add MATLAB data to database tables
isopen	Determine if database connection or database cursor is open
tables	Return database table names
select	Execute SQL SELECT statement and import data into MATLAB

JDBC Connection Function

runstoredprocedure	Call stored procedure with and without input and output arguments

Examples

Connect to MySQL Using ODBC Driver

First, create an ODBC connection to the MySQL database. Then, import data from the database into MATLAB and perform simple data analysis. Close the database connection. The code assumes that you are connecting to a MySQL database version 5.5.46 using the MySQL ODBC 5.3 ANSI Driver.

Connect to the database using the data source name, user name, and password.

```
datasource = 'dsname';
username = 'username';
password = 'pwd';
```

```
conn = database(datasource,username,password)

conn =

  connection with properties:

                  DataSource: 'MySQLdb'
                    UserName: 'username'
                     Message: ''
                        Type: 'ODBC Connection Object'
  Database Properties:

                  AutoCommit: 'on'
                    ReadOnly: 'off'
                LoginTimeout: 0
      MaxDatabaseConnections: 0

  Catalog and Schema Information:

               DefaultCatalog: 'catalog'
                     Catalogs: {'catalog1', 'catalog2'}
                      Schemas: {}

  Database and Driver Information:

          DatabaseProductName: 'MySQL'
       DatabaseProductVersion: '5.5.46-0+deb7u1'
                   DriverName: 'myodbc5a.dll'
                DriverVersion: '05.03.0004'
```

`conn` has an empty `Message` property, which indicates a successful connection.

The property sections of the `connection` object are:

- `Database Properties` — Information about the database configuration
- `Catalog and Schema Information` — Names of catalogs and schemas in the database
- `Database and Driver Information` — Names and versions of the database and driver

Import all data from the table `inventoryTable` into MATLAB using the `select` function. Display the data.

```
selectquery = 'SELECT * FROM inventoryTable';
data = select(conn,selectquery)

ans =

    productnumber    quantity    price          inventorydate
    _____________    ________    _____    ____________________________

     1               1700        14.5     '2014-09-23 09:38:34.0'
     2               1200         9.3     '2014-07-08 22:50:45.0'
     3                356        17.2     '2014-05-14 07:14:28.0'
     ...
```

Determine the highest product quantity from the table.

```
max(data.Quantity)

ans =

        9000
```

Close the database connection `conn`.

```
close(conn)
```

Connect to Oracle Using JDBC Driver

First, create a JDBC connection to the Oracle database. Then, import data from the database into MATLAB and perform simple data analysis. Close the database connection. The code assumes that you are connecting to a Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 using the Oracle JDBC Driver 12.1.0.1.0.

Connect to the database using the data source name, user name, and password.

```
datasource = 'dsname';
username = 'username';
password = 'pwd';

conn = database(datasource,username,password,'Vendor','Oracle', ...
    'Server','remotehost','DriverType','thin','PortNumber',1234)

conn =

  connection with properties:
```

```
                DataSource: 'datasource'
                  UserName: 'username'
                    Driver: 'oracle.jdbc.pool.OracleDa ...'
                       URL: 'jdbc:oracle:thin:@(DESCRI ...'
                   Message: ''
                      Type: 'JDBC Connection Object'
  Database Properties:

                AutoCommit: 'on'
                  ReadOnly: 'off'
              LoginTimeout: 0
    MaxDatabaseConnections: 0

  Catalog and Schema Information:

             DefaultCatalog: ''
                   Catalogs: {}
                    Schemas: {'schema1', 'schema2', 'schema3' ... and 39 more}

  Database and Driver Information:

        DatabaseProductName: 'Oracle'
     DatabaseProductVersion: 'Oracle Database 12c Enter ...'
                 DriverName: 'Oracle JDBC driver'
              DriverVersion: '12.1.0.1.0'
```

`conn` has an empty `Message` property, which indicates a successful connection.

The property sections of the `connection` object are:

- `Database Properties` — Information about the database configuration
- `Catalog and Schema Information` — Names of catalogs and schemas in the database
- `Database and Driver Information` — Names and versions of the database and driver

Import all data from the table `inventoryTable` into MATLAB using the `select` function. Display the data.

```
selectquery = 'SELECT * FROM inventoryTable';
data = select(conn,selectquery)

ans =

    productnumber    quantity    price          inventorydate
    _____________    ________    _____    ____________________________

     1               1700        14.5     '2014-09-23 09:38:34.0'
     2               1200         9.3     '2014-07-08 22:50:45.0'
```

```
    3                356        17.2     '2014-05-14 07:14:28.0'
    ...
```

Determine the highest product quantity from the table.

```
max(data.Quantity)
```

```
ans =

        9000
```

Close the database connection `conn`.

```
close(conn)
```

Alternative Functionality

A `connection` object is one of the two available database connection types. The other creates a `sqlite` object that connects to a SQLite database file using the MATLAB interface to SQLite without installing or administering a database or driver. For details, see “Working with MATLAB Interface to SQLite” on page 2-6.

See Also

`close` | `exec` | `fetch` | `select`

Topics

“Configuring Driver and Data Source” on page 2-15
“MySQL ODBC for Windows” on page 2-54
“Oracle JDBC for Windows” on page 2-47
“Connecting to Database” on page 2-140
“Import Data from Databases into MATLAB” on page 5-2
“Export Data to New Record in Database” on page 5-20
“Database Connection Error Messages” on page 3-6

Introduced before R2006a

cursor

Database cursor

Description

After connecting to a relational database using either ODBC or JDBC drivers, you can perform actions using the database connection. To import data into MATLAB from a database and perform database operations, you must create a `cursor` object. Database Toolbox uses this object to retrieve rows from database tables and execute SQL statements.

There are two types of database cursors, basic and scrollable. Basic cursors let you import data in an SQL query in a sequential way. However, scrollable cursors enable data import from a specified offset in the data set. For details, see “Using Scrollable Cursors” on page 5-52.

To import data quickly using a SQL `SELECT` statement, use the `select` function. To import data with full functionality, use the `exec` and `fetch` functions. For differences, see “Data Import Using Database Explorer App or Command Line” on page 2-143.

A `cursor` object stays open until you close it using the `close` function.

Creation

Create a `cursor` object using the `exec` function.

Properties

ODBC and JDBC Driver Properties

`Data` — SQL query results

cell array (default) | table | structure | numeric | dataset

SQL query results, specified as a cell array, table, structure, numeric, or dataset array. After running the `exec` function, this property is blank. The `fetch` function populates this property with imported data from the executed SQL query.

To set the data return format, use the `setdbprefs` function.

Note The dataset array value will be removed in a future release. Use table instead.

Example: `[15×5 table]`

Data Types: `double` | `struct` | `table` | `cell`

`RowLimit` — Number of rows to import

`0` (default) | positive numeric scalar

This property is read-only.

Number of rows to import at a time, specified as a positive numeric scalar.

Data Types: `double`

`SQLQuery` — SQL query

character vector

This property is read-only.

SQL query, specified as a character vector. To change the SQL query, create a `cursor` object and specify the SQL query in the input argument `sqlquery` of the `exec` function.

For information about the SQL query language, see the SQL Tutorial.

Example: `'SELECT * FROM productTable'`

Data Types: `char`

`Message` — Error message

`''` (default) | character vector

This property is read-only.

Error message, specified as a character vector. An empty character vector specifies that the `exec` or `fetch` functions executed successfully. If this property is empty after

running `exec`, then the SQL statement executed successfully. If this property is empty after running `fetch`, then the data import completed successfully. Otherwise, the property populates with the returned error message.

To throw error messages to the Command Window, use the `setdbprefs` function. Enter this code:

```
setdbprefs('ErrorHandling','report');
sqlquery = 'SELECT * FROM invalidtablename';
curs = exec(conn,sqlquery)
```

To store error messages in the `Message` property instead, enter this code:

```
setdbprefs('ErrorHandling','store');
sqlquery = 'SELECT * FROM invalidtablename';
curs = exec(conn,sqlquery)
```

Example: `'Table 'schame.InvalidTableName' doesn't exist'`

Data Types: `char`

`Type` — Database cursor type

`'ODBCCursor Object'` | `'Database Cursor Object'`

This property is read-only.

Database cursor type, specified as one of these values.

Value	Database Cursor Type
`'ODBCCursor Object'`	`cursor` object created using an ODBC database connection
`'Database Cursor Object'`	`cursor` object created using a JDBC database connection

`Statement` — Statement

C statement object | Java statement object

This property is read-only.

Statement, specified as a C statement object or Java statement object.

Example: `[1×1 com.mysql.jdbc.StatementImpl]`

`Scrollable` — Scrollable cursor

`0` (default) | `1`

This property is read-only.

Scrollable cursor, specified as a logical value. The value `0` identifies the `cursor` object as basic. The value `1` identifies the `cursor` object as scrollable.

Note This property is hidden.

Data Types: `logical`

`Position` — Cursor position

`0` (default) | numeric scalar

This property is read-only.

Cursor position of a scrollable cursor in the data set, specified as a numeric scalar. Only scrollable cursors have this property. The cursor position behaves differently depending on the database driver used to establish the database connection. For details, see "Using Scrollable Cursors" on page 5-52.

Data Types: `double`

JDBC Driver Properties

`DatabaseObject` — JDBC connection

`connection` object

This property is read-only.

JDBC connection, specified as a `connection` object created by connecting to a database using the JDBC driver.

Example: `[1×1 database.jdbc.connection]`

`ResultSet` — Result set

Java result set object

This property is read-only.

Result set, specified as a Java result set object.

Example: `[1×1 com.mysql.jdbc.JDBC4ResultSet]`

`Cursor` — Database cursor

Java object

This property is read-only.

Database cursor, specified as an internal Java object that represents the `cursor` object.

Example: `[1×1 com.mathworks.toolbox.database.sqlExec]`

`Fetch` — Imported data

Java object

This property is read-only.

Imported data, specified as an internal Java object that represents the imported data.

Example: `[1×1 com.mathworks.toolbox.database.fetchTheData]`

Object Functions

attr	Retrieve attributes of columns in fetched data set
close	Close and invalidate database and driver resource utilizer
cols	Retrieve number of columns in fetched data set
columnnames	Retrieve names of columns in fetched data set
fetch	Import data into MATLAB workspace from database cursor or from execution of SQL statement
fetchmulti	Import data from multiple result sets
get	(To be removed) Retrieve object properties
isopen	Determine if database connection or database cursor is open
querytimeout	Get time specified for SQL queries to succeed
rows	Return number of rows in fetched data set
set	(To be removed) Set properties for database or cursor object
width	Return field size of column in fetched data set

Examples

Select Data Using Native ODBC Interface

Use a native ODBC connection to import product data from a Microsoft® SQL Server® database into MATLAB®. Then, determine the highest unit cost among products.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message


ans =

     []
```

Select all data from the table `productTable` using the `connection` object. Assign the SQL `SELECT` statement to the variable `sqlquery`. The `cursor` object contains the executed SQL query.

```
sqlquery = 'SELECT * FROM productTable';
curs = exec(conn,sqlquery)


curs =

  cursor with properties:

         Data: 0
     RowLimit: 0
     SQLQuery: 'SELECT * FROM productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1×1 database.internal.ODBCStatementHandle]
```

With the native ODBC interface, the `Type` property contains the character vector `ODBCCursor Object`. For JDBC connections, this property contains the character vector `Database Cursor Object`.

Import data from the table into MATLAB®.

```
curs = fetch(curs);
data = curs.Data;
```

Determine the highest unit cost in the table.

```
max(data.unitCost)
```

```
ans =

    24
```

After you finish working with the cursor object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Select Data Using JDBC Driver

Using the `cursor` object and JDBC driver, import product data from a MySQL database into MATLAB. Then, determine the highest unit cost among products.

Create a JDBC database connection using the `'Vendor'` name-value pair argument in the `database` function to specify connecting to a MySQL database. Specify a user name and password. Specify the database server name using the `'Server'` name-value pair argument.

```
conn = database('dbname','username','pwd','Vendor','MySQL', ...
    'Server','sname');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select all data from the table `productTable` using the `connection` object. Assign the SQL `SELECT` statement to the variable `sqlquery`. The `cursor` object contains the executed SQL query.

```
sqlquery = 'SELECT * FROM productTable';
curs = exec(conn,sqlquery)
```

```
curs =

  cursor with properties:

        Attributes: []
              Data: 0
    DatabaseObject: [1×1 database.jdbc.connection]
          RowLimit: 0
          SQLQuery: 'SELECT * FROM productTable'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1×1 com.mysql.jdbc.JDBC4ResultSet]
            Cursor: [1×1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1×1 com.mysql.jdbc.StatementImpl]
             Fetch: 0
```

For JDBC connections, the `Type` property contains `Database Cursor Object`. For ODBC connection, this property contains `ODBCCursor Object`.

Import data from the table into MATLAB.

```
curs = fetch(curs);
data = curs.Data;
```

Determine the highest unit cost in the table.

```
max(data.unitCost)

ans =

    24
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

See Also

`close` | `database` | `fetch` | `setdbprefs`

Introduced before R2006a

database

Connect to database

Syntax

```
conn = database(datasource,username,password)
conn = database(datasource,username,password,driver,url)
conn = database(___,Name,Value)
```

Description

`conn = database(datasource,username,password)` creates an ODBC database connection to a data source with a user name and password. The database connection is a `connection` object.

`conn = database(datasource,username,password,driver,url)` creates a JDBC database connection specified by the JDBC driver name and database connection URL.

`conn = database(___,Name,Value)` includes any of the input argument combinations in the previous syntaxes and adds options that you specify by one or more `Name,Value` pair arguments.

To specify optional database properties for ODBC or JDBC drivers, use the ODBC and JDBC connection options. For example, `conn = database(datasource,username,password,'LoginTimeout',5);` creates an ODBC connection with a login timeout of 5 seconds.

To create a JDBC connection without using the database connection URL, use the JDBC connection options. For example, `conn = database(datasource,username,password,'Vendor','MySQL','Server','remotehost');` creates a JDBC connection to a MySQL database.

Note The `database.ODBCConnection` syntax will be removed in a future release. Use the `database` syntax instead.

Examples

Connect to Microsoft® SQL Server® Using ODBC Driver

First, connect to the Microsoft® SQL Server® database. Then, import data from the database into MATLAB®. Perform simple data analysis. Close the database connection.

The code assumes that you are connecting to a Microsoft® SQL Server® Version 11.00.2100 database using the Microsoft® SQL Server® Driver 11.00.5058.

Create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','')
```

```
conn =

  connection with properties:

                 DataSource: 'MS SQL Server Auth'
                   UserName: ''
                    Message: ''
                       Type: 'ODBC Connection Object'
  Database Properties:

                 AutoCommit: 'on'
                   ReadOnly: 'off'
               LoginTimeout: 15
    MaxDatabaseConnections: 0

  Catalog and Schema Information:

             DefaultCatalog: 'toy_store'
                   Catalogs: {'master', 'msdb', 'tempdb' ... and 1 more}
                    Schemas: {'dbo', 'INFORMATION_SCHEMA', 'sys'}

  Database and Driver Information:

        DatabaseProductName: 'Microsoft SQL Server'
    DatabaseProductVersion: '11.00.2100'
                DriverName: 'sqlncli11.dll'
```

```
                DriverVersion: '11.00.5058'
```

`conn` has an empty `Message` property, which indicates a successful connection.

The property sections of the `conn` object are:

- `Database Properties` -- Information about the database configuration
- `Catalog and Schema Information` -- Names of catalogs and schemas in the database
- `Database and Driver Information` -- Names and versions of the database and driver

Import all data from the table `inventoryTable` into MATLAB® using the `select` function. Display the first three rows of data.

```
selectquery = 'SELECT * FROM inventoryTable';
data = select(conn,selectquery);
data(1:3,:)
```

```
ans =

    productNumber    Quantity    Price    inventoryDate
    _____________    ________    _____    ______________

    1                1700        15       '2014-09-23'
    2                1200         9       '2014-07-08'
    3                 356        17       '2014-05-14'
```

Determine the highest quantity in the table.

```
max(data.Quantity)
```

```
ans =

        9000
```

Close the database connection.

```
close(conn)
```

Connect to PostgreSQL Using JDBC Driver URL

First, connect to the PostgreSQL database. Then, import data from the database into MATLAB and perform simple data analysis. Close the database connection. The code assumes that you are connecting to a PostgreSQL 9.4.5 database using the JDBC PostgreSQL Native Driver 8.4.

Connect to the database using the database name, user name, and password. Use the JDBC driver `org.postgresql.Driver` to make the connection.

Use the URL defined by the driver vendor including your server name `host`, port number, and database name.

```
datasource = 'dbname';
username = 'username';
password = 'pwd';
driver = 'org.postgresql.Driver';
url = 'jdbc:postgresql://host:port/dbname';

conn = database(datasource,username,password,driver,url)
```

```
conn =

  connection with properties:

                DataSource: 'dbname'
                  UserName: 'username'
                    Driver: 'org.postgresql.Driver'
                       URL: 'jdbc:postgresql://host: ...'
                   Message: ''
                      Type: 'JDBC Connection Object'
  Database Properties:

                AutoCommit: 'on'
                  ReadOnly: 'off'
              LoginTimeout: 0
    MaxDatabaseConnections: 8192

  Catalog and Schema Information:

            DefaultCatalog: 'catalog'
                  Catalogs: {'catalog'}
                   Schemas: {'schema1', 'schema2', 'schema3' ... and 1 more}

  Database and Driver Information:

       DatabaseProductName: 'PostgreSQL'
    DatabaseProductVersion: '9.4.5'
```

```
          DriverName: 'PostgreSQL Native Driver'
       DriverVersion: 'PostgreSQL 8.4 JDBC4 (bui ...'
```

`conn` has an empty `Message` property, which indicates a successful connection.

The property sections of the `conn` object are:

- `Database Properties` — Information about the database configuration
- `Catalog and Schema Information` — Names of catalogs and schemas in the database
- `Database and Driver Information` — Names and versions of the database and driver

Import all data from the table `inventoryTable` into MATLAB using the `select` function. Display the data.

```
selectquery = 'SELECT * FROM inventoryTable';
data = select(conn,selectquery)
```

```
ans =

    productnumber    quantity    price          inventorydate
    _____________    ________    _____    ____________________________

     1               1700        14.5     '2014-09-23 09:38:34.0'
     2               1200         9.3     '2014-07-08 22:50:45.0'
     3                356        17.2     '2014-05-14 07:14:28.0'
     ...
```

Determine the highest quantity in the table.

```
max(data.quantity)
```

```
ans =

    9000
```

Close the database connection.

```
close(conn)
```

Connect to Microsoft® SQL Server® Using JDBC Driver with Additional Options

First, connect to the Microsoft® SQL Server® database. Then, import data from the database into MATLAB®. Perform simple data analysis. Close the database connection.

The code assumes that you are connecting to a Microsoft® SQL Server® Version 11.00.2100 database using the Microsoft® SQL Server® JDBC Driver 4.0.2206.100.

Create a database connection to a Microsoft® SQL Server® database with Windows® authentication and a login timeout of 5 seconds. Specify a blank user name and password.

```
datasource = 'toy_store';
conn = database(datasource,'','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','AuthType','Windows','PortNumber',54317, ...
    'LoginTimeout',5)
```

```
conn =

  connection with properties:

                 DataSource: 'toy_store'
                   UserName: ''
                     Driver: 'com.microsoft.sqlserver.j ...'
                        URL: 'jdbc:sqlserver://dbtb04:5 ...'
                    Message: ''
                       Type: 'JDBC Connection Object'
  Database Properties:

                 AutoCommit: 'on'
                   ReadOnly: 'off'
               LoginTimeout: 5
    MaxDatabaseConnections: 0

  Catalog and Schema Information:

             DefaultCatalog: 'toy_store'
                   Catalogs: {'master', 'model', 'msdb' ... and 2 more}
                    Schemas: {'db_accessadmin', 'db_backupoperator', 'db_datareader' .

  Database and Driver Information:

        DatabaseProductName: 'Microsoft SQL Server'
```

```
      DatabaseProductVersion: '11.00.2100'
                  DriverName: 'Microsoft JDBC Driver 4.0 ...'
               DriverVersion: '4.0.2206.100'
```

`conn` has an empty `Message` property, which indicates a successful connection.

The property sections of the `conn` object are:

- `Database Properties` -- Information about the database configuration
- `Catalog and Schema Information` -- Names of catalogs and schemas in the database
- `Database and Driver Information` -- Names and versions of the database and driver

Import all data from the table `inventoryTable` into MATLAB® using the `select` function. Display the first three rows of data.

```
selectquery = 'SELECT * FROM inventoryTable';
data = select(conn,selectquery);
data(1:3,:)
```

```
ans =

    productNumber    Quantity    Price    inventoryDate
    _____________    ________    _____    ______________

    1                1700        15       '2014-09-23'
    2                1200         9       '2014-07-08'
    3                 356        17       '2014-05-14'
```

Determine the highest quantity in the table.

```
max(data.Quantity)
```

```
ans =

        9000
```

Close the database connection.

```
close(conn)
```

Input Arguments

`datasource` — Data source name or database name

character vector | string scalar

Data source name or database name, specified as a character vector or string scalar. Specify a data source for ODBC connection, and the database name for JDBC connection.

- For an ODBC driver, `datasource` is the name you provide for your data source when you create a data source using the Microsoft ODBC Administrator.
- For a JDBC driver, `datasource` is the name of your database.

The name differs for different database systems. For example, `datasource` is the SID or the service name when you are connecting to an Oracle database. Or, `datasource` is the catalog name when you are connecting to a MySQL database.

For details about your database name, contact your database administrator or refer to your database documentation.

Data Types: `char` | `string`

`username` — User name

character vector | string scalar

User name required to access the database, specified as a character vector or string scalar. If no user name is required, specify an empty value `''`.

Data Types: `char` | `string`

`password` — Password

character vector | string scalar

Password required to access the database, specified as a character vector or string scalar. If no password is required, specify an empty value `''`.

Data Types: `char` | `string`

`driver` — JDBC driver name

character vector | string scalar

JDBC driver name, specified as a character vector or string scalar that refers to the name of the Java driver that implements the `java.sql.Driver` interface. For details, see JDBC driver name and database connection URL on page 8-69.

Data Types: `char` | `string`

`url` — Database connection URL

character vector | string scalar

Database connection URL, specified as a character vector or string scalar for the vendor-specific URL. This URL is typically constructed using connection properties such as server name, port number, and database name. For details, see JDBC driver name and database connection URL on page 8-69. If you do not know the driver name or the URL, you can use name-value pair arguments to specify individual connection properties.

Data Types: `char` | `string`

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `'Vendor','MySQL','Server','remotehost'` connects to a MySQL database using a JDBC driver on a machine named `remotehost`.

Tip: When creating a JDBC connection using the JDBC connection options, you can omit:

- `'Server'` name-value pair argument when connecting to a database locally
- `'PortNumber'` name-value pair argument when connecting to a database server listening on the default port (except for Oracle connections)

ODBC and JDBC Connection Options

`AutoCommit` — Auto-commit transactions

`'on'` (default) | `'off'`

Auto-commit transactions, specified as the comma-separated pair consisting of `'AutoCommit'` and one of these values:

- `'on'` — Database transactions are automatically committed to the database.
- `'off'` — Database transactions must be committed to the database manually.

Example: `'AutoCommit','off'`

`LoginTimeout` — Login timeout

`0` (default) | positive numeric scalar

Login timeout, specified as the comma-separated pair consisting of `'LoginTimeout'` and a positive numeric scalar. The login timeout specifies the number of seconds that the driver waits while trying to connect to a database before throwing an error.

To specify no login timeout for the connection attempt, set the value to `0`.

When login timeout is unsupported by the database, the value is `-1`.

Example: `'LoginTimeout',5`

Data Types: `double`

`ReadOnly` — Read-only database data

`'off'` (default) | `'on'`

Read-only database data, specified as the comma-separated pair consisting of `'ReadOnly'` and one of these values:

- `'on'` — Database data is read-only.
- `'off'` — Database data is writable.

Example: `'ReadOnly','on'`

JDBC Connection Options

`Vendor` — Database vendor

`'MySQL'` | `'Oracle'` | `'Microsoft SQL Server'` | `'PostgreSQL'`

Database vendor, specified as the comma-separated pair consisting of `'Vendor'` and one of these values:

- `'MySQL'`
- `'Oracle'`
- `'Microsoft SQL Server'`
- `'PostgreSQL'`

If you are connecting to a database system not listed here, use the `driver` and `url` syntax.

Example: `'Vendor','Oracle'`

`Server` — Database server

`'localhost'` (default) | character vector | string scalar

Database server name or address, specified as the comma-separated pair consisting of `'Server'` and a character vector or string scalar.

Example: `'Server','remotehost'`

Data Types: `char` | `string`

`PortNumber` — Server port number

numeric scalar

Server port number where the server is listening, specified as the comma-separated pair consisting of `'PortNumber'` and a numeric scalar.

Example: `'PortNumber',1234`

Data Types: `double`

`AuthType` — Authentication type

`'Server'` (default) | `'Windows'`

Authentication type (required only for Microsoft SQL Server), specified as the comma-separated pair consisting of `'AuthType'` and one of these values:

- `'Server'` — Microsoft SQL Server authentication
- `'Windows'` — Windows authentication

Example: `'AuthType','Windows'`

`DriverType` — Driver type

`'thin'` | `'oci'`

Driver type (required only for Oracle), specified as the comma-separated pair consisting of `'DriverType'` and one of these values:

- `'thin'` — Thin driver
- `'oci'` — Windows authentication

Example: `'DriverType','thin'`

Output Arguments

conn — Database connection
`connection` object

Database connection, returned as a `connection` object.

Definitions

JDBC Driver Name and Database Connection URL

The JDBC driver name and database connection URL take different forms for different databases.

Database	JDBC Driver Name and Database URL Example Syntax
IBM® Informix®	**JDBC driver:** `com.informix.jdbc.IfxDriver` **Database URL:** `jdbc:informix-sqli://161.144.202.206:3000:INFORMIXSERVER=stars`
Microsoft SQL Server 2005	**JDBC driver:** `com.microsoft.sqlserver.jdbc.SQLServerDriver` **Database URL:** `jdbc:sqlserver://localhost:port;database=databasename`

Database	JDBC Driver Name and Database URL Example Syntax
MySQL	**JDBC driver:** `twz1.jdbc.mysql.jdbcMysqlDriver` **Database URL:** `jdbc:z1MySQL://natasha:3306/metrics` **JDBC driver:** `com.mysql.jdbc.Driver` **Database URL:** `jdbc:mysql://devmetrics.mrkps.com/testing` To insert or select characters with encodings that are not default, append the value `useUnicode=true&characterEncoding=`*`encoding`* to the URL, where *`encoding`* is any valid MySQL character encoding followed by `&`. For example, `useUnicode=true&characterEncoding=utf8&`. *The trailing `&` is required.*
Oracle oci7 drivers	**JDBC driver:** `oracle.jdbc.driver.OracleDriver` **Database URL:** `jdbc:oracle:oci7:@rex`
Oracle oci8 drivers	**JDBC driver:** `oracle.jdbc.driver.OracleDriver` **Database URL:** `jdbc:oracle:oci8:@111.222.333.44:1521:` **Database URL:** `jdbc:oracle:oci8:@frug`
Oracle 10 Connections with JDBC (Thin drivers)	**JDBC driver:** `oracle.jdbc.driver.OracleDriver` **Database URL:** `jdbc:oracle:thin:`
Oracle Thin drivers	**JDBC driver:** `oracle.jdbc.driver.OracleDriver` **Database URL:** `jdbc:oracle:thin:@144.212.123.24:1822:` **Database URL:** `jdbc:oracle:thin:@(DESCRIPTION = (ADDRESS = (PROTOCOL = TCP)(HOST = ServerName)(PORT = 1234)) (CONNECT_DATA = (SERVER = DEDICATED) (SERVICE_NAME = dbname) ) )`
PostgreSQL	**JDBC driver:** `org.postgresql.Driver` **Database URL:** `jdbc:postgresql://host:port/database`

Database	JDBC Driver Name and Database URL Example Syntax
PostgreSQL with SSL Connection	**JDBC driver:** `org.postgresql.Driver` **Database URL:** `jdbc:postgresql:servername:dbname:ssl=true&sslfactory=org.postgresql.ssl.NonValidatingFactory&` *The trailing `&` is required.*

Alternative Functionality

Database Explorer App

The `database` function connects to a database using the command line. To connect to a database and explore its data in a visual way, use the **Database Explorer** app.

See Also

Functions

`close` | `datainsert` | `exec` | `fetch` | `isopen` | `select` | `update`

Apps

Database Explorer

Topics

"Setup Requirements for Database Connection" on page 2-12
"Connection Options" on page 2-9
"Configuring Driver and Data Source" on page 2-15
"Microsoft SQL Server ODBC for Windows" on page 2-24
"Microsoft SQL Server JDBC for Windows" on page 2-31
"PostgreSQL JDBC for Windows" on page 2-71
"Connecting to Database" on page 2-140
"Connecting to Database Using Native ODBC Interface" on page 3-17
"Import Data from Databases into MATLAB" on page 5-2
"Export Data to New Record in Database" on page 5-20
"Display Database Metadata" on page 5-37
"Database Connection Error Messages" on page 3-6

“Java Class Path” (MATLAB)

Introduced before R2006a

datastore

(Not recommended) Create datastore to access collection of data in a database

This `datastore` function creates a `DatabaseDatastore` object. You can use this object to read large volumes of data in a relational database.

A `DatabaseDatastore` is one of the available datastore types. You can create other types of datastores using the MATLAB function `datastore`. After creating any datastore, you can analyze data by writing custom functions to run MapReduce using the `mapreduce` function. For details, see "Getting Started with MapReduce" (MATLAB).

Note `datastore` is not recommended. Use `databaseDatastore` instead.

Syntax

```
dbds = datastore(conn,sqlquery)
```

Description

`dbds = datastore(conn,sqlquery)` creates a `DatabaseDatastore` object `dbds` using the database connection `conn`. This datastore contains query results from the executed SQL query `sqlquery`.

Examples

Create a DatabaseDatastore

Create a database connection `conn` using the ODBC driver. This code assumes that you are connecting to a MySQL database with the data source named `MySQL`, user name `username`, and password `pwd`. `MySQL` contains the table named `productTable` with 15 product records.

```
conn = database('MySQL','username','pwd');
```

Create a `DatabaseDatastore` object `dbds` using the database connection `conn` and SQL query `sqlquery`. This SQL query retrieves all products from the product table `productTable`.

```
sqlquery = 'SELECT * FROM productTable';

dbds = datastore(conn,sqlquery)

dbds =

  DatabaseDatastore with properties:

      Connection: [1×1 database.odbc.connection]
           Query: 'SELECT * FROM productTable'
    VariableNames: {1×5 cell}
        ReadSize: 10000
```

`datastore` executes the SQL query `sqlquery` and creates a `cursor` object with the resulting data. `dbds` contains these properties:

- `connection` object
- Executed SQL query
- Column names of the executed SQL query
- Number of rows to read from the SQL query results

Display the database connection property `Connection`.

```
dbds.Connection

ans =

  connection with properties:

                  DataSource: 'MySQLdb'
                    UserName: 'username'
                     Message: ''
                        Type: 'ODBC Connection Object'
  Database Properties:

                  AutoCommit: 'on'
                    ReadOnly: 'off'
```

```
               LoginTimeout: 0
    MaxDatabaseConnections: 0

  Catalog and Schema Information:

             DefaultCatalog: 'toy_store'
                   Catalogs: {'information_schema', 'toy_store'}
                    Schemas: {}

  Database and Driver Information:

        DatabaseProductName: 'MySQL'
    DatabaseProductVersion: '5.5.46-0+deb7u1'
                DriverName: 'myodbc5a.dll'
             DriverVersion: '05.03.0004'
```

The `Message` property is blank when the database connection is successful.

Close the `DatabaseDatastore` and database connection.

```
close(dbds)
```

- “Import Large Data Using DatabaseDatastore Object” on page 5-63

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`sqlquery` — SQL statement

character vector | string scalar

SQL statement, specified as a character vector or string scalar.

For information about the SQL query language, see the SQL Tutorial.

Example: `SELECT * FROM invoice` selects all columns and rows from the `invoice` table.

Data Types: `char` | `string`

Output Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in database, returned as a `DatabaseDatastore` object.

See Also

`close` | `database` | `databaseDatastore` | `datastore` | `preview` | `read`

Topics

“Import Large Data Using DatabaseDatastore Object” on page 5-63
`DatabaseDatastore`
“Getting Started with Datastore” (MATLAB)

Introduced in R2014b

hasdata

Determine if data in `DatabaseDatastore` is available to read

Syntax

```
tf = hasdata(dbds)
```

Description

`tf = hasdata(dbds)` returns logical `1` (`true`) if there is data available to read from the `DatabaseDatastore` object `dbds`. Otherwise, it returns logical `0` (`false`).

Note If there is no more data to read from the query, `hasdata` returns logical `0`.

Examples

Determine If `DatabaseDatastore` Object Contains More Data

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using the database connection and SQL query. This SQL query reads the first 30 rows of data from the table.

```
sqlquery = 'select top 30 * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery);
```

Read the first 10 rows.

```
dbds.ReadSize = 10;
read(dbds)
```

```
ans =

    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1990    9         4            2            1228       1230          1350       134
    1990    9        12            3            1125       1125          1231       123
    1990    9        23            7            1721       1719          2201       220
    1990    9        27            4             645        645           802        81
    1990    9         3            1             710        711           837        84
    1990    9        20            4            1338       1335          1853       190
    1990    9        22            6             900        900          1241       122
    1990    9         3            1             925        755          1258       114
    1990    9        29            6            1434       1435          1615       163
    1990    9         2            7             NaN       1805           NaN       190
```

Determine if the `DatabaseDatastore` object has additional data.

```
hasdata(dbds)
```

```
ans =

  logical

   1
```

When more data is available in `dbds`, `hasdata` returns `1`.

Read the rest of the data in `dbds` 10 rows at a time.

```
while(hasdata(dbds))
     read(dbds)
end
```

```
ans =
```

```
    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1990    9         4            2            1228       1230          1350       134
    1990    9        12            3            1125       1125          1231       123
    1990    9        23            7            1721       1719          2201       220
    1990    9        27            4             645        645           802        81
    1990    9         3            1             710        711           837        84
    1990    9        20            4            1338       1335          1853       190
    1990    9        22            6             900        900          1241       122
    1990    9         3            1             925        755          1258       114
    1990    9        29            6            1434       1435          1615       163
    1990    9         2            7             NaN       1805           NaN       190
```

```
ans =
```

```
    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1990    9        23            7            1721       1719          2201       220
    1990    9        27            4             645        645           802        81
    1990    9         3            1             710        711           837        84
    1990    9        20            4            1338       1335          1853       190
    1990    9        22            6             900        900          1241       122
    1990    9         3            1             925        755          1258       114
    1990    9        29            6            1434       1435          1615       163
    1990    9         2            7             NaN       1805           NaN       190
    1990    9        11            2             908        910          1613       155
    1990    9        22            6            1801       1750          2005       193
```

When no more data remains in `dbds`, `hasdata` returns logical `0` and the `while` loop stops.

Close the `DatabaseDatastore` object and database connection.

```
close(dbds)
```

- “Import Large Data Using DatabaseDatastore Object” on page 5-63
- “Analyze Large Data in Database Using Tall Arrays”
- “Analyze Large Data in Database Using MapReduce”

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in a database, specified as a `DatabaseDatastore` object created using the `databaseDatastore` function.

See Also

`close` | `database` | `databaseDatastore` | `read`

Topics

“Import Large Data Using DatabaseDatastore Object” on page 5-63
“Analyze Large Data in Database Using Tall Arrays”
“Analyze Large Data in Database Using MapReduce”
`DatabaseDatastore`

Introduced in R2014b

isopen

Determine if database connection or database cursor is open

Syntax

```
i = isopen(conn)
i = isopen(curs)
```

Description

`i = isopen(conn)` returns `1` if the database connection is open and `0` if the database connection is closed or invalid.

`i = isopen(curs)` returns the same values using the database `cursor` object.

Examples

Determine If Database Connection Is Open

First, connect to the Microsoft® SQL Server® database. Verify the database connection. Then, import data from the database into MATLAB®. Determine the highest unit cost among the retrieved products in the table. Close the database connection.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Determine if the database connection is open. The `isopen` function returns the numeric scalar `1` that denotes the database connection is open.

```
i = isopen(conn)
```

```
i =

     1
```

Select all data from `productTable` and sort it by the product number. `data` is a table that contains the imported data from executing the SQL `SELECT` statement.

```
selectquery = 'SELECT * FROM productTable ORDER BY productNumber';
data = select(conn,selectquery);
```

Display first three rows of data.

```
data(1:3,:)
```

```
ans =

  3×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1                4.0035e+05     1001              14          'Building Blocks'
    2                4.0031e+05     1002               9          'Painting Set'
    3                  4.01e+05     1009              17          'Slinky'
```

Determine the highest unit cost in the table.

```
max(data.unitCost)
```

```
ans =
```

```
    24
```

Close the database connection.

```
close(conn)
```

Determine if the database connection is closed. The `isopen` function returns the numeric scalar `0` that denotes the database connection is closed. If the database connection is invalid, the `isopen` function returns the same result.

```
i = isopen(conn)
```

```
i =

     0
```

Determine If Database Cursor Is Open

First, connect to the Microsoft® SQL Server® database. Verify the database cursor. Import data from the database into MATLAB®. Determine the highest unit cost among the retrieved products in the table. Close the database connection.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Create a `cursor` object by executing an SQL query in the database. Select all data from the table `productTable` using the database connection.

```
sqlquery = 'SELECT * FROM productTable ORDER BY productNumber';
curs = exec(conn,sqlquery);
```

Determine if the database cursor is open. The `isopen` function returns the numeric scalar `1` that denotes the database cursor is open.

```
i = isopen(curs)
```

```
i =

     1
```

Import data from the executed SQL query. Display the first three rows of imported data.

```
curs = fetch(curs);
curs.Data(1:3,:)
```

```
ans =

  3×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1                4.0035e+05     1001              14          'Building Blocks'
    2                4.0031e+05     1002               9          'Painting Set'
    3                  4.01e+05     1009              17          'Slinky'
```

Determine the highest unit cost in the table.

```
data = curs.Data;
max(data.unitCost)
```

```
ans =

    24
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Determine if the database cursor is closed. The `isopen` function returns the numeric scalar `0` that denotes the database cursor is closed. If the `cursor` object is invalid, the `isopen` function returns the same result.

```
i = isopen(curs)


i =

     0
```

Close the database connection.

```
close(conn)
```

- "Import Data from Databases into MATLAB" on page 5-2
- "Export Data to New Record in Database" on page 5-20

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`curs` — Database cursor

`cursor` object

Database cursor, specified as a `cursor` object created using the `exec` function.

See Also

`close` | `database` | `exec` | `isreadonly` | `ping`

Topics

“Import Data from Databases into MATLAB” on page 5-2
“Export Data to New Record in Database” on page 5-20
“Connecting to Database” on page 2-140
“Connecting to Database Using Native ODBC Interface” on page 3-17

Introduced in R2015b

preview

Return subset of data from `DatabaseDatastore`

Syntax

```
data = preview(dbds)
```

Description

`data = preview(dbds)` returns the first eight rows of data from the `DatabaseDatastore` object `dbds` without changing its current position.

Note `preview` returns data as a table only. `preview` ignores database preference settings for data return formatting.

If there is no data to read from the query, `preview` throws an error.

Examples

Preview Data

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using the database connection and SQL query. This SQL query reads all data from the table.

```
sqlquery = 'select * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery);
```

Preview the first eight records in the data set returned by executing the SQL query in the `DatabaseDatastore` object.

```
preview(dbds)
```

```
ans =

    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1990    9        22            6            1801       1750          2005       193
    1990    9        11            2             908        910          1613       155
    1990    9         2            7             NaN       1805           NaN       190
    1990    9        29            6            1434       1435          1615       163
    1990    9         3            1             925        755          1258       114
    1990    9        22            6             900        900          1241       122
    1990    9        20            4            1338       1335          1853       190
    1990    9         3            1             710        711           837        84
```

Close the `DatabaseDatastore` object and database connection.

```
close(dbds)
```

- “Import Large Data Using DatabaseDatastore Object” on page 5-63
- “Analyze Large Data in Database Using Tall Arrays”
- “Analyze Large Data in Database Using MapReduce”

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in a database, specified as a `DatabaseDatastore` object created using the `databaseDatastore` function.

Output Arguments

`data` — Query results

table

Query results, returned as a table of the first eight records in the data set. Executing the SQL statement specified in the `Query` property of the `DatabaseDatastore` object creates the data set.

If there is no data to read from the query, `preview` throws an error.

See Also

`close` | `database` | `databaseDatastore` | `read`

Topics

"Import Large Data Using DatabaseDatastore Object" on page 5-63
"Analyze Large Data in Database Using Tall Arrays"
"Analyze Large Data in Database Using MapReduce"
`DatabaseDatastore`

Introduced in R2014b

read

Read data in `DatabaseDatastore`

Syntax

```
data = read(dbds)
[data,info] = read(dbds)
```

Description

`data = read(dbds)` returns data from the `DatabaseDatastore` object in increments specified by the `ReadSize` property of the `DatabaseDatastore` object. Subsequent calls to the `read` function continue reading from the endpoint of the previous call.

Note `read` returns data as a table only. `read` ignores database preference settings for data return formatting.

If there is no more data to read from the query, `read` throws an error.

`[data,info] = read(dbds)` returns database information `info`.

Note The syntax `data = read(dbds,rowcount)` has been removed. Set the `DatabaseDatastore` property `ReadSize` instead.

Examples

Read Data

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The

code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using the database connection and SQL query. This SQL query retrieves all data from the table. Specify reading a maximum of 10 records from the executed SQL query.

```
sqlquery = 'select * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery,'ReadSize',10);
```

Read the data in the `DatabaseDatastore` object.

```
data = read(dbds)
```

```
data =

    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1987    10       28            3            1140       1140          1212       121
    1987    10        9            5            1155       1155          1250       130
    1987    10       22            4             715        715           807        80
    1987    10       16            5            1553       1555          1641       164
    1987    10       30            5            1821       1815          1956       195
    1987    10       12            1            1300       1300          1529       152
    1987    10        7            3             810        810           904        90
    1987    10       19            1             733        735           827        83
    1987    10       15            4             828        830           916        92
    1987    10        4            7            1750       1735          1837       181
```

`data` contains the query results.

Close the `DatabaseDatastore` object and database connection.

```
close(dbds)
```

Read Data and Database Information

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using the database connection and SQL query. This SQL query retrieves all data from the table. Specify reading a maximum of 10 records from the executed SQL query.

```
sqlquery = 'select * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery,'ReadSize',10);
```

Read the data in the `DatabaseDatastore` object and retrieve information about the database.

```
[data,info] = read(dbds)
```

```
data =

    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1987    10       28            3            1140       1140          1212       121
    1987    10        9            5            1155       1155          1250       130
    1987    10       22            4             715        715           807        80
    1987    10       16            5            1553       1555          1641       164
    1987    10       30            5            1821       1815          1956       195
    1987    10       12            1            1300       1300          1529       152
    1987    10        7            3             810        810           904        90
    1987    10       19            1             733        735           827        83
    1987    10       15            4             828        830           916        92
    1987    10        4            7            1750       1735          1837       181


info =

  struct with fields:
```

```
    datasource: 'toy_store'
        offset: 10
```

`data` contains the query results. The structure `info` contains the data source name `datasource` and current cursor position `offset`.

Close the `DatabaseDatastore` object and database connection.

```
close(dbds)
```

- “Import Large Data Using DatabaseDatastore Object” on page 5-63
- “Analyze Large Data in Database Using Tall Arrays”
- “Analyze Large Data in Database Using MapReduce”

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in a database, specified as a `DatabaseDatastore` object created using the `databaseDatastore` function.

Output Arguments

`data` — Query results

table

Query results, returned as a table of the records in the data set. Executing the SQL statement specified in the `Query` property of the `DatabaseDatastore` object creates the data set. The `ReadSize` property of the `DatabaseDatastore` object specifies the number of rows in the table.

If there is no more data to read from the query, `read` throws an error.

`info` — Database information

structure

Database information, returned as a structure with these fields.

Field	Description
`datasource`	Data source name for ODBC drivers or a database name for JDBC drivers
`offset`	Current cursor position in the returned data set

See Also

`close` | `database` | `databaseDatastore` | `hasdata`

Topics

“Import Large Data Using DatabaseDatastore Object” on page 5-63
“Analyze Large Data in Database Using Tall Arrays”
“Analyze Large Data in Database Using MapReduce”
`DatabaseDatastore`

Introduced in R2014b

readall

Read all data in `DatabaseDatastore`

Syntax

```
data = readall(dbds)
```

Description

`data = readall(dbds)` returns all the data in the `DatabaseDatastore` object `dbds`, and resets the `DatabaseDatastore` to the point where no data has been read from it.

Note `readall` returns data as a table only. `readall` ignores database preference settings for data return formatting.

Examples

Read All Data in `DatabaseDatastore` Object

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using the database connection and SQL query. This SQL query reads all data from the table.

```
sqlquery = 'select * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery);
```

Read all data in the `DatabaseDatastore` object.

```
data = readall(dbds);
```

`data` contains the query results.

Display the first three rows of query results.

```
data(1:3,:)
```

```
ans =

    Year    Month    DayofMonth    DayOfWeek    DepTime    CRSDepTime    ArrTime    CRS
    ____    _____    __________    _________    _______    __________    _______    ___

    1987    10       28            3            1140       1140          1212       121
    1987    10        9            5            1155       1155          1250       130
    1987    10       22            4             715        715           807        80
```

Close the `DatabaseDatastore` object and database connection.

```
close(dbds)
```

- “Import Large Data Using DatabaseDatastore Object” on page 5-63
- “Analyze Large Data in Database Using Tall Arrays”
- “Analyze Large Data in Database Using MapReduce”

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in a database, specified as a `DatabaseDatastore` object created using the `databaseDatastore` function.

Output Arguments

`data` — Query results

table

Query results, returned as a table of the records in the data set. Executing the SQL statement specified in the `Query` property of the `DatabaseDatastore` object creates the data set.

See Also

`close` | `database` | `databaseDatastore` | `preview` | `read`

Topics

"Import Large Data Using DatabaseDatastore Object" on page 5-63
"Analyze Large Data in Database Using Tall Arrays"
"Analyze Large Data in Database Using MapReduce"
`DatabaseDatastore`

Introduced in R2014b

reset

Reset `DatabaseDatastore` to initial state

Syntax

```
reset(dbds)
```

Description

`reset(dbds)` resets the `DatabaseDatastore` object `dbds` to the state where no data has been read from it. Resetting allows re-reading from the same `DatabaseDatastore`.

Examples

Reset `DatabaseDatastore` Object to Initial State

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using the database connection and SQL query. This SQL query retrieves all data from the table. Specify reading a maximum of 10 records from the executed SQL query when using the `read` function.

```
sqlquery = 'select * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery,'ReadSize',10);
```

Read data from the start of the data set.

```
read(dbds)
```

```
ans =
```

Year	Month	DayofMonth	DayOfWeek	DepTime	CRSDepTime	ArrTime	CRS
1987	10	28	3	1140	1140	1212	121
1987	10	9	5	1155	1155	1250	130
1987	10	22	4	715	715	807	80
1987	10	16	5	1553	1555	1641	164
1987	10	30	5	1821	1815	1956	195
1987	10	12	1	1300	1300	1529	152
1987	10	7	3	810	810	904	90
1987	10	19	1	733	735	827	83
1987	10	15	4	828	830	916	92
1987	10	4	7	1750	1735	1837	181

`read` returns the first 10 records in the data set.

Reset the `DatabaseDatastore` object to the state where no data has been read from it. Resetting allows rereading from the same `DatabaseDatastore` object.

```
reset(dbds)
```

Read data from the start of the data set.

```
read(dbds)
```

```
ans =
```

Year	Month	DayofMonth	DayOfWeek	DepTime	CRSDepTime	ArrTime	CRS
1987	10	28	3	1140	1140	1212	121
1987	10	9	5	1155	1155	1250	130
1987	10	22	4	715	715	807	80
1987	10	16	5	1553	1555	1641	164
1987	10	30	5	1821	1815	1956	195
1987	10	12	1	1300	1300	1529	152
1987	10	7	3	810	810	904	90
1987	10	19	1	733	735	827	83

```
    1987    10       15            4             828        830           916        92
    1987    10        4            7            1750       1735          1837       181
```

`read` again returns the first 10 records in the data set.

Close the `DatabaseDatastore` object and the database connection.

```
close(dbds)
```

- "Import Large Data Using DatabaseDatastore Object" on page 5-63
- "Analyze Large Data in Database Using Tall Arrays"
- "Analyze Large Data in Database Using MapReduce"

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in a database, specified as a `DatabaseDatastore` object created using the `databaseDatastore` function.

See Also

`close` | `database` | `databaseDatastore` | `exec` | `read`

Topics

"Import Large Data Using DatabaseDatastore Object" on page 5-63
"Analyze Large Data in Database Using Tall Arrays"
"Analyze Large Data in Database Using MapReduce"
`DatabaseDatastore`

Introduced in R2014b

DatabaseDatastore

Datastore for data in database

Description

MATLAB has various datastores that let you import large data sets into MATLAB for analysis. A `DatabaseDatastore` object is a type of datastore that contains the results from executing an SQL query in a relational database. For details about the other datastores, see “Getting Started with Datastore” (MATLAB).

With a `DatabaseDatastore` object, you can preview and read records or chunks in a data set and reset the `DatabaseDatastore` to the initial state. Additionally, you can analyze a large data set in a database using tall arrays or MapReduce.

Reading data from `DatabaseDatastore` objects is the same as executing `exec` and `fetch` functions on the data set. Advantages are:

- Working with databases containing large amounts of data.
- Analyzing large amounts of data using tall arrays with common MATLAB functions, such as `mean` and `histogram`. Create a tall array using the `tall` function. For details, see “Tall Arrays” (MATLAB).
- Writing MapReduce algorithms that define the chunking and reduction of large amounts of data using the `mapreduce` function. For details, see “Getting Started with MapReduce” (MATLAB). For an example, see “Analyze Large Data in Database Using MapReduce”. For more MapReduce examples, see Building Effective Algorithms with MapReduce (MATLAB).

Creation

Syntax

```
dbds = databaseDatastore(conn,sqlquery)
dbds = databaseDatastore(conn,sqlquery,'ReadSize',rowcount)
```

Description

`dbds = databaseDatastore(conn,sqlquery)` creates a `DatabaseDatastore` object `dbds` using the database connection `conn`. This datastore contains query results from the executed SQL query `sqlquery`.

`dbds = databaseDatastore(conn,sqlquery,'ReadSize',rowcount)` specifies the number of records `rowcount` to return when reading data from the database.

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`sqlquery` — SQL statement

character vector | string scalar

SQL statement, specified as a character vector or string scalar.

For information about the SQL query language, see the SQL Tutorial.

Example: `SELECT * FROM invoice` selects all columns and rows from the `invoice` table.

Data Types: `char` | `string`

`rowcount` — Record count

numeric scalar

Record count, specified as a nonnegative numeric scalar to denote the maximum number of records to retrieve from the `DatabaseDatastore` object `dbds`.

Data Types: `double`

Limitations

- The `DatabaseDatastore` object supports only Microsoft SQL Server 2012 and later versions.

- The `DatabaseDatastore` object does not support using a parallel pool with Parallel Computing Toolbox installed. To analyze data using tall arrays or run MapReduce algorithms, set the global execution environment to be the local MATLAB session using `mapreducer`. Enter this code:

  ```
  mapreducer(0)
  ```

  For details about controlling parallel resources, see "Run mapreduce on a Parallel Pool" (Parallel Computing Toolbox).

Properties

`Connection` — Database connection

`connection` object

Database connection, specified as a `connection` object created using `database`.

`Cursor` — Database cursor

database cursor object

Database cursor, specified as a database cursor object created using `exec` with the SQL query.

Note This property has been removed.

`Query` — SQL query

character vector

SQL query, specified as a character vector to denote the SQL query to execute in the database.

Data Types: `char`

`VariableNames` — Column names of retrieved data table

cell array of character vectors

Column names of the retrieved data table, specified as a cell array of one or more character vectors.

Data Types: `char`

`ReadSize` — Number of rows to read

10000 (default) | numeric scalar

Number of rows to read from the retrieved data table, specified as a nonnegative numeric scalar. To specify the number of rows to read, set the `ReadSize` property.

Example: `dbds.ReadSize = 5000;`

Data Types: `double`

Object Functions

hasdata	Determine if data in DatabaseDatastore is available to read
preview	Return subset of data from DatabaseDatastore
read	Read data in DatabaseDatastore
readall	Read all data in DatabaseDatastore
reset	Reset DatabaseDatastore to initial state
close	Close and invalidate database and driver resource utilizer

Examples

Create `DatabaseDatastore` Object

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using a database connection and SQL query. This SQL query retrieves all data from table. `databaseDatastore` executes the SQL query.

```
sqlquery = 'select * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery)


dbds =
```

```
  DatabaseDatastore with properties:

       Connection: [1×1 database.jdbc.connection]
            Query: 'select * from airlinesmall'
    VariableNames: {1×29 cell}
         ReadSize: 10000
```

`dbds` contains these properties:

- `Connection` -- Database connection object
- `Query` -- Executed SQL query
- `VariableNames` -- List of column names from the executed SQL query
- `ReadSize` -- Maximum number of records to read from the executed SQL query

Display the database connection property.

```
dbds.Connection
```

```
ans =

  connection with properties:

                  DataSource: 'toy_store'
                    UserName: ''
                      Driver: 'com.microsoft.sqlserver.j ...'
                         URL: 'jdbc:sqlserver://dbtb04:5 ...'
                     Message: ''
                        Type: 'JDBC Connection Object'
  Database Properties:

                  AutoCommit: 'on'
                    ReadOnly: 'off'
                LoginTimeout: 0
      MaxDatabaseConnections: 0

  Catalog and Schema Information:

              DefaultCatalog: 'toy_store'
                    Catalogs: {'master', 'model', 'msdb' ... and 2 more}
                     Schemas: {'db_accessadmin', 'db_backupoperator', 'db_datareader' .
```

```
  Database and Driver Information:

        DatabaseProductName: 'Microsoft SQL Server'
     DatabaseProductVersion: '11.00.2100'
                 DriverName: 'Microsoft JDBC Driver 4.0 ...'
              DriverVersion: '4.0.2206.100'
```

The `Message` property is blank when the database connection is successful.

Close the `DatabaseDatastore` object and the database connection.

```
close(dbds)
```

Create `DatabaseDatastore` Object with Specific Record Count

Using a JDBC driver, create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The code assumes that you are connecting to database `toy_store`, database server `dbtb04`, and port number `54317`.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Create a `DatabaseDatastore` object using a database connection and SQL query. This SQL query retrieves all data from table. Specify reading a maximum of 1000 records from the executed SQL query when using the `read` function. `databaseDatastore` executes the SQL query.

```
sqlquery = 'select * from airlinesmall';

dbds = databaseDatastore(conn,sqlquery,'ReadSize',1000)


dbds =

  DatabaseDatastore with properties:

      Connection: [1×1 database.jdbc.connection]
           Query: 'select * from airlinesmall'
    VariableNames: {1×29 cell}
```

```
        ReadSize: 1000
```

`dbds` contains these properties:

- `Connection` -- Database connection object
- `Query` -- Executed SQL query
- `VariableNames` -- List of column names from the executed SQL query
- `ReadSize` -- Maximum number of records to read from the executed SQL query

Display the database connection property.

```
dbds.Connection
```

```
ans =

  connection with properties:

                 DataSource: 'toy_store'
                   UserName: ''
                     Driver: 'com.microsoft.sqlserver.j ...'
                        URL: 'jdbc:sqlserver://dbtb04:5 ...'
                    Message: ''
                       Type: 'JDBC Connection Object'
  Database Properties:

                 AutoCommit: 'on'
                   ReadOnly: 'off'
               LoginTimeout: 0
    MaxDatabaseConnections: 0

  Catalog and Schema Information:

             DefaultCatalog: 'toy_store'
                   Catalogs: {'master', 'model', 'msdb' ... and 2 more}
                    Schemas: {'db_accessadmin', 'db_backupoperator', 'db_datareader' .

  Database and Driver Information:

        DatabaseProductName: 'Microsoft SQL Server'
    DatabaseProductVersion: '11.00.2100'
                DriverName: 'Microsoft JDBC Driver 4.0 ...'
```

```
DriverVersion: '4.0.2206.100'
```

The `Message` property is blank when the database connection is successful.

Close the `DatabaseDatastore` object and the database connection.

```
close(dbds)
```

- “Import Large Data Using DatabaseDatastore Object” on page 5-63
- “Analyze Large Data in Database Using Tall Arrays”
- “Analyze Large Data in Database Using MapReduce”

See Also

`database` | `exec`

Topics

“Import Large Data Using DatabaseDatastore Object” on page 5-63
“Analyze Large Data in Database Using Tall Arrays”
“Analyze Large Data in Database Using MapReduce”
“Getting Started with Datastore” (MATLAB)
“Getting Started with MapReduce” (MATLAB)

Introduced in R2014b

datainsert

Export MATLAB data into database table

Syntax

```
datainsert(conn,tablename,colnames,data)
```

Description

`datainsert(conn,tablename,colnames,data)` exports data from the MATLAB workspace and inserts it into existing columns of a database table using the database connection `conn`.

Examples

Export MATLAB Cell Array Data

Use an ODBC connection and a cell array to export inventory data from MATLAB into a MySQL database table.

Create a database connection `conn` to the MySQL database using the native ODBC interface. Here, this code assumes that you are connecting to an ODBC data source named `MySQL` with a user name and password. This database contains the table `inventoryTable` with these columns:

- `productNumber`
- `Quantity`
- `Price`
- `inventoryDate`

```
conn = database('MySQL','username','pwd');
```

Display the last rows in `inventoryTable` before inserting data.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    ...
    [14]    [2000]    [19.1000]    '2014-10-22 10:52...'
    [15]    [1200]    [20.3000]    '2014-10-22 10:52...'
    [16]    [1400]    [34.3000]    '1999-12-31 00:00...'
```

Create a cell array of column names for the database table `inventoryTable`.

```
colnames = {'productNumber','Quantity','Price','inventoryDate'};
```

Define a cell array of input data to insert.

```
data = {50 100 15.50 datestr(now,'yyyy-mm-dd HH:MM:SS')};
```

Insert the input data into the table `inventoryTable` using the database connection.

```
tablename = 'inventoryTable';

datainsert(conn,tablename,colnames,data)
```

Display the inserted data in `inventoryTable`.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    ...
    [15]    [1200]    [20.3000]    '2014-10-22 10:52...'
    [16]    [1400]    [34.3000]    '1999-12-31 00:00...'
    [50]    [ 100]    [15.5000]    '2014-10-22 11:29...'
```

The last row contains the inserted data.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Export MATLAB Table Data

Use a JDBC connection and a MATLAB table to export inventory data from MATLAB into a MySQL database table.

Create a database connection `conn` to the MySQL database using the JDBC driver. Use the `Vendor` name-value pair argument of the `database` function to specify a connection to a MySQL database. Here, this code assumes that you are connecting to a database named `dbname` on a database server named `sname` with a user name and password. This database contains the table `inventoryTable` with these columns:

- `productNumber`
- `Quantity`
- `Price`
- `inventoryDate`

```
conn = database('dbname','username','pwd', ...
    'Vendor','MySQL', ...
    'Server','sname');
```

Display the last rows in `inventoryTable` before inserting data.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    ...
    [14]    [2000]    [19.1000]    '2014-10-22 10:52...'
    [15]    [1200]    [20.3000]    '2014-10-22 10:52...'
    [16]    [1400]    [34.3000]    '1999-12-31 00:00...'
```

Create a cell array of column names for the database table `inventoryTable`.

```
colnames = {'productNumber','Quantity','Price','inventoryDate'};
```

Define the input data as a table.

```
data = table(50,100,15.50,{datestr(now,'yyyy-mm-dd HH:MM:SS')}, ...
    'VariableNames',colnames);
```

Insert the input data into the table `inventoryTable` using the database connection.

```
tablename = 'inventoryTable';

datainsert(conn,tablename,colnames,data)
```

Display the inserted data in `inventoryTable`.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    ...
    [15]    [1200]    [20.3000]    '2014-10-22 10:52...'
    [16]    [1400]    [34.3000]    '1999-12-31 00:00...'
    [50]    [ 100]    [15.5000]    '2014-10-22 11:29...'
```

The last row contains the inserted data.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Export MATLAB Structure Data

Use an ODBC connection and a MATLAB structure to export inventory data from MATLAB into a MySQL database table.

Create a database connection `conn` to the MySQL database using the native ODBC interface. Here, this code assumes that you are connecting to an ODBC data source named `MySQL` with a user name and password. This database contains the table `inventoryTable` with these columns:

- productNumber
- Quantity
- Price
- inventoryDate

```
conn = database('MySQL','username','pwd');
```

Display the last rows in `inventoryTable` before inserting data.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    ...
    [14]    [2000]    [19.1000]    '2014-10-22 10:52...'
    [15]    [1200]    [20.3000]    '2014-10-22 10:52...'
    [16]    [1400]    [34.3000]    '1999-12-31 00:00...'
```

Create a cell array of column names for the database table `inventoryTable`.

```
colnames = {'productNumber','Quantity','Price','inventoryDate'};
```

Define the input data as a structure.

```
data = struct('productNumber',50,'Quantity',100,'Price',15.50, ...
    'inventoryDate',datestr(now,'yyyy-mm-dd HH:MM:SS'));
```

Insert the input data into the table `inventoryTable` using the database connection.

```
tablename = 'inventoryTable';

datainsert(conn,tablename,colnames,data)
```

Display the inserted data in `inventoryTable`.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    ...
```

```
    [15]    [1200]    [20.3000]    '2014-10-22 10:52...'
    [16]    [1400]    [34.3000]    '1999-12-31 00:00...'
    [50]    [ 100]    [15.5000]    '2014-10-22 11:29...'
```

The last row contains the inserted data.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Export MATLAB Numeric Matrix Data

Use a JDBC connection and a numeric matrix to export sales data from MATLAB into a MySQL database table.

Create a database connection `conn` to the MySQL database using the JDBC driver. Use the `Vendor` name-value pair argument of `database` to specify a connection to a MySQL database. Here, this code assumes that you are connecting to a database named `dbname` on a database server named `sname` with a user name and password. This database contains the table `salesVolume` with the column `stockNumber` and columns for each month of the year.

```
conn = database('dbname','username','pwd', ...
    'Vendor','MySQL', ...
    'Server','sname');
```

Display the last rows in `salesVolume` before inserting data.

```
curs = exec(conn,'SELECT * FROM salesVolume');
curs = fetch(curs);
curs.Data
```

```
ans =

  Columns 1 through 8

    ...
    [470816]    [3100]    [9400]    [1540]    [1500]    [1350]    [1190]    [ 900]
    [510099]    [ 235]    [1800]    [1040]    [ 900]    [ 750]    [ 700]    [ 400]
    [899752]    [ 123]    [1700]    [ 823]    [ 701]    [ 689]    [ 621]    [ 545]
```

```
  Columns 9 through 13

    ...
    [867]    [ 923]    [1400]    [ 3000]    [35000]
    [350]    [ 500]    [ 100]    [ 3000]    [18000]
    [421]    [ 495]    [ 650]    [ 4200]    [11000]
```

Create a cell array of column names for the database table `salesVolume`.

```
colnames = {'stockNumber','January','February' ...
    'March','April','May', ...
    'June','July','August', ...
    'September','October','November', ...
    'December'};
```

Define the numeric matrix `data` that contains the sales volume data.

```
data = [777666,0,350,400,450,250,450,500,515, ...
    235,100,300,600];
```

Insert the contents of `data` into the table `salesVolume` using the database connection.

```
tablename = 'salesVolume';

datainsert(conn,tablename,colnames,data)
```

Display the inserted data in `salesVolume`.

```
curs = exec(conn,'SELECT * FROM salesVolume');
curs = fetch(curs);
curs.Data
```

```
ans =

  Columns 1 through 8

    ...
    [510099]    [ 235]    [1800]    [1040]    [ 900]    [ 750]    [ 700]    [ 400]
    [899752]    [ 123]    [1700]    [ 823]    [ 701]    [ 689]    [ 621]    [ 545]
    [777666]    [   0]    [ 350]    [ 400]    [ 450]    [ 250]    [ 450]    [ 500]

Columns 9 through 13

    ...
    [350]    [ 500]    [ 100]    [ 3000]    [18000]
    [421]    [ 495]    [ 650]    [ 4200]    [11000]
    [515]    [ 235]    [ 100]    [  300]    [  600]
```

The last row contains the inserted data.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```


- “Export Data to New Record in Database” on page 5-20
- “Export Multiple Records from MATLAB Workspace” on page 5-26
- “Export Data Using Bulk Insert” on page 5-31
- “Replace Existing Data in Database” on page 5-24
- “Roll Back Data After Updating Record” on page 5-17

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`tablename` — Database table name

character vector | string scalar

Database table name, specified as a character vector or string scalar denoting the name of a table in your database.

Data Types: `char` | `string`

`colnames` — Database table column names

cell array of character vectors | string array

Database table column names, specified as a cell array of one or more character vectors or string array to denote the columns in the existing database table `tablename`.

Example: `{'col1','col2','col3'}`

Data Types: `cell` | `string`

`data` — Insert data

cell array | numeric matrix | table | structure | dataset

Insert data, specified as a cell array, numeric matrix, table, structure, or dataset array.

If you are connecting to a database using a JDBC driver, then convert the insert data to a supported format before running `datainsert`. If `data` contains MATLAB dates, times, or timestamps, use this formatting:

- Dates must be character vectors of the form `yyyy-mm-dd`.
- Times must be character vectors of the form `HH:MM:SS`.
- Timestamps must be character vectors of the form `yyyy-mm-dd HH:MM:SS.FFF`.

The database preference settings `NullNumberWrite` and `NullStringWrite` do not apply to this function. If `data` contains `null` entries and `NaN`s, convert these entries to an empty value `''`.

The `datainsert` function supports inserting MATLAB date numbers and `NaN`s when `data` is a numeric matrix. Date numbers inserted into database date and time columns convert to `java.sql.Date`. Upon insertion into the target database, any converted date and time data accurately reverts to the native database format.

If `data` is a structure, then field names in the structure must match `colnames`.

If `data` is a table or a dataset array, then the variable names in the table or dataset array must match `colnames`.

Tips

- When you establish a database connection using a JDBC driver, `datainsert` performs faster than `fastinsert`.
- `datainsert` uses the SQL `TRANSACTION` statement to insert records with faster performance for these databases:
  - Microsoft SQL Server
  - MySQL
  - Oracle
  - PostgreSQL

  For other databases, refer to your database documentation to start a transaction manually. Before running `datainsert`, use `exec` to start the transaction.

- The value of the `AutoCommit` property in the `connection` object determines whether `datainsert` automatically commits the data to the database.
  - To view the `AutoCommit` value, access it using the `connection` object; for example, `conn.AutoCommit`.
  - To set the `AutoCommit` value, use the corresponding name-value pair argument in the `database` function.
  - To commit the data to the database, use the `commit` function or issue an SQL `COMMIT` statement using the `exec` function.
  - To roll back the data, use `rollback` or issue an SQL `ROLLBACK` statement using the `exec` function.

Alternative Functionality

To export MATLAB data into a database, you can use the `fastinsert` and `insert` functions. For maximum performance, use `datainsert`.

For other differences among these functions, see “Inserting Data Using Command Line” on page 2-146.

See Also

`close` | `database` | `fastinsert` | `insert` | `select`

Topics

“Export Data to New Record in Database” on page 5-20
“Export Multiple Records from MATLAB Workspace” on page 5-26
“Export Data Using Bulk Insert” on page 5-31
“Replace Existing Data in Database” on page 5-24
“Roll Back Data After Updating Record” on page 5-17
“Inserting Data Using Command Line” on page 2-146
“Data Type Support” on page 1-3

External Websites

SQL Tutorial

Introduced in R2011a

Database Explorer

Configure, explore, and import database data

Description

The **Database Explorer** app lets you quickly connect to a database, explore the database data, and import data into the MATLAB workspace in a visual way. If you have minimal proficiency writing SQL queries or want to browse the data in your database quickly, use this app to interact with your database.

You can:

- Create and configure ODBC and JDBC data sources.
- Establish multiple connections to the same or different databases.
- Select tables and columns of interest.
- Fine-tune selection using SQL query criteria.
- Preview selected data.
- Import selected data into the MATLAB workspace for analysis.
- Save generated SQL queries.
- Generate MATLAB code.

To watch an introductory video, see Using the Database Explorer App.

Open the Database Explorer App

- MATLAB Toolstrip: On the **Apps** tab, click the **Show more** arrow to open the apps gallery. Then, under **Database Connectivity and Reporting**, click **Database Explorer**.
- MATLAB command prompt: Enter `databaseExplorer`.

Examples

Preview Rows in Single Table

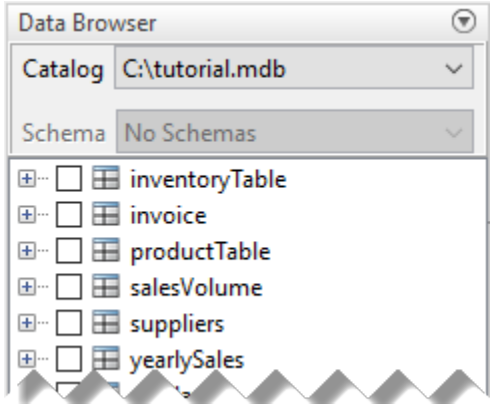
Connect to a Microsoft Access database using the Database Explorer app. Then, select columns from a single table and preview the data. The Database Explorer app previews query results by default.

Set up the data source for the `tutorial.mdb` database and name it `dbdemo`. For details, see "Microsoft Access ODBC for Windows" on page 2-18.

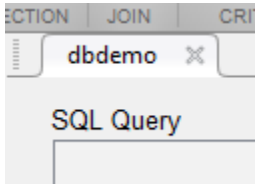
In the **Data Source** section of the **Database Explorer** tab, click **New Query**. The Connect to a Data Source dialog box opens. Select `dbdemo` from the **Data Source** list. Leave the user name and password blank, and click **Connect**.

Note For other databases, the Catalog and Schema dialog box opens. Select the name of the catalog and schema from the **Catalog** and **Schema** lists, as appropriate for your database.

The Database Explorer app creates a connection to the Microsoft Access database. The **Data Browser** pane displays the available tables in the database.



The data source tab, which is named **dbdemo**, appears to the right of the **Data Browser** pane. The data source tab contains two empty panes, **SQL Query** and **Data Preview**.



For any table, you can select the table information in these ways:

- To select tables, click the database table name in the **Data Browser** pane. The Database Explorer app updates the **SQL Query** pane with an SQL query that selects all columns and rows from the chosen table. Simultaneously, the Database Explorer app updates the **Data Preview** pane with a preview of the query results. The first 10 rows of data appear in the **Data Preview** pane by default.
- To select individual columns from a selected table, expand the table name node in the **Data Browser** tree view. Select specific check boxes to choose individual table columns and display them in the **Data Preview** pane. The SQL query adjusts to each selection automatically.

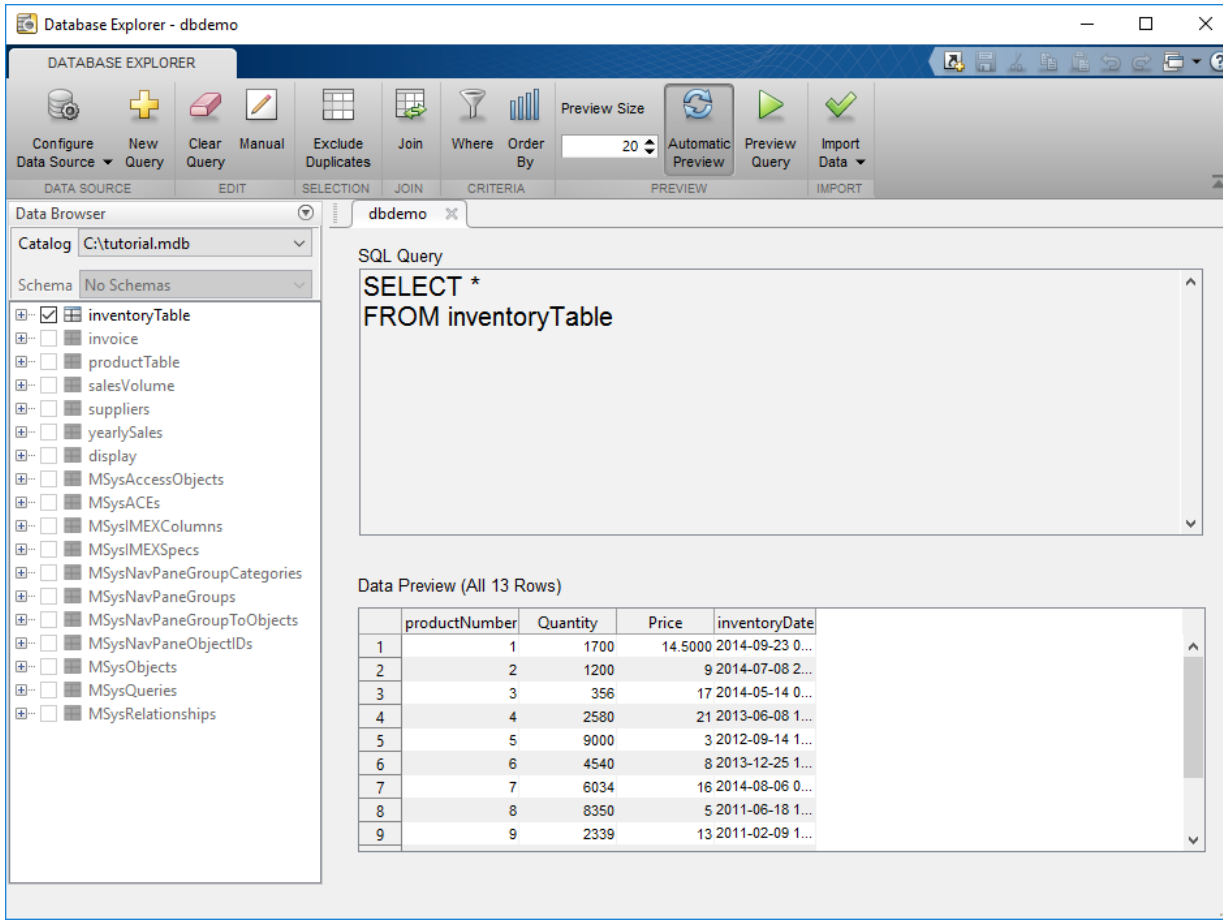
Note The order of the columns in the **Data Preview** pane matches the order in which you select them in the **Data Browser** pane.

Select the table name **inventoryTable**.

To change the data you see, select or clear check boxes in the **Data Browser** pane. The SQL query updates in the **SQL Query** pane. The data updates in the **Data Preview** pane.

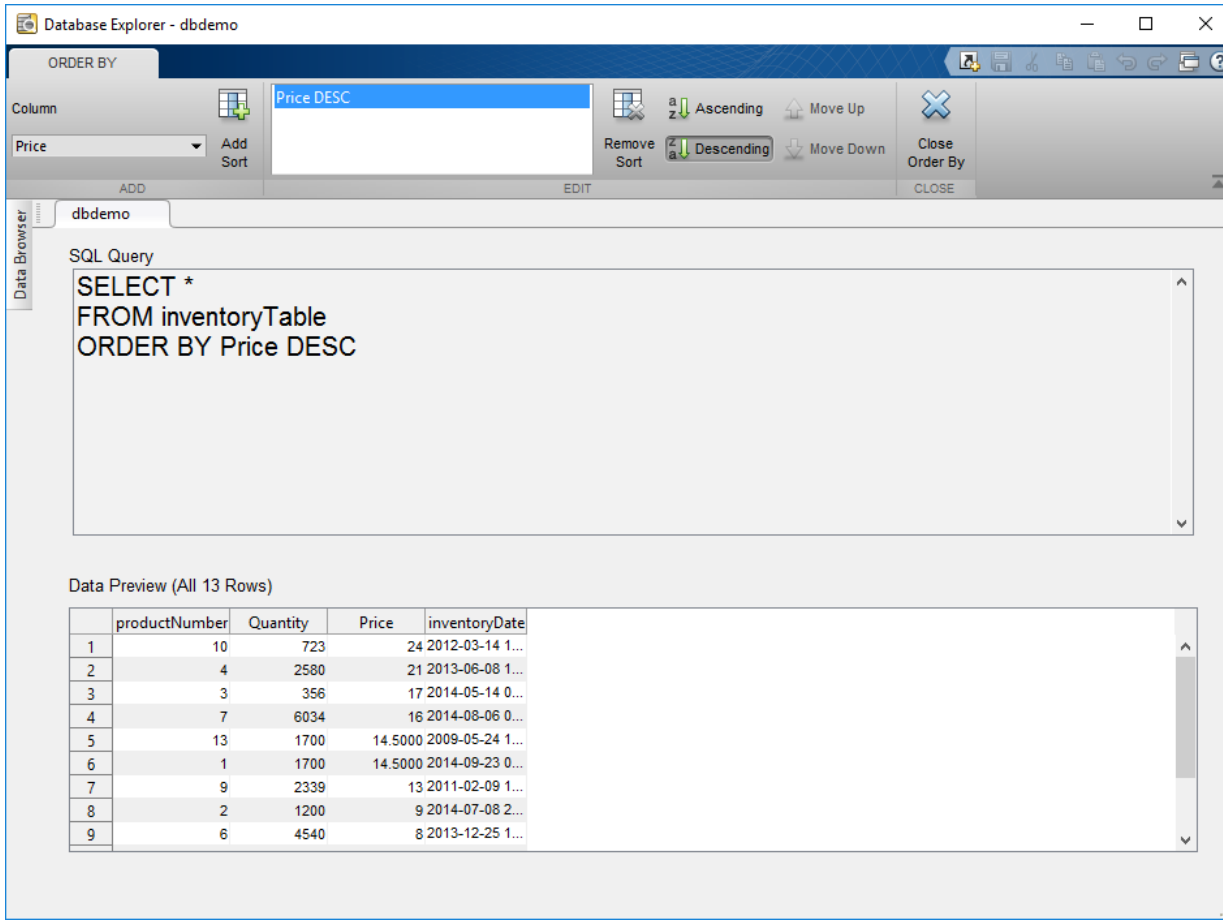
The **Data Preview** pane displays 10 rows. The total number of rows selected in the database appears, within parentheses, next to the name of the pane, **Data Preview**. Change the number of rows by selecting or entering a value in the **Preview Size** box in the **Preview** section of the **Database Explorer** tab. Select the value `20`. The number of rows adjusts in the **Data Preview** pane.

Note The value in the **Preview Size** box controls the maximum number of rows displayed in the **Data Preview** pane. If this value is larger than the total number of rows in the query results, then the total number of rows is displayed, within parentheses, next to the name of the pane, **Data Preview**.

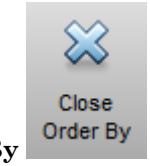


You can sort the rows of data by a specific column. In the **Criteria** section, click **Order By**. The **Order By** tab is displayed in the toolstrip.

In the **Add** section, in the **Column** list, select the column `Price`. In the **Add** section, click **Add Sort**. The Database Explorer app sorts the data in ascending order in the **Data Preview** pane. To change the order, click **Descending** in the **Edit** section.



Note To add more sorts, select another column from the **Column** list and click **Add Sort**. You can change the position of the sort in the SQL query by clicking it in the list in the **Edit** section, and then clicking **Move Up** or **Move Down**.

In the **Close** section, click **Close Order By** 

to close the **Order By** tab.

Close the database connection by closing the data source tab.

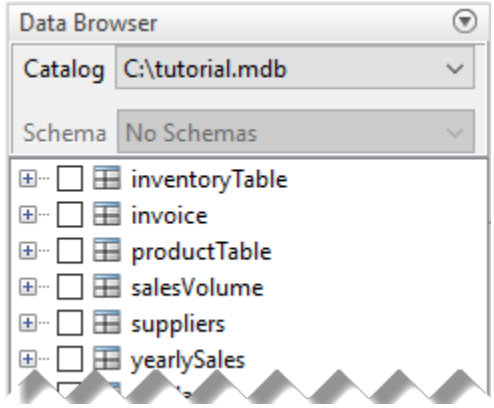
Join Multiple Tables and Import Query Results

Connect to a Microsoft Access database using the Database Explorer app. Then, select columns from multiple tables. The Database Explorer app previews query results by default. After previewing the data, import all query results into the MATLAB workspace and perform simple data analysis.

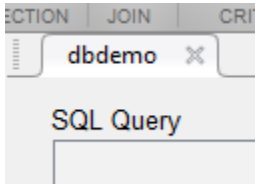
Set up the data source for the `tutorial.mdb` database and name it `dbdemo`. For details, see "Microsoft Access ODBC for Windows" on page 2-18.

In the **Data Source** section of the **Database Explorer** tab, click **New Query**. The Connect to a Data Source dialog box opens. Select `dbdemo` from the **Data Source** list. Leave the user name and password blank, and click **Connect**.

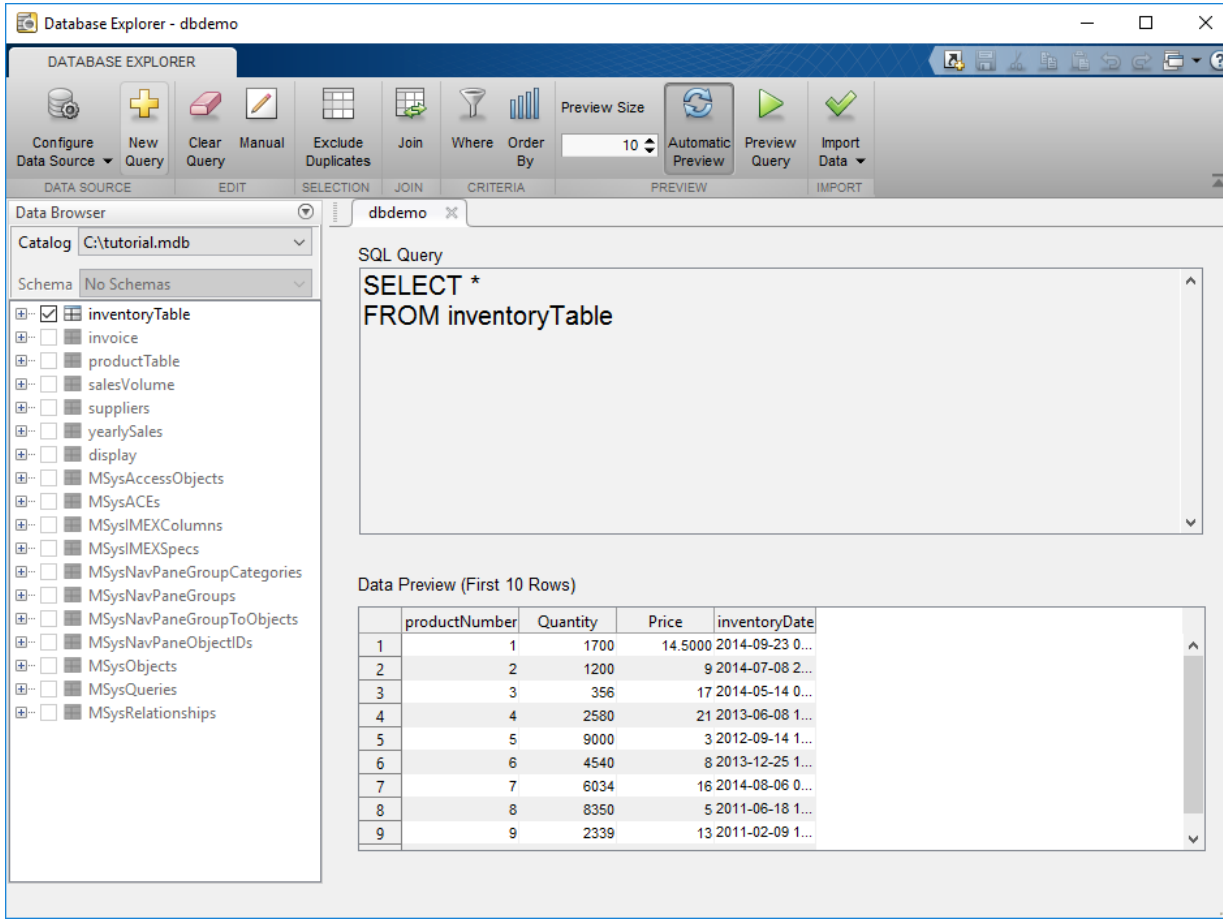
The Database Explorer app creates a connection to the Microsoft Access database. The **Data Browser** pane displays the available tables in the database.



The data source tab, which is named **dbdemo**, appears to the right of the **Data Browser** pane. The data source tab contains two empty panes, **SQL Query** and **Data Preview**.

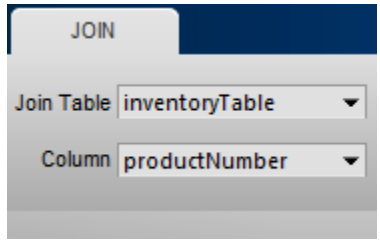


In the **Data Browser** pane, select the **inventoryTable** table as the first table for the join. The Database Explorer app updates the **SQL Query** pane with an SQL query that selects all columns and rows from the **inventoryTable** table. Simultaneously, the Database Explorer app updates the **Data Preview** pane with a preview of the query results. The first 10 rows of data appear in the pane by default.

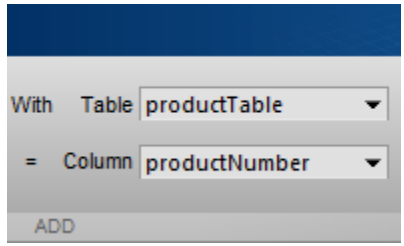


In the **Join** section, click **Join** to display the **Join** tab in the toolstrip. In the **Add** section, the name of the table selected in the **Data Browser** pane appears in the left **Table** list. For details about joining tables, see “Join Tables Using Database Explorer App” on page 4-6.

In the left **Column** list, select the name of the shared column `productNumber`.



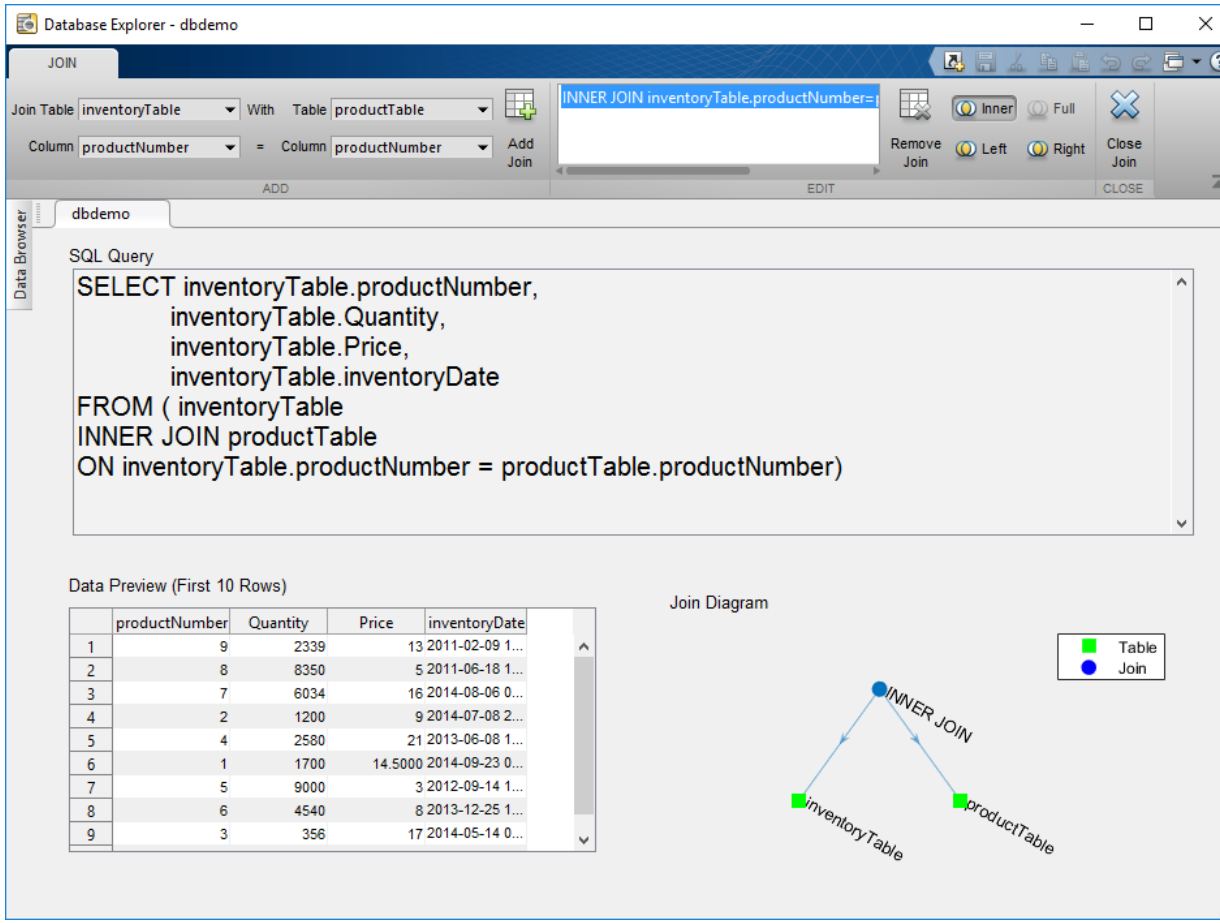
In the right **Table** list, select the table `productTable` as the table to join. Select the name of the shared column `productNumber` in this table in the right **Column** list.

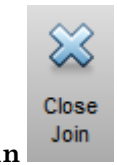


In the **Add** section, click **Add Join**. The **Join Diagram** pane displays a pictorial representation of the join between the selected tables. The **SQL Query** pane updates the SQL query with the new join. The **Data Preview** pane reflects the results of the updated SQL query.

The Database Explorer app selects the inner join by default.

Note Some databases do not support all join types.



In the **Close** section, click **Close Join** 

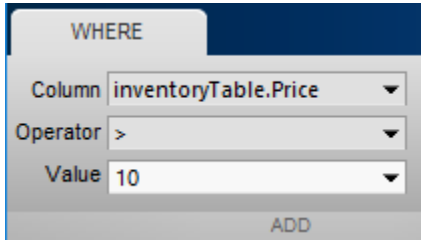
to close the **Join** tab.

In the tree view of the **Data Browser** pane, select **productDescription** under **productTable**. The **SQL Query** and **Data Preview** panes update with the selected table column.

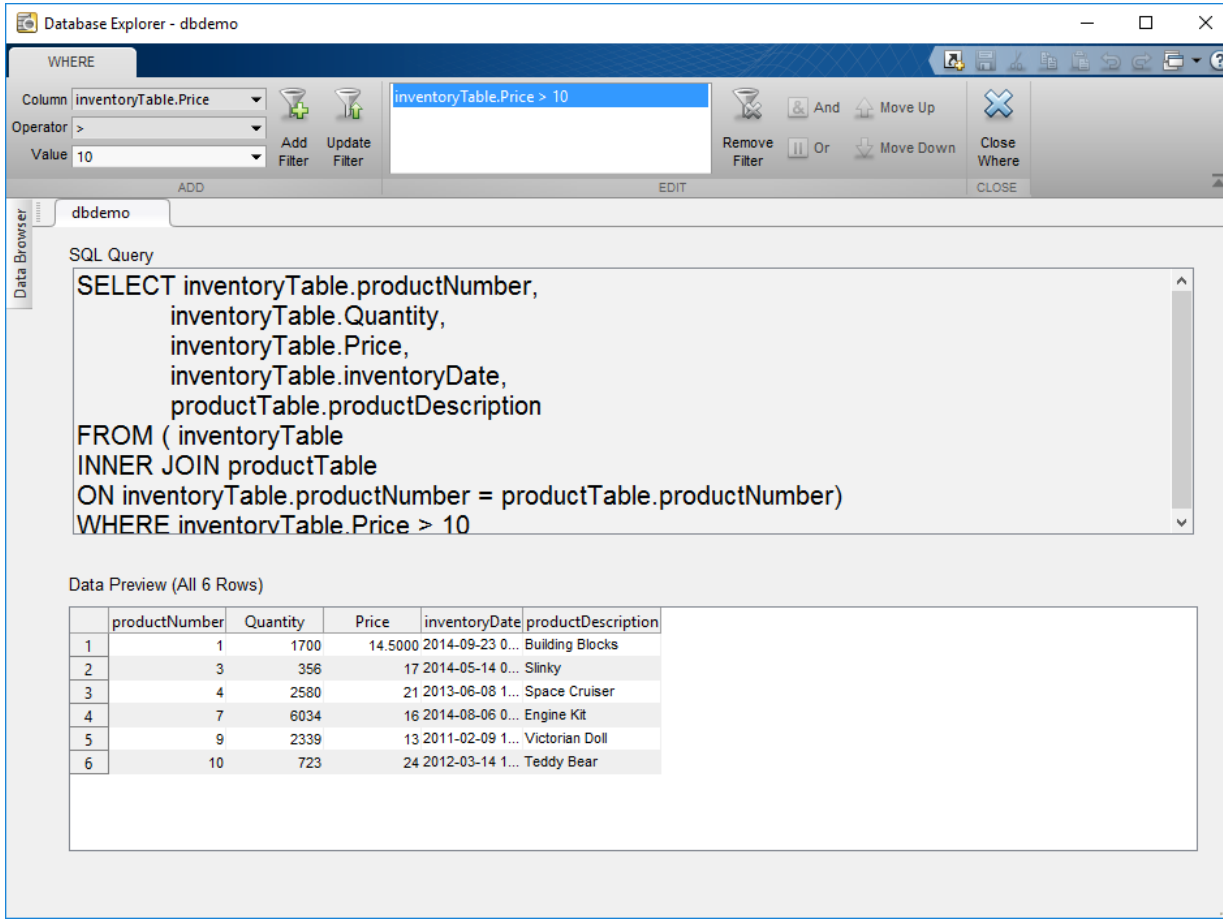
Add filter criteria to the SQL query. In the **Criteria** section, click **Where** to display the **Where** tab in the toolstrip.

Filter the SQL query results for prices greater than $10. In the **Add** section, in the **Column** list, select `inventoryTable.Price`. Select the > operator for the filter in the **Operator** list. Enter `10` in the **Value** list. Click **Add Filter**.

Note If you enter filters using the `LIKE` or `NOT LIKE` operators, then enter the value in single quotes to represent a string.



The **SQL Query** and **Data Preview** panes display the updated query results based on the new filter with the `WHERE` condition.



In the **Close** section, click **Close Where** 

to close the **Where** tab.

Import all SQL query results into the MATLAB workspace. In the **Import** section, click  . In the Import Data dialog box, enter the name `data` for the MATLAB workspace variable, and click **OK**. The MATLAB workspace displays the table `data`.

Display the SQL query results at the command line.

```
data
```

```
data =

  6×5 table

    productNumber    Quantity    Price        inventoryDate         productDescription
    _____________    ________    _____    ____________________    __________________

     1               1700        14.5     '2014-09-23 09:38:34'    'Building Blocks'
     3                356          17     '2014-05-14 07:14:28'    'Slinky'
     4               2580          21     '2013-06-08 14:24:33'    'Space Cruiser'

    ...
```

Find the maximum product price.

```
max(data.Price)
```

```
ans =

     24
```

Close the database connection by closing the data source tab.

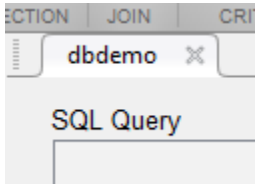
Join Tables Using Left Join and Import Query Results

Connect to a Microsoft Access database using the Database Explorer app. Then, create an SQL query that joins two tables using a left join. The Database Explorer app previews query results by default. After previewing the data, import all query results into the MATLAB workspace and perform simple data analysis.

Set up the data source for the `tutorial.mdb` database and name it `dbdemo`. For details, see “Microsoft Access ODBC for Windows” on page 2-18.

In the **Data Source** section of the **Database Explorer** tab, click **New Query**. The Connect to a Data Source dialog box opens. Select `dbdemo` from the **Data Source** list. Leave the user name and password blank, and click **Connect**.

The Database Explorer app creates a connection to the Microsoft Access database. The **Data Browser** pane displays the available tables in the database. The data source tab, which is named **dbdemo**, appears to the right of the **Data Browser** pane. The data source tab contains two empty panes, **SQL Query** and **Data Preview**.



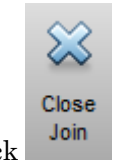
In the **Data Browser** pane, select the **suppliers** table as the first table for the join.

The Database Explorer app updates the **SQL Query** pane with an SQL query that selects all columns and rows from the **suppliers** table. Simultaneously, the Database Explorer app updates the **Data Preview** pane with a preview of the query results. The first 10 rows of data appear in the pane by default.

In the **Join** section, click **Join** to display the **Join** tab in the toolstrip. In the **Add** section, the name of the table selected in the **Data Browser** pane appears in the left **Table** list. For details about joining tables, see "Join Tables Using Database Explorer App" on page 4-6.

In the left **Column** list, select the name of the shared column `SupplierNumber`. In the right **Table** list, select the name `productTable` as the table to join. Select the name of the shared column `supplierNumber` in this table in the right **Column** list.

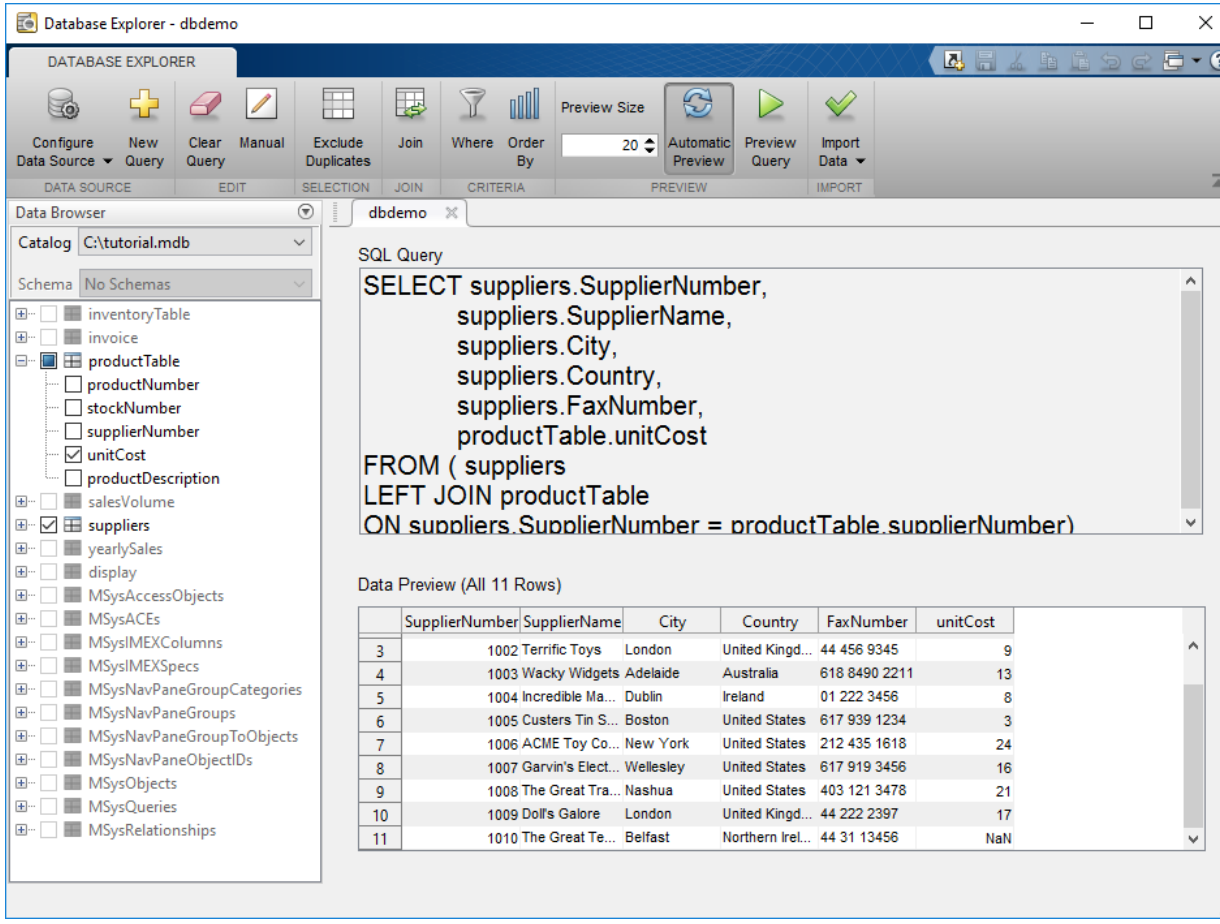
In the **Add** section, click **Add Join**. The Database Explorer app creates an inner join by default. In the **Edit** section, click **Left** to change the join from an inner join to a left join. The **Join Diagram** pane displays a pictorial representation of the join between the selected tables. The **SQL Query** pane updates the SQL query with the new join. The **Data Preview** pane reflects the results of the updated SQL query.

In the **Close** section, click 

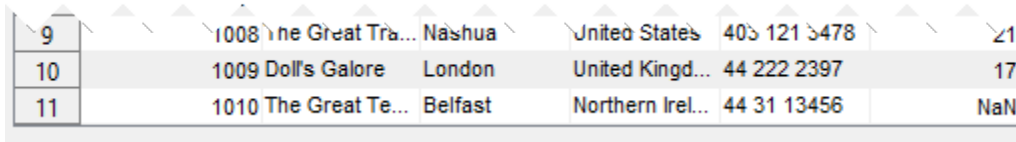
to close the **Join** tab.

Increase the number of rows displayed in the **Data Preview** pane. In the **Preview** section, enter `20` in the **Preview Size** box.

In the tree view of the **Data Browser** pane, select **unitCost** under **productTable**. The **Data Preview** pane updates with a new row.



The `NaN` value in the **unitCost** column indicates that the corresponding supplier does not supply products.



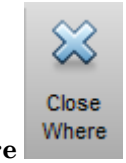
Add filter criteria to the SQL query. In the **Criteria** section, click **Where** to display the **Where** tab in the toolstrip.

Filter the SQL query results for products with a unit cost greater than $10. In the **Add** section, in the **Column** list, select the column name `productTable.unitCost`. Select the > operator for the filter in the **Operator** list. Enter `10` in the **Value** list. Click **Add Filter**.

Note If you enter filters using the `LIKE` or `NOT LIKE` operators, then enter the value in single quotes to represent a string.

The **SQL Query** and **Data Preview** panes display the updated query results based on the new filter with the `WHERE` condition.

Change the value of the filter from `10` to `20`. Click **Update Filter**. The **SQL Query** and **Data Preview** panes update with the results of the modified query.

In the **Close** section, click **Close Where** 

to close the **Where** tab.

Import all SQL query results into the MATLAB workspace. In the **Import** section, click  . In the Import Data dialog box, enter the name `data` for the MATLAB workspace variable, and click **OK**. The MATLAB workspace displays the table `data`.

Display the SQL query results at the command line.

```
data
```

```
data =

  2×6 table

    SupplierNumber          SupplierName              City          Country          FaxNumber        unitCost
    ______________    ____________________________    _________    _____________    ______________    ________

    1008              'The Great Train Company'     'Nashua'     'United States'    '403 121 3478'    21
    1006              'ACME Toy Company'            'New York'   'United States'    '212 435 1618'    24
```

Find the maximum product price.

```
max(data.unitCost)
```

```
ans =

    24
```

Close the database connection by closing the data source tab.

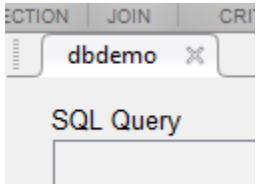
Sort Query Results

Connect to a Microsoft Access database using the Database Explorer app. Create a simple SQL query and sort the results by the data in one column. The Database Explorer app previews query results by default. Then, import the sorted data into the MATLAB workspace.

Set up the data source for the `tutorial.mdb` database and name it `dbdemo`. For details, see “Microsoft Access ODBC for Windows” on page 2-18.

In the **Data Source** section of the **Database Explorer** tab, click **New Query**. The Connect to a Data Source dialog box opens. Select `dbdemo` from the **Data Source** list. Leave the user name and password blank, and click **Connect**.

The Database Explorer app creates a connection to the Microsoft Access database. The **Data Browser** pane displays the available tables in the database. The data source tab, which is named **dbdemo**, appears to the right of the **Data Browser** pane. The data source tab contains two empty panes, **SQL Query** and **Data Preview**.

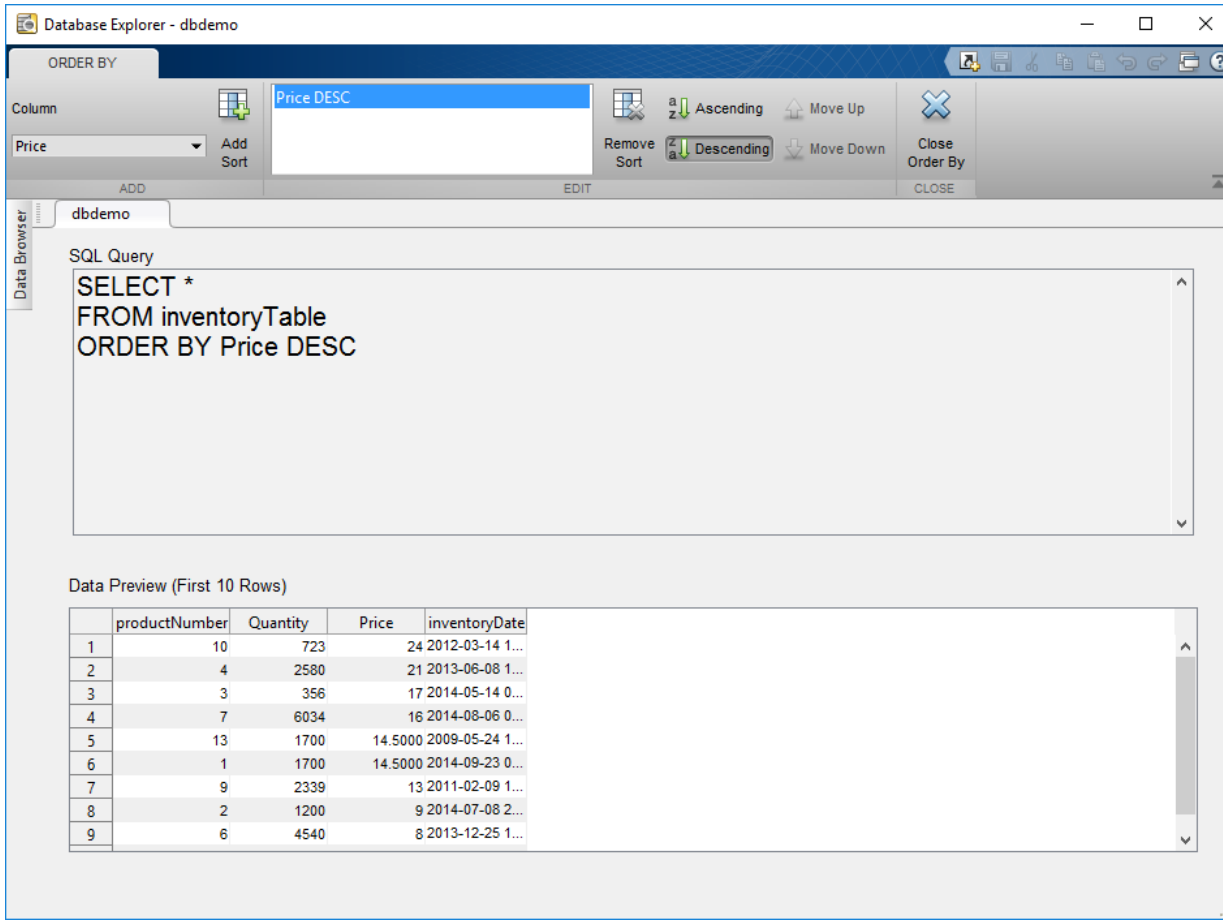


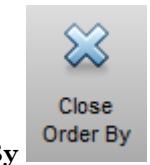
In the **Data Browser** pane, select the **inventoryTable** table. The **SQL Query** pane displays the SQL query that selects all columns and rows from this table. The **Data Preview** pane displays the first 10 rows of the query results.

Sort the results of the SQL query. In the **Criteria** section, click **Order By** to display the **Order By** tab in the toolstrip.

In the **Add** section, in the **Column** list, select the `Price` column. Click **Add Sort**.

In the **Edit** section, click **Descending** to sort the prices in decreasing order. The **Data Preview** pane displays the updated query results with sorted prices.



In the **Close** section, click **Close Order By** 

to close the **Order By** tab.

Import all SQL query results into the MATLAB workspace. In the **Import** section, click  . In the Import Data dialog box, enter the name `data` for the MATLAB workspace variable, and click **OK**. The MATLAB workspace displays the table `data`.

Close the database connection by closing the data source tab.

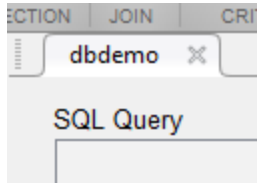
Filter Query Results

Connect to a Microsoft Access database using the Database Explorer app. Create a simple SQL query and filter the results. Use a text filter to retrieve specific rows of data. The Database Explorer app previews query results by default. Then, import the filtered data into the MATLAB workspace.

Set up the data source for the `tutorial.mdb` database and name it `dbdemo`. For details, see “Microsoft Access ODBC for Windows” on page 2-18.

In the **Data Source** section of the **Database Explorer** tab, click **New Query**. The Connect to a Data Source dialog box opens. Select `dbdemo` from the **Data Source** list. Leave the user name and password blank, and click **Connect**.

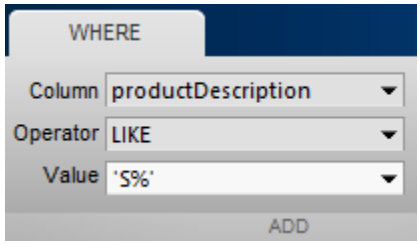
The Database Explorer app creates a connection to the Microsoft Access database. The **Data Browser** pane displays the available tables in the database. The data source tab, which is named **dbdemo**, appears to the right of the **Data Browser** pane. The data source tab contains two empty panes, **SQL Query** and **Data Preview**.



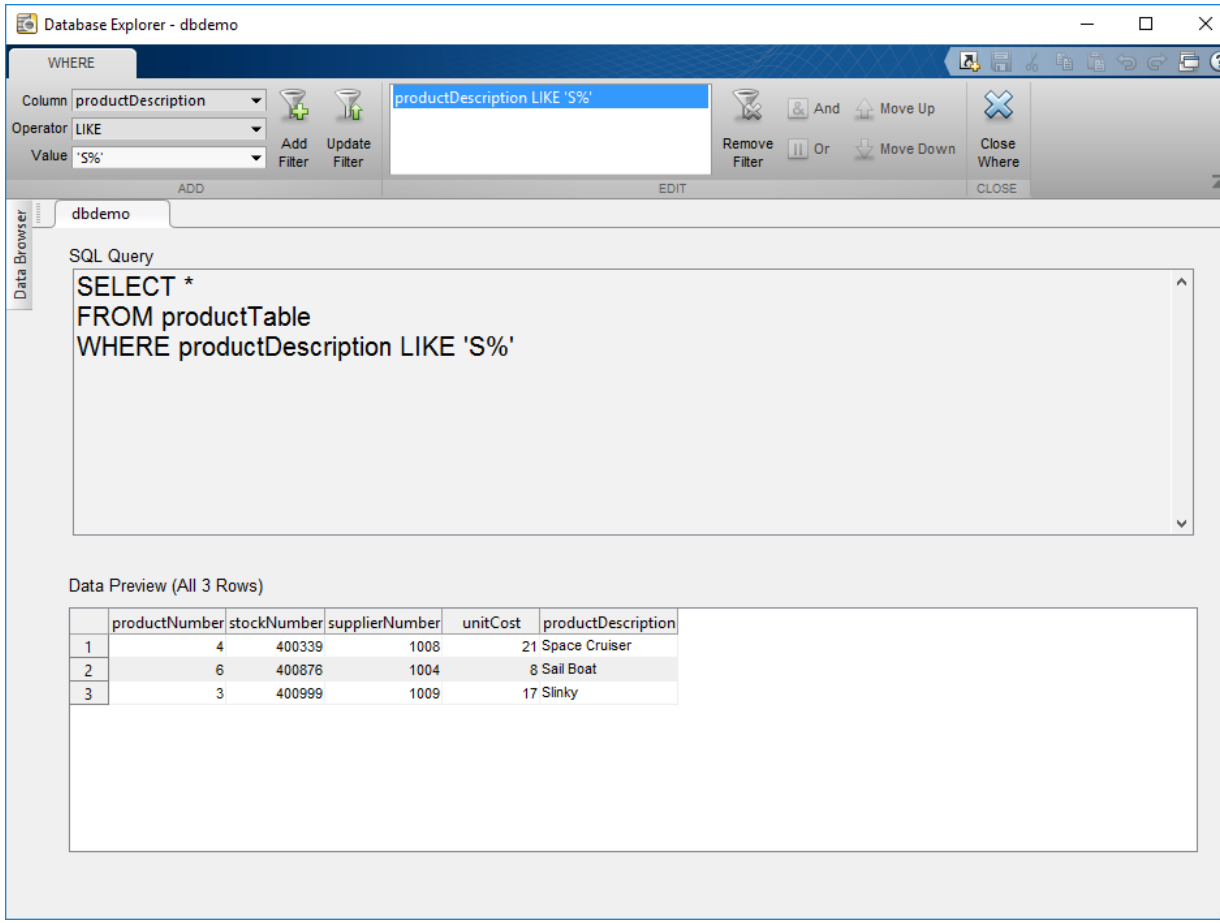
In the **Data Browser** pane, select the **productTable** table. The **SQL Query** pane displays the SQL query that selects all columns and rows from this table. The **Data Preview** pane displays the first 10 rows of the query results.

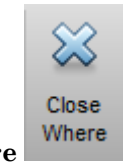
Add filter criteria to the SQL query. In the **Criteria** section, click **Where** to display the **Where** tab in the toolstrip.

Filter for products with a product description that starts with the letter `S`. In the **Add** section, in the **Column** list, select `productDescription`. In the **Operator** list, select `LIKE`. To filter for text, enclose the text in single quotes. In the **Value** list, enter `'S%'`.



Click **Add Filter**. The **Data Preview** pane displays three rows of data. The product description in each row starts with the letter `S`.



In the **Close** section, click **Close Where** 

to close the **Where** tab.

Import all SQL query results into the MATLAB workspace. In the **Import** section, click  . In the Import Data dialog box, enter the name `data` for the MATLAB workspace variable, and click **OK**. The MATLAB workspace displays the table `data`.

Close the database connection by closing the data source tab.

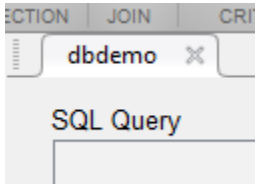
Remove Duplicate Rows from Query Results

Connect to a Microsoft Access database using the Database Explorer app. Create a simple SQL query and remove duplicate rows from the query results. The Database Explorer app previews query results by default. After removing duplicates, import the data into the MATLAB workspace.

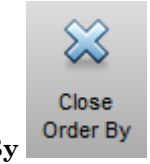
Set up the data source for the `tutorial.mdb` database and name it `dbdemo`. For details, see "Microsoft Access ODBC for Windows" on page 2-18.

In the **Data Source** section of the **Database Explorer** tab, click **New Query**. The Connect to a Data Source dialog box opens. Select `dbdemo` from the **Data Source** list. Leave the user name and password blank, and click **Connect**.

The Database Explorer app creates a connection to the Microsoft Access database. The **Data Browser** pane displays the available tables in the database. The data source tab, which is named **dbdemo**, appears to the right of the **Data Browser** pane. The data source tab contains two empty panes, **SQL Query** and **Data Preview**.

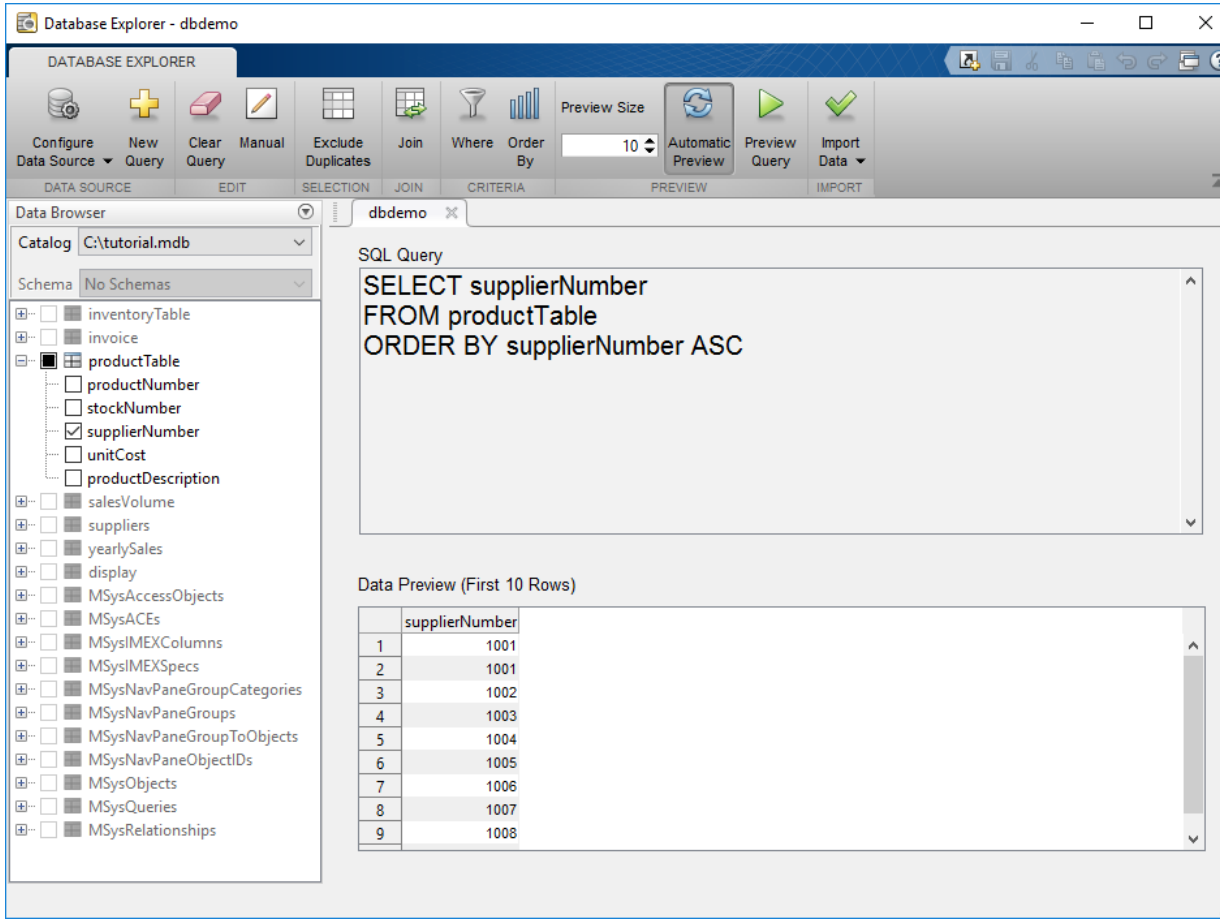


Sort the results of the SQL query. In the **Criteria** section, click **Order By** to display the **Order By** tab in the toolstrip. In the **Add** section, in the **Column** list, select the `supplierNumber` column, and click **Add Sort**.

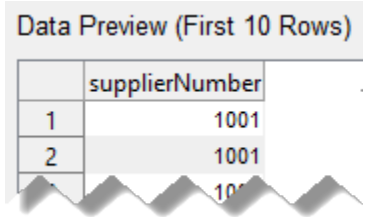
In the **Close** section, click **Close Order By** 

to close the **Order By** tab.

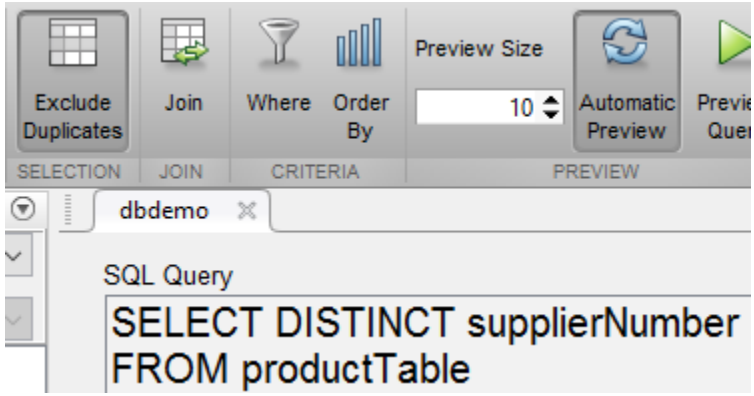
The **Data Preview** pane displays the rows sorted in increasing order, which is the default order.



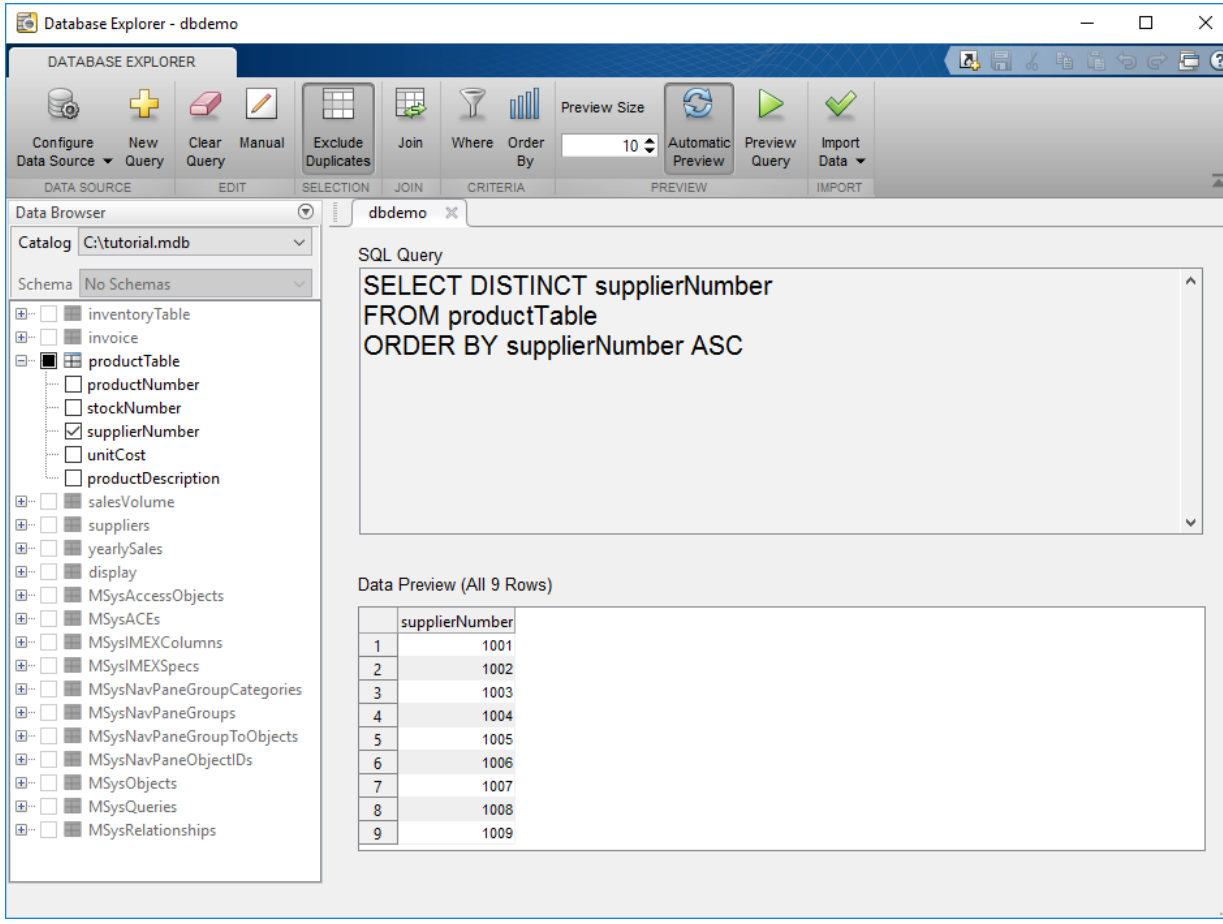
The **Data Preview** pane shows the duplicate supplier number `1001`.



In the **Selection** section, click **Exclude Duplicates** to remove duplicate rows in the **Data Preview** pane. The Database Explorer App adds the SQL statement `DISTINCT` to the query in the **SQL Query** pane. This statement removes duplicate rows from the query results.



The **Data Preview** pane displays unique rows only.



Import all SQL query results into the MATLAB workspace. In the **Import** section, click  . In the Import Data dialog box, enter the name `data` for the MATLAB workspace variable, and click **OK**. The MATLAB workspace displays the table `data`.

Close the database connection by closing the data source tab.

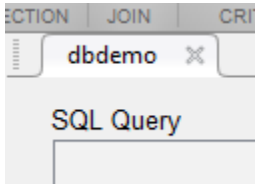
Enter SQL Query Manually

Connect to a Microsoft Access database using the Database Explorer app. Enter an SQL query manually or paste an existing SQL query into the **SQL Query** pane. Then, import the query results into the MATLAB workspace.

Set up the data source for the `tutorial.mdb` database and name it `dbdemo`. For details, see "Microsoft Access ODBC for Windows" on page 2-18.

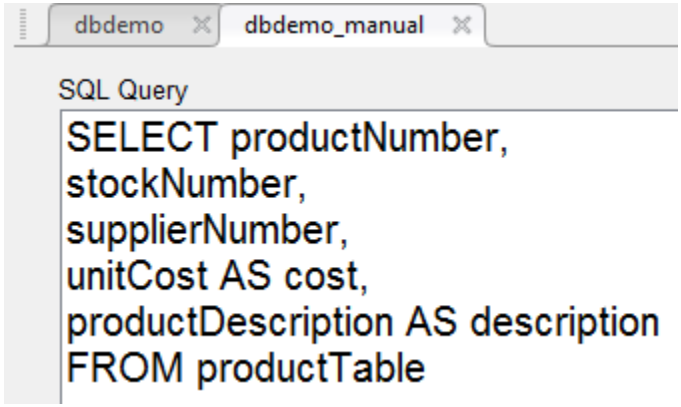
In the **Data Source** section of the **Database Explorer** tab, click **New Query**. The Connect to a Data Source dialog box opens. Select `dbdemo` from the **Data Source** list. Leave the user name and password blank, and click **Connect**.

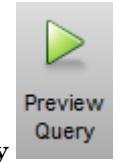
The Database Explorer app creates a connection to the Microsoft Access database. The **Data Browser** pane displays the available tables in the database. The data source tab, which is named **dbdemo**, appears to the right of the **Data Browser** pane. The data source tab contains two empty panes, **SQL Query** and **Data Preview**.



In the **Edit** section, click **Manual**. A new data source tab appears to the right of the **dbdemo** tab with the name **dbdemo_manual**. The suffix `_manual` attached to the tab name indicates that you are entering an SQL query manually.

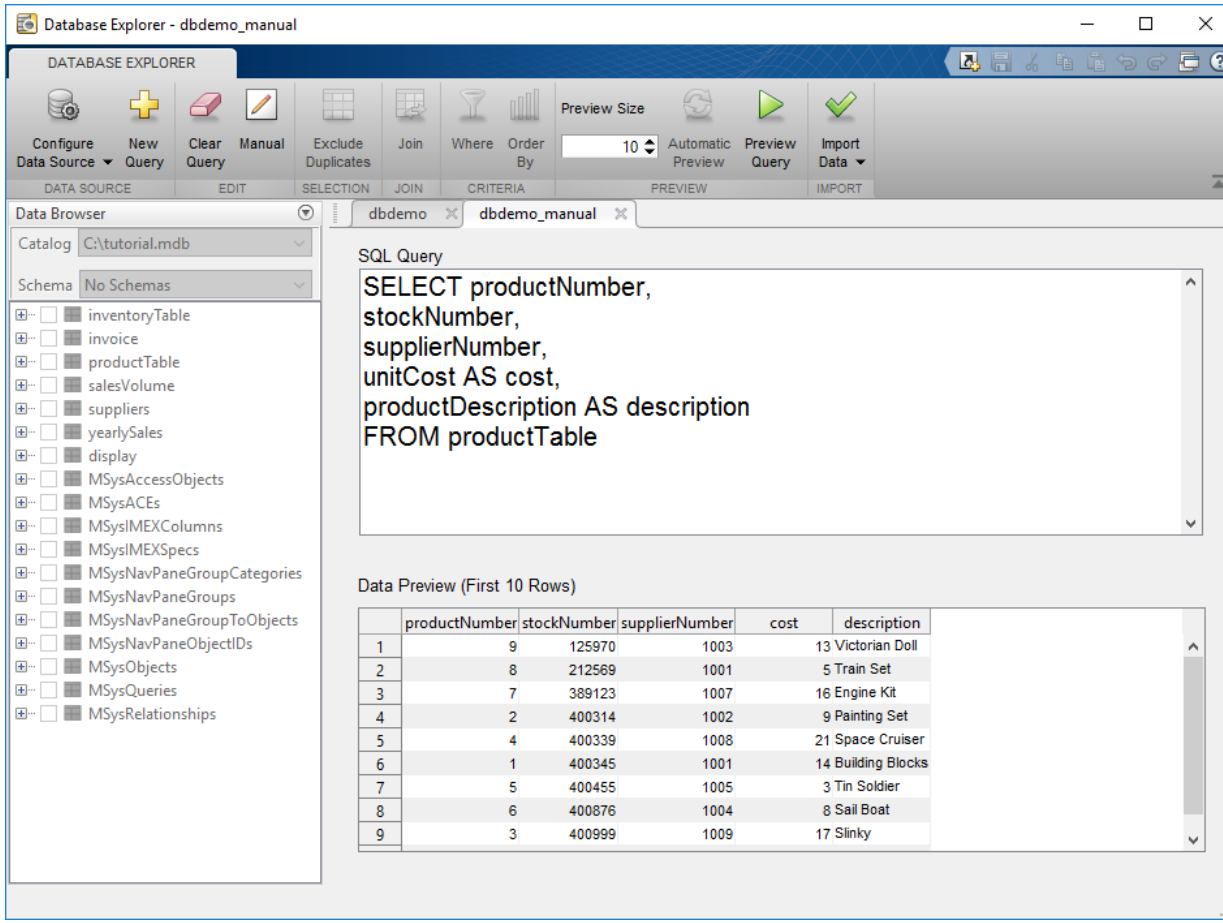
Enter an SQL query in the **SQL Query** pane. Here, select all columns and rows from the `productTable` table, and rename the `unitCost` and `productDescription` columns. Use the SQL statement `AS` to create aliases.



In the **Preview** section, click **Preview Query** 

to preview the query results.

The **Data Preview** pane shows the results of the SQL query. The pane displays the first 10 rows of data by default.



Import all SQL query results into the MATLAB workspace. In the **Import** section, click  . In the Import Data dialog box, enter the name `data` for the MATLAB workspace variable, and click **OK**. The MATLAB workspace displays the table `data`.

Close the database connection by closing both the **dbdemo** and **dbdemo_manual** data source tabs.

See Also

Functions

`close` | `database` | `exec` | `fetch`

Topics

“Connection Options” on page 2-9
“Configuring Driver and Data Source” on page 2-15
“Create SQL Queries Using Database Explorer App” on page 4-2
“Join Tables Using Database Explorer App” on page 4-6
“Data Preview Using Database Explorer App” on page 4-11
“Generate SQL Query and MATLAB Script” on page 4-17
“Modify and Delete Data Sources” on page 4-14
“Database Explorer App Error Messages” on page 3-14

External Websites

SQL Tutorial

Introduced in R2017b

dmd

Construct database metadata object

Syntax

```
dbmeta = dmd(conn)
```

Description

`dbmeta = dmd(conn)` constructs a database metadata object for the database connection `conn`. Use `get` and `supports` to obtain properties of `dbmeta`. Use `dmd` and `get(dbmeta)` to obtain information you need about a database, such as table names required to retrieve data.

Examples

Create a database metadata object `dbmeta` for the database connection `conn` and list its properties:

```
dbmeta = dmd(conn);
v = get(dbmeta)
```

See Also

`columns` | `database` | `get` | `supports` | `tables`

Topics

“Display Database Metadata” on page 5-37

Introduced before R2006a

exec

Execute SQL statement and open cursor

Syntax

```
exec(conn,sqlquery)

curs = exec(conn,sqlquery)
curs = exec(___,Name,Value)
curs = exec(conn,sqlquery,qTimeOut)
```

Description

`exec(conn,sqlquery)` performs database operations on a SQLite database file by executing the SQL statement `sqlquery` for the SQLite connection `conn` using the MATLAB interface to SQLite.

`curs = exec(conn,sqlquery)` creates the `cursor` object after executing the SQL statement `sqlquery` for the database connection `conn`.

`curs = exec(___,Name,Value)` specifies additional options using one or more name-value pair arguments. For example, `'MaxRows',10` limits the number of rows to return before SQL query execution to 10 rows.

`curs = exec(conn,sqlquery,qTimeOut)` uses a timeout value `qTimeOut` for SQL query execution.

Examples

Select Data Using Native ODBC Interface

Use a native ODBC connection to import product data from a Microsoft® SQL Server® database into MATLAB®. Then, determine the highest unit cost among products.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message


ans =

     []
```

Select all data from the table `productTable` using the `connection` object. Assign the SQL `SELECT` statement to the variable `sqlquery`. The `cursor` object contains the executed SQL query.

```
sqlquery = 'SELECT * FROM productTable';
curs = exec(conn,sqlquery)


curs =

  cursor with properties:

         Data: 0
     RowLimit: 0
     SQLQuery: 'SELECT * FROM productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1×1 database.internal.ODBCStatementHandle]
```

With the native ODBC interface, the `Type` property contains the character vector `ODBCCursor Object`. For JDBC connections, this property contains the character vector `Database Cursor Object`.

Import data from the table into MATLAB®.

```
curs = fetch(curs);
data = curs.Data;
```

Determine the highest unit cost in the table.

```
max(data.unitCost)
```

```
ans =

    24
```

After you finish working with the cursor object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Select Data Using Timeout Value

Use an ODBC connection with a timeout value to import product data from a Microsoft® SQL Server® database into MATLAB®. Then, determine the highest unit cost among products.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select all data from the table `productTable` using the `connection` object. Specify a timeout value of 10 seconds. The timeout value specifies the maximum amount of time the `exec` function tries to execute the SQL `SELECT` statement. Assign the SQL `SELECT` statement to the variable `sqlquery`. The `cursor` object contains the executed SQL query.

```
sqlquery = 'SELECT * FROM productTable';
qTimeOut = 10;
curs = exec(conn,sqlquery,qTimeOut)
```

```
curs =

  cursor with properties:

         Data: 0
     RowLimit: 0
     SQLQuery: 'SELECT * FROM productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1×1 database.internal.ODBCStatementHandle]
```

Import data from the table into MATLAB®.

```
curs = fetch(curs);
data = curs.Data;
```

Determine the highest unit cost in the table.

```
max(data.unitCost)
```

```
ans =

    24
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Select Data Using Variable in Query

Use an ODBC connection to import product data from a Microsoft® SQL Server® database into MATLAB® using a variable in the SQL `SELECT` statement.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select data from `productTable` by specifying the product description as a variable. The `cursor` object contains the executed query. Import the data from the executed query using the `fetch` function.

The SQL `SELECT` statement uses square brackets to concatenate the two character vectors. To create the pair of single quotation marks that appears in the SQL `SELECT` statement, specify the pair of four quotation marks around `productdesc`. The outer two marks delineate the next character vector for concatenation. The two inner marks denote a quotation mark inside a character vector.

```
productdesc = 'Painting Set';
sqlquery = ['SELECT * FROM productTable ' ...
    'WHERE productDescription = ' '''' productdesc ''''];
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data
```

```
ans =

  1×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________
```

```
    2                4.0031e+05     1002              9            'Painting Set'
```

Close the `cursor` object before executing another SQL statement.

```
close(curs)
```

Instead of a variable, use the character vector `'Slinky'` to import data.

```
sqlquery = ['SELECT * FROM productTable ' ...
    'WHERE productDescription = ' '''Slinky'''];
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data
```

```
ans =

  1×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    3                4.01e+05       1009              17          'Slinky'
```

After you finish working with the cursor object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Limit Maximum Number of Rows to Return

Use an ODBC connection to import a limited number of rows of product data from a Microsoft® SQL Server® database into MATLAB®. Then, determine the highest unit cost among products.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select all data from `productTable`. Specify the maximum number of rows to return as two rows.

```
sqlquery = 'SELECT * FROM productTable ORDER BY productNumber';
rowlimit = 2;
curs = exec(conn,sqlquery,'MaxRows',rowlimit);
```

Display the returned data.

```
curs = fetch(curs);
data = curs.Data
```

```
data =

  2×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1                4.0035e+05     1001              14          'Building Blocks'
    2                4.0031e+05     1002               9          'Painting Set'
```

Determine the highest unit cost in the limited data set.

```
max(data.unitCost)
```

```
ans =

    14
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Call Stored Procedure Without Input and Output Arguments

Using a Microsoft SQL Server database, run a stored procedure using the native ODBC database connection `conn`.

Define a stored procedure `create_table` that creates a table named `test_table` by executing the following code. This procedure has no input or output arguments. The code assumes that you are using a Microsoft SQL Server database.

```
CREATE PROCEDURE create_table

AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

CREATE TABLE test_table
     (
        CATEGORY_ID     INTEGER     IDENTITY PRIMARY KEY,
        CATEGORY_DESC   CHAR(50)    NOT NULL
        );

END
GO
```

Connect to the Microsoft SQL Server database. This code assumes that you are connecting to a data source named `MS SQL Server` with a user name and password.

```
conn = database('MS SQL Server','username','pwd');
```

Call the stored procedure `create_table`. Assign the returned `cursor` object to the variable `curs`.

```
curs = exec(conn,'create_table')
```

```
curs =

  cursor with properties:
```

```
        Data: 0
    RowLimit: 0
    SQLQuery: 'create_table'
     Message: []
        Type: 'ODBCCursor Object'
   Statement: [1x1 database.internal.ODBCStatementHandle]
```

The empty `Message` property means the stored procedure completed successfully.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Select Data Using Scrollable Cursor

Use a scrollable `cursor` object to import product data from a Microsoft® SQL Server® database into MATLAB®. Then, determine the highest unit cost among products.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select all data from the table `productTable` and create a scrollable cursor using the `connection` object. Assign the SQL `SELECT` statement to the variable `sqlquery`. The `cursor` object contains the executed SQL query.

```
sqlquery = 'SELECT * FROM productTable';
curs = exec(conn,sqlquery,'CursorType','scrollable')
```

```
curs =

  cursor with properties:

         Data: 0
     RowLimit: 0
     SQLQuery: 'SELECT * FROM productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1×1 database.internal.ODBCStatementHandle]
```

To verify that the `exec` function creates a scrollable cursor, display the hidden `Scrollable` property of the `cursor` object.

```
curs.Scrollable
```

```
ans =

  logical

   1
```

The `Scrollable` property equals 1 when the database cursor is scrollable.

Import data from the table into MATLAB®.

```
curs = fetch(curs);
data = curs.Data;
```

Determine the highest unit cost in the table.

```
max(data.unitCost)
```

```
ans =

    24
```

After you finish working with the cursor object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Create Table Using MATLAB® Interface to SQLite

Using the MATLAB® Interface to SQLite, create a table in a new SQLite database file.

Create a SQLite connection `conn` to a new SQLite database file `tutorial.db`. Specify the file name in the current working folder.

```
dbfile = fullfile(pwd,'tutorial.db');

conn = sqlite(dbfile,'create');
```

Create the table `inventoryTable` using `exec`.

```
createInventoryTable = ['create table inventoryTable ' ...
    '(productNumber NUMERIC, Quantity NUMERIC, ' ...
    'Price NUMERIC, inventoryDate VARCHAR)'];

exec(conn,createInventoryTable)
```

`inventoryTable` is an empty table in `tutorial.db`.

Close the SQLite connection.

```
close(conn)
```

- “Import Data from Databases into MATLAB” on page 5-2
- “Create Queries with Characters and Variables” on page 5-6
- “Call Stored Procedure That Returns Data” on page 5-40
- “Import Data Using MATLAB® Interface to SQLite” on page 5-67
- “Roll Back and Commit Data in Database” on page 5-11
- “Change Database Connection Catalog” on page 5-12
- “Create Table and Add Column” on page 5-13
- “Run Custom Database Function” on page 5-43

Input Arguments

`conn` — Database connection

`connection` object | `sqlite` object

Database connection, specified as a `connection` object or `sqlite` object created using the `database` or `sqlite` functions.

`sqlquery` — SQL statement

character vector | string scalar

SQL statement, specified as a character vector or string scalar. The SQL statement can be any valid SQL statement, including nested queries. The SQL statement can be a stored procedure, such as `{call sp_name (parm1,parm2,...)}`. For stored procedures that return one or more result sets, use this function. For procedures that return output arguments, use `runstoredprocedure`.

For information about the SQL query language, see the SQL Tutorial.

Data Types: `char` | `string`

`qTimeOut` — Timeout value

numeric scalar

Timeout value, specified as a numeric scalar denoting the maximum amount of time in seconds `exec` tries to execute the SQL statement, `sqlquery`.

Data Types: `double`

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `curs = exec(conn,sqlquery,'MaxRows',rowlimit);`

`MaxRows` — Maximum number of rows to return

positive numeric scalar

Maximum number of rows to return before executing the SQL query, specified as a comma-separated pair consisting of `'MaxRows'` and a positive numeric scalar. By default, the `exec` function returns all rows from the executed SQL query. Use this name-value pair argument to limit the number of rows imported into MATLAB from the SQL query execution. For details about this option and other memory management options, see “Data Import Approaches and Memory Management” on page 5-45.

Data Types: `double`

`CursorType` — Cursor type
`'forward_only'` (default) | `'scrollable'`

Cursor type, specified as a comma-separated pair consisting of `'CursorType'` and one of these values.

Value	Description
`'forward_only'`	Create a basic cursor.
`'scrollable'`	Create a scrollable cursor.

For details, see “Using Scrollable Cursors” on page 5-52.

Output Arguments

`curs` — Database cursor
`cursor` object

Database cursor, returned as a `cursor` object.

Limitations

The name-value pair argument `'MaxRows'` has these limitations:

- The native ODBC interface is not supported if you are using Microsoft Access.
- Not all database drivers support setting the maximum number of rows before query execution. For an unsupported driver, modify your SQL query to limit the maximum number of rows to return. The SQL syntax varies with the driver. For details, consult the driver documentation.

Tips

- The order of records in your database is not constant. To sort records, use the SQL statement `ORDER BY`.
- For Microsoft Excel, tables in `sqlquery` are Excel worksheets. By default, some worksheet names include a `$` symbol. To select data from a worksheet with this name format, use an SQL statement of the form `SELECT * FROM "Sheet1$"` (or `'Sheet1$'`).
- Before you modify database tables, ensure that the database is not open for editing. If you try to edit the database while it is open, you receive this MATLAB error:

  ```
  [Vendor][ODBC Driver] The database engine could not lock
  table 'TableName' because it is already in use by
  another person or process.
  ```

- The PostgreSQL database management system supports multidimensional fields, but SQL `SELECT` statements fail when retrieving these fields unless you specify an index.
- Some databases require that you include a symbol, such as #, before and after a date in a query as follows:

  ```
  curs = exec(conn,'SELECT * FROM mydb WHERE mydate > #03/05/2005#')
  ```

Alternative Functionality

App

`exec` executes SQL statements using the command line. To execute SQL statements interactively, use the **Database Explorer** app.

See Also

`close` | `database` | `fetch` | `setdbprefs`

Topics

“Import Data from Databases into MATLAB” on page 5-2
“Create Queries with Characters and Variables” on page 5-6
“Call Stored Procedure That Returns Data” on page 5-40

“Import Data Using MATLAB® Interface to SQLite” on page 5-67
“Roll Back and Commit Data in Database” on page 5-11
“Change Database Connection Catalog” on page 5-12
“Create Table and Add Column” on page 5-13
“Run Custom Database Function” on page 5-43
“Data Import Approaches and Memory Management” on page 5-45
“Using Scrollable Cursors” on page 5-52
“Working with MATLAB Interface to SQLite” on page 2-6
“Data Retrieval Restrictions” on page 1-5

External Websites

SQL Tutorial

Introduced before R2006a

exportedkeys

(To be removed) Retrieve information about exported foreign keys

Note The `exportedkeys` function will be removed in a future release.

Syntax

```
e = exportedkeys(dbmeta, 'cata', 'sch')
e = exportedkeys(dbmeta, 'cata', 'sch', 'tab')
```

Description

`e = exportedkeys(dbmeta, 'cata', 'sch')` returns foreign exported key information (that is, information about primary keys that are referenced by other tables) for the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

`e = exportedkeys(dbmeta, 'cata', 'sch', 'tab')` returns exported foreign key information for the table `tab`, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Examples

Get foreign exported key information for the schema `SCOTT` for the database metadata object `dbmeta`.

```
e = exportedkeys(dbmeta,'orcl','SCOTT')
e =
  Columns 1 through 7
    'orcl'   'SCOTT'   'DEPT'   'DEPTNO'    'orcl'...
    'SCOTT'    'EMP'
  Columns 8 through 13
    'DEPTNO'    '1'    'null'    '1'    'FK_DEPTNO'...
        'PK_DEPT'
```

The results show the foreign exported key information.

Column	Description	Value
1	Catalog containing primary key that is exported	null
2	Schema containing primary key that is exported	SCOTT
3	Table containing primary key that is exported	DEPT
4	Column name of primary key that is exported	DEPTNO
5	Catalog that has foreign key	null
6	Schema that has foreign key	SCOTT
7	Table that has foreign key	EMP
8	Foreign key column name, that is the column name that references the primary key in another table	DEPTNO
9	Sequence number within the foreign key	1
10	Update rule, that is, what happens to the foreign key when the primary key updates	null
11	Delete rule, that is, what happens to the foreign key when the primary key is deleted	1
12	Foreign key name	FK_DEPTNO
13	Primary key name that is referenced by foreign key	PK_DEPT

In the schema SCOTT, only one primary key is exported to (referenced by) another table. DEPTNO, the primary key of the table DEPT, is referenced by the field DEPTNO in the table EMP. The referenced table is DEPT and the referencing table is EMP. In the DEPT table, DEPTNO is an exported key. Reciprocally, the DEPTNO field in the table EMP is an imported key.

For a description of codes for update and delete rules, see the getExportedKeys property on the Oracle Java Web site:

http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html.

See Also

dmd | get | importedkeys | primarykeys

Topics

“Display Database Metadata” on page 5-37

Introduced before R2006a

fastinsert

Add MATLAB data to database tables

Syntax

```
fastinsert(conn,tablename,colnames,data)
```

Description

`fastinsert(conn,tablename,colnames,data)` exports data from the MATLAB workspace and inserts it into an existing database table using the database connection `conn`. You can specify the database table name and column names, and specify the data for insertion into the database.

You do not specify the type of data you are exporting. The data is exported in its current MATLAB format.

Examples

Insert Row into Table Using ODBC Driver

First, connect to the Microsoft® SQL Server® database. Then, export data from MATLAB® into the database and close the database connection.

Create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select and display all rows in the table sorted by the product number using the `select` function.

```
selectquery = 'SELECT * FROM productTable ORDER BY productNumber';

data = select(conn,selectquery)
```

```
data =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1                4.0035e+05     1001              14          'Building Blocks'
    2                4.0031e+05     1002               9          'Painting Set'
    3                  4.01e+05     1009              17          'Slinky'
```

Store the column names of `productTable` in a cell array.

```
tablename = 'productTable';
colnames = {'productNumber','stockNumber','supplierNumber', ...
    'unitCost','productDescription'};
```

Store the data for the insert in a cell array that contains these values:

- `productNumber` equal to 4
- `stockNumber` equal to 500565
- `supplierNumber` equal to 1010
- `unitCost` equal to $20
- `productDescription` equal to `'Cooking Set'`

Then, convert the cell array to a table.

```
insertdata = {4,500565,1010,20,'Cooking Set'};
insertdata = cell2table(insertdata,'VariableNames',colnames)
```

```
insertdata =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    4                5.0057e+05     1010              20          'Cooking Set'
```

Insert data into the table.

```
fastinsert(conn,tablename,colnames,insertdata)
```

Select and display all rows in the table again.

```
data = select(conn,selectquery)
```

```
data =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1                4.0035e+05     1001              14          'Building Blocks'
    2                4.0031e+05     1002               9          'Painting Set'
    3                  4.01e+05     1009              17          'Slinky'
    4                5.0057e+05     1010              20          'Cooking Set'
```

A new row appears in the `productTable` with data from `insertdata`.

Close the database connection.

```
close(conn)
```

Insert Multiple Rows into Table

First, connect to the Microsoft® SQL Server® database. Then, export multiple rows of data from MATLAB® into the database and close the database connection.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select and display data in the table `inventoryTable`. Import data using the `select` function.

```
selectquery = 'SELECT * FROM inventoryTable';
data = select(conn,selectquery)
```

```
data =

    productNumber    Quantity    Price    inventoryDate
    _____________    ________    _____    _____________

     1               1700        15       '2014-09-23'
     2               1200         9       '2014-07-08'
     3                356        17       '2014-05-14'
     4               2580        21       '2013-06-08'
     5               9000         3       '2012-09-14'
     6               4540         8       '2013-12-25'
     7               6034        16       '2014-08-06'
     8               8350         5       '2011-06-18'
     9               2339        13       '2011-02-09'
    10                723        24       '2012-03-14'
```

Assign multiple rows of data to the cell array `insertdata`. Each row contains data for the columns in `inventoryTable`. The first row of data contains:

- Product number is 11
- Quantity is 125

- Price is $23.00
- Inventory date is the current date

```
insertdata = {11,125,23.00,datestr(now,'yyyy-mm-dd'); ...
    12,1160,14.7,datestr(now,'yyyy-mm-dd'); ...
    13,150,54.5,datestr(now,'yyyy-mm-dd')};
```

Store the column names of `inventoryTable` in a cell array.

```
tablename = 'inventoryTable';
colnames = {'productNumber','Quantity','Price','inventoryDate'};
```

Insert data into the table.

```
fastinsert(conn,tablename,colnames,insertdata)
```

Select and display data in the table `inventoryTable` again.

```
data = select(conn,selectquery)
```

```
data =

    productNumber    Quantity    Price    inventoryDate
    _____________    ________    _____    _____________

     1               1700        15       '2014-09-23'
     2               1200         9       '2014-07-08'
     3                356        17       '2014-05-14'
     4               2580        21       '2013-06-08'
     5               9000         3       '2012-09-14'
     6               4540         8       '2013-12-25'
     7               6034        16       '2014-08-06'
     8               8350         5       '2011-06-18'
     9               2339        13       '2011-02-09'
    10                723        24       '2012-03-14'
    11                125        23       '2016-11-02'
    12               1160        15       '2016-11-02'
    13                150        55       '2016-11-02'
```

Three new rows appear in `inventoryTable` with data from `insertdata`.

Close the database connection.

```
close(conn)
```

Insert Numeric Data into Table

First, connect to the Microsoft® SQL Server® database. Then, export numeric data from MATLAB® into the database and close the database connection.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Define the numeric matrix `numdata` that contains sales volume data.

```
numdata = [777666,0,350,400,450,250,450,500,515,235,100,300,600];
```

Select and display data in the `salesVolume` table before insertion. Import data using the `select` function.

```
selectquery = 'SELECT * FROM salesVolume';
data = select(conn,selectquery)
```

```
data =

    StockNumber    January    February    March    April    May    June    July    Aug
    ___________    _______    ________    _____    _____    ___    ____    ____    ___

    1.2597e+05     1400       1100         981      882     794    752     654     773
    2.1257e+05     2400       1721        1414     1191     983    825     731     653
    3.8912e+05     1800       1200         890      670     550    450     400     410
```

```
    4.0031e+05     3000        2400        1800     1500     1200      900      700     650
    4.0034e+05     4300           0        2600     1800     1600     1550      895     700
    4.0035e+05     5000        3500        2800     2300     1700     1400     1000     900
    4.0046e+05     1200         900         800      500      399      345      300     175
    4.0088e+05     3000        2400        1500     1500     1300     1100      900     867
      4.01e+05     3000        1500        1000      900      750      700      400     350
    8.8865e+05        0         900         821      701      689      621      545     421
    4.0814e+05     6000        3100        8800     2300     1700     1400     1000     900
    2.1046e+05     1800        9700         800      500     3997      349      300     175
    4.7082e+05     3100        9400        1540     1500     1350     1190      900     867
     5.101e+05      235        1800        1040      900      750      700      400     350
    8.9975e+05      123        1700         823      701      689      621      545     421
```

Store the column names of `salesVolume` in a cell array.

```
tablename = 'salesVolume';
colnames = {'stockNumber','January','February','March','April','May', ...
    'June','July','August','September','October','November', ...
    'December'};
```

Insert data into the table.

```
fastinsert(conn,tablename,colnames,numdata)
```

Select and display data in the `salesVolume` table again.

```
data = select(conn,selectquery)
```

```
data =

    StockNumber    January    February    March    April    May     June    July    Aug
    ___________    _______    ________    _____    _____    ____    ____    ____    ___

    1.2597e+05     1400       1100         981      882      794     752     654     773
    2.1257e+05     2400       1721        1414     1191      983     825     731     653
    3.8912e+05     1800       1200         890      670      550     450     400     410
    4.0031e+05     3000       2400        1800     1500     1200     900     700     650
    4.0034e+05     4300          0        2600     1800     1600    1550     895     700
    4.0035e+05     5000       3500        2800     2300     1700    1400    1000     900
    4.0046e+05     1200        900         800      500      399     345     300     175
    4.0088e+05     3000       2400        1500     1500     1300    1100     900     867
      4.01e+05     3000       1500        1000      900      750     700     400     350
    8.8865e+05        0        900         821      701      689     621     545     421
```

```
    4.0814e+05      6000        3100        8800      2300      1700      1400      1000      900
    2.1046e+05      1800        9700         800       500      3997       349       300      175
    4.7082e+05      3100        9400        1540      1500      1350      1190       900      867
     5.101e+05       235        1800        1040       900       750       700       400      350
    8.9975e+05       123        1700         823       701       689       621       545      421
    7.7767e+05         0         350         400       450       250       450       500      515
```

A new row appears in `salesVolume` with data from `numdata`.

Close the database connection.

```
close(conn)
```

Insert and Commit Data in Table

First, connect to the Microsoft® SQL Server® database. Then, export data from MATLAB® into the database and commit the insert transaction. Close the database connection.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. Use the name-value pair argument `AutoCommit` to specify manually committing transactions to the database.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','','AutoCommit','off');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message


ans =

     []
```

Insert the cell array `data` into the table `inventoryTable` with column names `colnames`.

```
data = {157,358,740.00,datestr(now,'yyyy-mm-dd HH:MM:SS')};
colnames = {'productNumber','Quantity','Price','inventoryDate'};
tablename = 'inventoryTable';

fastinsert(conn,tablename,colnames,data)
```

Commit the insert transaction.

```
commit(conn)
```

Close the database connection.

```
close(conn)
```

Insert Boolean Data into Table

First, connect to the Microsoft® SQL Server® database. Then, export Boolean data from MATLAB® into the database. Close the database connection.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

This database contains the table `Invoice` with these columns:

- `InvoiceNumber`
- `InvoiceDate`
- `productNumber`
- `Paid`
- `Receipt`

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message


ans =
```

```
     []
```

Display the data in the `Invoice` table before insertion.

```
selectquery = 'SELECT * FROM Invoice';
data = select(conn,selectquery)
```

```
data =

  10×5 table

    InvoiceNumber          InvoiceDate          ProductNumber    Paid        Receipt
    _____________    ____________________________    _____________    _____    ___________

     2101            '2010-08-01 00:00:00.000'     1               false    [8000×1 uin
     3546            '2010-03-01 00:00:00.000'     2               true     [8000×1 uin
    33116            '2011-05-15 00:00:00.000'     3               true     [8000×1 uin
    34155            '2011-07-12 00:00:00.000'     4               false    [8000×1 uin
    34267            '2011-07-22 00:00:00.000'     5               true     [8000×1 uin
    37197            '2011-09-03 00:00:00.000'     6               true     [8000×1 uin
    37281            '2011-09-21 00:00:00.000'     7               false    [8000×1 uin
    41011            '2011-12-12 00:00:00.000'     8               true     [8000×1 uin
    61178            '2012-01-15 00:00:00.000'     9               false    [8000×1 uin
    62145            '2012-01-23 00:00:00.000'    10               true     [8000×1 uin
```

Create the variable `insertdata` as a structure containing the invoice number `2105`, product number `11`, and the Boolean data `false` to signify unpaid. Boolean data is represented as the MATLAB® data type `logical`. This code assumes that the receipt image is missing.

```
insertdata.InvoiceNumber{1} = 2105;
insertdata.InvoiceDate{1} = datestr(now,'yyyy-mm-dd HH:MM:SS');
insertdata.productNumber{1} = 11;
insertdata.Paid{1} = false;
```

Insert the paid invoice data into the `Invoice` table with column names `colnames` using the database connection.

```
colnames = {'InvoiceNumber';'InvoiceDate';'productNumber';'Paid'};
tablename = 'Invoice';

fastinsert(conn,tablename,colnames,insertdata)
```

View the new record in the database to verify that the `Paid` column value is Boolean. In some databases, the MATLAB® logical value `false` shows as a Boolean `false`, `No`, or a cleared check box.

```
data = select(conn,selectquery)
```

```
data =

  11×5 table

    InvoiceNumber           InvoiceDate           ProductNumber    Paid        Receipt
    _____________    ____________________________    _____________    _____    ___________

     2101            '2010-08-01 00:00:00.000'     1               false    [8000×1 uin
     3546            '2010-03-01 00:00:00.000'     2               true     [8000×1 uin
    33116            '2011-05-15 00:00:00.000'     3               true     [8000×1 uin
    34155            '2011-07-12 00:00:00.000'     4               false    [8000×1 uin
    34267            '2011-07-22 00:00:00.000'     5               true     [8000×1 uin
    37197            '2011-09-03 00:00:00.000'     6               true     [8000×1 uin
    37281            '2011-09-21 00:00:00.000'     7               false    [8000×1 uin
    41011            '2011-12-12 00:00:00.000'     8               true     [8000×1 uin
    61178            '2012-01-15 00:00:00.000'     9               false    [8000×1 uin
    62145            '2012-01-23 00:00:00.000'    10               true     [8000×1 uin
     2105            '2017-01-04 10:19:42.000'    11               false    ''
```

The last row contains the Boolean data `false`.

Close the database connection.

```
close(conn)
```

- “Export Data to New Record in Database” on page 5-20
- “Export Multiple Records from MATLAB Workspace” on page 5-26
- “Export Data Using Bulk Insert” on page 5-31
- “Replace Existing Data in Database” on page 5-24
- “Roll Back Data After Updating Record” on page 5-17

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`tablename` — Database table name

character vector | string scalar

Database table name, specified as a character vector or string scalar denoting the name of a table in your database.

Data Types: `char` | `string`

`colnames` — Database table column names

cell array of character vectors | string array

Database table column names, specified as a cell array of one or more character vectors or string array to denote the columns in the existing database table `tablename`.

Example: `{'col1','col2','col3'}`

Data Types: `cell` | `string`

`data` — Data to insert

numeric matrix | cell array | table | dataset | structure

Data to insert, specified as a numeric matrix, cell array, table, dataset array, or structure that contains all data for insertion into the existing database table `tablename`. If `data` is a structure, then field names in the structure must match `colnames`. If `data` is a table or a dataset array, then the variable names in the table or dataset array must match `colnames`.

To insert data into a structure, table, or dataset array, use this special formatting. Each field or variable in a structure, table, or dataset array must be a cell array or double vector. The double vector must be of size `n`-by-1, where `n` is the number of rows to be inserted.

To reduce conversion time, convert dates to serial date numbers using `datenum` before calling `fastinsert`.

Tips

- The value of the `AutoCommit` property in the `connection` object determines whether `fastinsert` automatically commits the data to the database.
  - To view the `AutoCommit` value, access it using the `connection` object; for example, `conn.AutoCommit`.
  - To set the `AutoCommit` value, use the corresponding name-value pair argument in the `database` function.
  - To commit the data to the database, use the `commit` function or issue an SQL `COMMIT` statement using the `exec` function.
  - To roll back the data, use `rollback` or issue an SQL `ROLLBACK` statement using the `exec` function.
- If an error message like the following appears when you run `fastinsert`, the table might be open in edit mode.

  ```
  [Vendor][ODBC Product Driver] The database engine could
  not lock table 'TableName' because it is already in use
  by another person or process.
  ```

  In this case, close the table in the database and rerun the `fastinsert` function.

Alternative Functionality

To export MATLAB data into a database, you can use the `datainsert` and `insert` functions. For maximum performance, use `datainsert`.

For other differences among these functions, see “Inserting Data Using Command Line” on page 2-146.

See Also

`close` | `commit` | `database` | `exec` | `insert` | `logical` | `rollback` | `select`

Topics

“Export Data to New Record in Database” on page 5-20

"Export Multiple Records from MATLAB Workspace" on page 5-26
"Export Data Using Bulk Insert" on page 5-31
"Replace Existing Data in Database" on page 5-24
"Roll Back Data After Updating Record" on page 5-17
"Inserting Data Using Command Line" on page 2-146
"Connecting to Database Using Native ODBC Interface" on page 3-17
"Data Type Support" on page 1-3

External Websites

SQL Tutorial

Introduced before R2006a

fetch

Import data into MATLAB workspace from database cursor or from execution of SQL statement

Syntax

```
curs = fetch(curs)
curs = fetch(curs,rowlimit)
curs = fetch(___,Name,Value)

results = fetch(conn,sqlquery)
results = fetch(conn,sqlquery,fetchbatchsize)

results = fetch(conn,sqlquery,rowlimit)
```

Description

`curs = fetch(curs)` imports all rows of data from an executed SQL query into the `Data` property of the `cursor` object. Use the `cursor` object to investigate imported data and its structure.

Caution: Leaving `cursor` and `connection` objects open or overwriting open objects can result in unexpected behavior. After you finish working with these objects, you must close them using `close`.

`curs = fetch(curs,rowlimit)` imports the maximum number of rows of data from an executed SQL query.

`curs = fetch(___,Name,Value)` specifies additional options using name-value pair arguments to specify a scrollable cursor.

You can specify either an absolute or relative position offset. For example, `curs = fetch(curs,'AbsolutePosition',5);` imports data using an absolute position offset

in a scrollable cursor. While `curs = fetch(curs,'RelativePosition',10);` imports data using a relative position offset.

`results = fetch(conn,sqlquery)` returns all rows of data after executing the SQL statement `sqlquery` for the `connection` or `sqlite` objects. `fetch` imports data in batches.

When you use the `connection` object as the input argument instead of the `cursor` object, running the `exec` function is unnecessary.

The `fetch` function imports data from a SQLite database file immediately using a `sqlite` object of the MATLAB interface to SQLite.

`results = fetch(conn,sqlquery,fetchbatchsize)` imports all rows of data in batches of a specified number of rows at a time.

`results = fetch(conn,sqlquery,rowlimit)` imports the maximum number of rows from an executed SQL query using a `sqlite` object of the MATLAB interface to SQLite.

Examples

Import All Data Using `cursor` Object

Use the `cursor` object to import product data from a Microsoft® SQL Server® database into MATLAB®. Then, determine the highest unit cost among products in the table.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Execute the SQL query using the `exec` function and the database connection. Then, import all the data from `productTable`.

```
sqlquery = 'SELECT * FROM productTable';
curs = exec(conn,sqlquery);
curs = fetch(curs)
```

```
curs =

  cursor with properties:

         Data: [15×5 table]
     RowLimit: 0
     SQLQuery: 'SELECT * FROM productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1×1 database.internal.ODBCStatementHandle]
```

With the native ODBC interface, the `Type` property of `curs` contains `ODBCCursor Object`. For JDBC connections, the `Type` property contains `Database Cursor Object`.

Display the data in the `cursor` object property `Data`.

```
curs.Data
```

```
ans =

  15×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     9               1.2597e+05     1003              13          'Victorian Doll'
     8               2.1257e+05     1001               5          'Train Set'
     7               3.8912e+05     1007              16          'Engine Kit'
     2               4.0031e+05     1002               9          'Painting Set'
```

```
     4              4.0034e+05     1008              21          'Space Cruiser'
     1              4.0035e+05     1001              14          'Building Blocks'
     5              4.0046e+05     1005               3          'Tin Soldier'
     6              4.0088e+05     1004               8          'Sail Boat'
     3                4.01e+05     1009              17          'Slinky'
    10              8.8865e+05     1006              24          'Teddy Bear'
    11              4.0814e+05     1004              11          'Convertible'
    12              2.1046e+05     1010              22          'Hugsy'
    13              4.7082e+05     1012              17          'Pancakes'
    14               5.101e+05     1011              19          'Shawl'
    15              8.9975e+05     1011              20          'Snacks'
```

Determine the highest unit cost for all products in the table.

```
data = curs.Data;
max(data.unitCost)
```

```
ans =

    24
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Import Number of Rows Using `cursor` Object

Use the `cursor` object to import a specific number of rows from a Microsoft® SQL Server® database table into MATLAB®. Then, determine the highest unit cost among the retrieved products in the table.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Execute the SQL query using the `exec` function and the database connection. Then, use the input argument `rowlimit` to retrieve only the first two rows of data.

```
sqlquery = 'SELECT * FROM productTable';
curs = exec(conn,sqlquery);
rowlimit = 2;
curs = fetch(curs,rowlimit)
```

```
curs =

  cursor with properties:

         Data: [2×5 table]
     RowLimit: 0
     SQLQuery: 'SELECT * FROM productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1×1 database.internal.ODBCStatementHandle]
     Position: 1
```

Display data in the `cursor` object property `Data`.

```
curs.Data
```

```
ans =

  2×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    9                1.2597e+05     1003              13          'Victorian Doll'
    8                2.1257e+05     1001               5          'Train Set'
```

Determine the highest unit cost in the table.

```
data = curs.Data;
max(data.unitCost)
```

```
ans =

    13
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Import Data Iteratively Using `cursor` Object

Use a loop with the `cursor` object to import inventory data from a Microsoft® SQL Server® database table into MATLAB®.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Currently, the data type for imported data is `'table'`. Change the data type to `'cellarray'` using the `setdbprefs` function.

```
setdbprefs('DataReturnFormat','cellarray')
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Execute the SQL query using the `exec` function and the database connection. Specify retrieving two rows from `inventoryTable` at a time.

```
sqlquery = 'SELECT inventoryDate FROM inventoryTable';
curs = exec(conn,sqlquery);
rowlimit = 2;
```

Use a loop to import data using the `fetch` function

```
while ~strcmp(curs.Data,'No Data')
    curs = fetch(curs,rowlimit);
    curs.Data(:)
end
```

```
ans =

  2×1 cell array

    '2014-09-23'
    '2014-07-08'


ans =

  2×1 cell array

    '2014-05-14'
    '2013-06-08'


ans =

  2×1 cell array

    '2012-09-14'
    '2013-12-25'


ans =

  2×1 cell array

    '2014-08-06'
    '2011-06-18'
```

```
ans =

  2×1 cell array

    '2011-02-09'
    '2012-03-14'


ans =

  2×1 cell array

    '2012-09-11'
    '2010-10-29'


ans =

  cell

    '2009-05-24'


ans =

  cell

    'No Data'
```

Set the data type for imported data back to `'table'`.

```
setdbprefs('DataReturnFormat','table')
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Import Data with Absolute Position Offset Using Scrollable Cursor

Use a scrollable `cursor` object to import inventory data from a Microsoft® SQL Server® database table into MATLAB®. Then, determine the highest quantity in the table.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `inventoryTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select all products from the `inventoryTable` table and sort them in ascending order by product number. Create a scrollable `cursor` object.

```
sqlquery = 'SELECT * FROM inventoryTable ORDER BY productNumber';
curs = exec(conn,sqlquery,'CursorType','scrollable');
```

Import data in the data set using the absolute position offset `10`.

```
curs = fetch(curs,'AbsolutePosition',10);
```

Display the imported data.

```
data = curs.Data
```

```
data =

  4×4 table

    productNumber    Quantity    Price    inventoryDate
    _____________    ________    _____    _____________
```

```
    10                723        24        '2012-03-14'
    11                567        11        '2012-09-11'
    12               1278        22        '2010-10-29'
    13               1700        17        '2009-05-24'
```

After executing `fetch`, the position of the cursor moves after the data set.

Determine the highest quantity in the table.

```
max(data.Quantity)
```

```
ans =

        1700
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Import Data with Row Limit Using Scrollable Cursor

Use a scrollable `cursor` object and a row limit to import inventory data from a Microsoft® SQL Server® database table into MATLAB®. Then, determine the highest quantity in the table.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `inventoryTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =
```

```
     []
```

Select all products from the table `inventoryTable` and sort them in ascending order by product number. Create a scrollable `cursor` object.

```
sqlquery = 'SELECT * FROM inventoryTable ORDER BY productNumber';
curs = exec(conn,sqlquery,'CursorType','scrollable');
```

Import data for two products in the middle of the data set. Use the row limit `2` to import data for two rows. Use the absolute position offset `3` to import data starting from the third row in the data set.

```
rowlimit = 2;
curs = fetch(curs,rowlimit,'AbsolutePosition',3);
```

Display the imported data.

```
data = curs.Data
```

```
data =

  2×4 table

    productNumber    Quantity    Price    inventoryDate
    _____________    ________    _____    _____________

    3                 356        17       '2014-05-14'
    4                2580        21       '2013-06-08'
```

Display the position of the scrollable cursor. The position of the cursor stays at the absolute position offset `3`.

```
curs.Position
```

```
ans =

     3
```

Determine the highest quantity in the table.

```
max(data.Quantity)
```

```
ans =

        2580
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Import Data with Different Formats Using `cursor` Object

Use the `cursor` object to import invoice data as a cell array from a Microsoft® SQL Server® database table into MATLAB®. Then, determine the highest invoice number.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `Invoice`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select the invoice number and paid data from the `Invoice` table using the `exec` function. The `Paid` column has data type of Boolean in the database. The `cursor` object contains the executed SQL query.

```
sqlquery = 'SELECT InvoiceNumber,Paid FROM Invoice';
curs = exec(conn,sqlquery);
```

Currently, the data type for imported data is `'table'`. Specify the data type `'cellarray'` using the `setdbprefs` function. Import the first five rows of data from the executed SQL query. Display the imported data.

```
setdbprefs('DataReturnFormat','cellarray')
rowlimit = 5;
curs = fetch(curs,rowlimit);
curs.Data
```

```
ans =

  5×2 cell array

    [ 2101]    [0]
    [ 3546]    [1]
    [33116]    [1]
    [34155]    [0]
    [34267]    [1]
```

Determine the highest invoice number by accessing the cell array and converting the numeric data to a numeric array using the `cell2mat` function.

```
invoices = curs.Data(1:5,1);
numinvoices = cell2mat(invoices);
max(numinvoices)
```

```
ans =

       34267
```

View the class of the second column in the imported data.

```
class(curs.Data{1,2})
```

```
ans =

    'logical'
```

Boolean data imports as a `logical` data type in MATLAB®.

Set the data type for imported data back to `'table'`.

```
setdbprefs('DataReturnFormat','table')
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Import All Data Using `connection` Object

Use the `connection` object to import all product data from a Microsoft® SQL Server® database table into MATLAB®. Then, determine the highest unit cost among products in the table.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Import all data from `productTable` using the `connection` object and SQL query. Display the imported data.

```
sqlquery = 'SELECT * FROM productTable';
results = fetch(conn,sqlquery)
```

```
results =

  15×5 table
```

```
    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     9               1.2597e+05     1003              13          'Victorian Doll'
     8               2.1257e+05     1001               5          'Train Set'
     7               3.8912e+05     1007              16          'Engine Kit'
     2               4.0031e+05     1002               9          'Painting Set'
     4               4.0034e+05     1008              21          'Space Cruiser'
     1               4.0035e+05     1001              14          'Building Blocks'
     5               4.0046e+05     1005               3          'Tin Soldier'
     6               4.0088e+05     1004               8          'Sail Boat'
     3                 4.01e+05     1009              17          'Slinky'
    10               8.8865e+05     1006              24          'Teddy Bear'
    11               4.0814e+05     1004              11          'Convertible'
    12               2.1046e+05     1010              22          'Hugsy'
    13               4.7082e+05     1012              17          'Pancakes'
    14                5.101e+05     1011              19          'Shawl'
    15               8.9975e+05     1011              20          'Snacks'
```

Determine the highest unit cost for all products in the table.

```
max(results.unitCost)
```

```
ans =

    24
```

Close the database connection.

```
close(conn)
```

Import Data in Batches Using `connection` Object

Use the `connection` object to import product data in batches from a Microsoft® SQL Server® database table into MATLAB®. Then, determine the highest unit cost among products in the table.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the table `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Import all data from `productTable` using the `connection` object and SQL query in batches of five rows at a time. Display the imported data.

```
sqlquery = 'SELECT * FROM productTable';
fetchbatchsize = 5;
results = fetch(conn,sqlquery,fetchbatchsize)
```

```
results =

  15×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     9               1.2597e+05     1003              13          'Victorian Doll'
     8               2.1257e+05     1001               5          'Train Set'
     7               3.8912e+05     1007              16          'Engine Kit'
     2               4.0031e+05     1002               9          'Painting Set'
     4               4.0034e+05     1008              21          'Space Cruiser'
     1               4.0035e+05     1001              14          'Building Blocks'
     5               4.0046e+05     1005               3          'Tin Soldier'
     6               4.0088e+05     1004               8          'Sail Boat'
     3                 4.01e+05     1009              17          'Slinky'
    10               8.8865e+05     1006              24          'Teddy Bear'
    11               4.0814e+05     1004              11          'Convertible'
    12               2.1046e+05     1010              22          'Hugsy'
```

```
    13              4.7082e+05     1012             17          'Pancakes'
    14               5.101e+05     1011             19          'Shawl'
    15              8.9975e+05     1011             20          'Snacks'
```

Determine the highest unit cost for all products in the table.

```
max(results.unitCost)
```

```
ans =

    24
```

Close the database connection.

```
close(conn)
```

Import Data Using MATLAB Interface to SQLite

Use the MATLAB® Interface to SQLite to import all data from a table into a SQLite database file. Then, determine the highest unit cost among products in the table.

Create a SQLite connection `conn` to an existing SQLite database file `tutorial.db`. The database file contains the table `productTable`. `conn` is a `sqlite` object.

```
dbfile = 'tutorial.db';

conn = sqlite(dbfile);
```

Import all data from `productTable` by using the `rowlimit` argument. `results` contains five rows of imported data as a cell array.

```
sqlquery = 'SELECT * FROM productTable';
rowlimit = 5;
results = fetch(conn,sqlquery,rowlimit)
```

```
results =

  5x5 cell array
```

```
    {[9]}    {[125970]}    {[1003]}    {[13]}    {'Victorian Doll'}
    {[8]}    {[212569]}    {[1001]}    {[ 5]}    {'Train Set'     }
    {[7]}    {[389123]}    {[1007]}    {[16]}    {'Engine Kit'    }
    {[2]}    {[400314]}    {[1002]}    {[ 9]}    {'Painting Set'  }
    {[4]}    {[400339]}    {[1008]}    {[21]}    {'Space Cruiser' }
```

Determine the highest unit cost for the limited number of products. Access unit cost data by looping through the fourth column of the cell array. `data` is a vector that contains numeric unit costs. Find the maximum unit cost.

```
for i = 1:rowlimit
    data(i) = results{i,4};
end

max(data)


ans =

  int64

   21
```

Close the SQLite connection.

```
close(conn)
```

- “Import Data from Databases into MATLAB” on page 5-2
- “Import Data Using Scrollable Cursor with Relative Position Offset” on page 5-60
- “Retrieve Image Data Types” on page 5-72
- “Display Information About Imported Data” on page 5-49
- “Import Data Using MATLAB® Interface to SQLite” on page 5-67

Input Arguments

`curs` — Database cursor

`cursor` object

Database cursor, specified as a `cursor` object created using the `exec` function.

`conn` — Database connection
`connection` object | `sqlite` object

Database connection, specified as a `connection` object or `sqlite` object created using the `database` or `sqlite` functions.

`sqlquery` — SQL statement
character vector | string scalar

SQL statement, specified as a character vector or string scalar. The SQL statement can be any valid SQL statement, including nested queries. The SQL statement can be a stored procedure, such as `{call sp_name (parm1,parm2,...)}`. For stored procedures that return one or more result sets, use this function. For procedures that return output arguments, use `runstoredprocedure`.

For information about the SQL query language, see the SQL Tutorial.

Data Types: `char` | `string`

`rowlimit` — Row limit
numeric scalar

Row limit, specified as a positive numeric scalar that indicates the maximum number of rows of data to import from the database.

If `rowlimit` is `0`, `fetch` returns all rows of data.

Data Types: `double`

`fetchbatchsize` — Fetch batch size
numeric scalar

Fetch batch size, specified as a positive numeric scalar that indicates the number of rows of data to batch at a time. Use `fetchbatchsize` when importing large amounts of data. Retrieving data in batches reduces overall retrieval time.

Data Types: `double`

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single

quotes (' '). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `curs = fetch(curs,'RelativePosition',10);`

`AbsolutePosition` — Absolute position offset
numeric scalar

Absolute position offset, specified as a numeric scalar that indicates the absolute position offset value. When you specify an absolute position offset value, `fetch` imports data starting from the cursor position equal to this value regardless of the current cursor location. The scalar can be a positive number to signify fetching data from the start of the data set. Or, the scalar can be a negative number to signify fetching data from the end of the data set. This name-value pair argument is only available when you create a scrollable `cursor` object using `exec`. For details, see "Using Scrollable Cursors" on page 5-52.

Example: `'AbsolutePosition',5`

Data Types: `double`

`RelativePosition` — Relative position offset
numeric scalar

Relative position offset, specified as a numeric scalar that indicates the relative position offset value. When you specify a relative position offset value, `fetch` adds the current cursor position value to the relative position offset value. Then, `fetch` imports data starting from the resulting value. The scalar can be a positive number to signify importing data after the current cursor position in the data set. Or, the scalar can be a negative number to signify importing data before the current cursor position in the data set. This name-value pair argument is only available when you create a scrollable `cursor` object using `exec`. For details, see "Using Scrollable Cursors" on page 5-52.

Example: `'RelativePosition',10`

Data Types: `double`

Output Arguments

`curs` — Database cursor
`cursor` object

Database cursor, returned as a `cursor` object populated with imported data in the `Data` property. You can specify the output data format in the `Data` property using the `setdbprefs` function.

`results` — Result data
cell array | table | dataset | structure | numeric matrix

Result data, returned as a cell array, table, dataset array, structure, or numeric matrix as specified by `'DataReturnFormat'` in the `setdbprefs` function. The result data contains all rows of data from the executed SQL statement.

If `conn` is a SQLite connection, then `results` must be a cell array. The cell array contains only one of these data types: `double`, `int64`, or `char`. If `NULL`s exist in the result data, `fetch` returns an error. To avoid these limitations, connect to the SQLite database file using the JDBC driver. For details, see "Configuring Driver and Data Source" on page 2-15.

Tips

- The order of records in your database does not remain constant. Sort data using the SQL `ORDER BY` command in your `sqlquery` statement.
- If you have a native ODBC connection that you established using `database`, then running `fetch` on the `cursor` object updates the input `cursor` object itself. Depending on whether you provide an output argument, the same object gets copied over to the output. Thus, there is always only one `cursor` object created in memory for any of these usages:
  - `curs = fetch(curs)`
  - `fetch(curs)`
  - `curs2 = fetch(curs)`

Alternative Functionality

App

The `fetch` function imports data using the command line. To import data interactively, use the **Database Explorer** app.

See Also

`close` | `database` | `exec` | `fetchmulti` | `setdbprefs`

Topics

“Import Data from Databases into MATLAB” on page 5-2
“Import Data Using Scrollable Cursor with Relative Position Offset” on page 5-60
“Retrieve Image Data Types” on page 5-72
“Display Information About Imported Data” on page 5-49
“Import Data Using MATLAB® Interface to SQLite” on page 5-67
“Using Scrollable Cursors” on page 5-52
“Data Import Approaches and Memory Management” on page 5-45
“Connecting to Database Using Native ODBC Interface” on page 3-17
“Working with MATLAB Interface to SQLite” on page 2-6

External Websites

SQL Tutorial

Introduced before R2006a

fetchmulti

Import data from multiple result sets

Syntax

```
curs = fetchmulti(curs)
```

Description

`curs = fetchmulti(curs)` imports all rows of data from multiple result sets into the `Data` property of the `cursor` object. To create multiple result sets, first execute a SQL query using the `exec` function. The SQL query can contain two or more `SELECT` statements or call a stored procedure that consists of two or more `SELECT` statements. Then, use the `fetchmulti` function to import data in each result set.

Examples

Import Multiple Resultsets

Use the `cursor` object to import inventory and product data from a Microsoft® SQL Server® database using two SQL queries. Then, determine the highest quantity among inventory items.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password. The database contains the tables `inventoryTable` and `productTable`.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Select all data from two tables using two `SELECT` statements.

```
sqlquery = 'SELECT * FROM inventoryTable; SELECT * FROM productTable';

curs = exec(conn,sqlquery);
```

Import data from the two resultsets. The `fetchmulti` function imports data into the `Data` property of the `cursor` object.

The `Data` property is a cell array consisting of cell arrays, tables, structures, or numeric matrices as specified in the `setdbprefs` function. The data type is the same for all resultsets. Here, `Data` is a cell array of two tables.

The `Data` property contains the data from both resultsets. The first table contains data from the first `SELECT` statement. The second table contains data from the second `SELECT` statement.

```
curs = fetchmulti(curs)


curs =

  cursor with properties:

         Data: {[13×4 table]  [15×5 table]}
     RowLimit: 0
     SQLQuery: 'SELECT * FROM inventoryTable; SELECT * FROM productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1×1 database.internal.ODBCStatementHandle]
```

Display data from both tables.

```
inventory = curs.Data{1,1}
products = curs.Data{1,2}


inventory =
```

```
  13×4 table

    productNumber    Quantity    Price    inventoryDate
    _____________    ________    _____    _____________

     1               1700        15       '2014-09-23'
     2               1200         9       '2014-07-08'
     3                356        17       '2014-05-14'
     4               2580        21       '2013-06-08'
     5               9000         3       '2012-09-14'
     6               4540         8       '2013-12-25'
     7               6034        16       '2014-08-06'
     8               8350         5       '2011-06-18'
     9               2339        13       '2011-02-09'
    10                723        24       '2012-03-14'
    11                567        11       '2012-09-11'
    12               1278        22       '2010-10-29'
    13               1700        17       '2009-05-24'


products =

  15×5 table

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     9               1.2597e+05     1003              13          'Victorian Doll'
     8               2.1257e+05     1001               5          'Train Set'
     7               3.8912e+05     1007              16          'Engine Kit'
     2               4.0031e+05     1002               9          'Painting Set'
     4               4.0034e+05     1008              21          'Space Cruiser'
     1               4.0035e+05     1001              14          'Building Blocks'
     5               4.0046e+05     1005               3          'Tin Soldier'
     6               4.0088e+05     1004               8          'Sail Boat'
     3                 4.01e+05     1009              17          'Slinky'
    10               8.8865e+05     1006              24          'Teddy Bear'
    11               4.0814e+05     1004              11          'Convertible'
    12               2.1046e+05     1010              22          'Hugsy'
    13               4.7082e+05     1012              17          'Pancakes'
    14                5.101e+05     1011              19          'Shawl'
    15               8.9975e+05     1011              20          'Snacks'
```

Determine the highest quantity among inventory items.

```
max(inventory.Quantity)
```

```
ans =

        9000
```

After you finish working with the cursor object, close it. Close the database connection.

```
close(curs)
close(conn)
```

- "Call Stored Procedure That Returns Data" on page 5-40
- "Import Data from Databases into MATLAB" on page 5-2
- "Display Information About Imported Data" on page 5-49

Input Arguments

`curs` — Database cursor

`cursor` object

Database cursor, specified as a `cursor` object created using the `exec` function.

Output Arguments

`curs` — Database cursor

`cursor` object

Database cursor, returned as a `cursor` object populated with imported data in the `Data` property. You can specify the output data format in the `Data` property using the `setdbprefs` function.

See Also

`database` | `exec` | `fetch` | `setdbprefs`

Topics

“Call Stored Procedure That Returns Data” on page 5-40
“Import Data from Databases into MATLAB” on page 5-2
“Display Information About Imported Data” on page 5-49
“Create Queries with Characters and Variables” on page 5-6

External Websites

SQL Tutorial

Introduced in R2006b

get

(To be removed) Retrieve object properties

Note `get` will be removed in a future release. To retrieve `connection` object properties, access the `connection` object instead.

`driver` and `drivermanager` have been removed.

`resultset` and `rsmd` have been removed.

Syntax

```
s = get(object)
v = get(object,property)
```

Description

`s = get(object)` returns a structure `s` that contains the `object` and its corresponding properties.

`v = get(object,property)` returns the value `v` of `property` for the `object`.

Examples

Get Database Metadata Object Properties

Retrieve the properties of a database metadata object created using a `connection` object.

Establish an ODBC database connection to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Construct a database metadata object using the `connection` object.

```
dbmeta = dmd(conn);
```

Retrieve the properties of `dbmeta` and assign them as fields in the structure `v`.

```
v = get(dbmeta)
```

```
v =

  struct with fields:

                AllProceduresAreCallable: 0
                  AllTablesAreSelectable: 0
    DataDefinitionCausesTransactionCommit: 1
      DataDefinitionIgnoredInTransactions: 0
               DoesMaxRowSizeIncludeBlobs: 0
  ...
```

Display catalog names in the database.

```
v.Catalogs
```

```
ans =

  2×1 cell array

    'information_schema'
    'toy_store'
```

Close the database connection.

```
close(conn)
```

Get the AutoCommit Flag Status

Retrieve the `'AutoCommit'` property of the `connection` object.

Establish an ODBC database connection to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Check the status of the `'AutoCommit'` property of the `connection` object.

```
v = get(conn,'AutoCommit')
```

```
v =

  1×2 char array

    'on'
```

Close the database connection.

```
close(conn)
```

- “Display Database Metadata” on page 5-37
- “Display Information About Imported Data” on page 5-49

Input Arguments

`object` — Database Toolbox object

`connection` object | `cursor` object | ...

Database Toolbox object, specified as the following allowable objects:

- `connection` object, which is created using `database`
- `cursor` object, which is created using `exec`
- Database metadata object, which is created using `dmd`

`property` — Property of Database Toolbox object

character vector | string scalar

Property of the Database Toolbox object, specified as a character vector or string scalar.

For `connection` objects, see this table for the available property names and returned values.

`connection` Object Property	Description
`'AutoCommit'`	`'on'` or `'off'`, as specified by `set`. When `'AutoCommit'` is set to `'on'`, the database automatically commits changes to the data. When `'AutoCommit'` is set to `'off'`, the database requires an execution of the SQL `COMMIT` statement for committing changes to the data.

`connection` Object Property	Description
`'Catalogs'`	Name of catalogs in the data source. Extract a single catalog name from `'Catalog'` for functions such as `columns`, which accept only a single catalog.
`'Driver'`	Driver used for a JDBC connection, as specified by `database`.
`'DataSource'`	Name of the data source for an ODBC connection or the name of a database for a JDBC connection, as specified by `database`.
`'Message'`	Error message returned by `database`.
`'ReadOnly'`	`'on'` if the database is read-only; `'off'` if the database is writable.
`'LoginTimeOut'`	Number of seconds that the driver waits while trying to establish a database connection before throwing an error.
`'Type'`	Object type.
`'URL'`	For JDBC connections only, the JDBC URL object `jdbc:`*`subprotocol`*`:`*`subname`*, as specified by `database`.
`'UserName'`	User name required to connect to a given database, as specified by `database`.

You cannot use the `get` function to retrieve the `Password` property.

For `cursor` objects, see this table for the available property names and returned values.

`cursor` Object Property	Description
`'Data'`	Data in the `cursor` object data element (the query results).
`'RowLimit'`	Maximum number of rows returned by `fetch`, as specified by `set`.
`'SQLQuery'`	SQL statement for a `cursor` object, as specified by `exec`.
`'Message'`	Error message returned from `exec` or `fetch`.
`'Type'`	Object type, specifically `'Database Cursor Object'`.
`'Statement'`	Handle to Java statement object.

`cursor` Object Property	Description
`'Scrollable'`	Logical value to identify the `cursor` object as scrollable or basic. This property is set to 1 for a scrollable cursor and 0 otherwise. This property is hidden and read-only.
`'Position'`	Current position of the cursor in the data set. This property is only available for a scrollable cursor. This property behaves differently for native ODBC, JDBC, and different database drivers. This property is read-only.

For database metadata objects, see this table for the available property names and returned values.

Database Metadata Object Property	Description	Example of Value
`'Catalogs'`	List of database catalogs	`{'toystore' 'dbo'}`
`'DatabaseProductName'`	Database vendor name	`'ACCESS'`
`'DatabaseProductVersion'`	Database version number	`'03.50.0000'`
`'DriverName'`	Name of the JDBC or ODBC driver	`'sqlncli11.dll'`
`'MaxColumnNameLength'`	Maximum length of the database column name	`64`
`'MaxColumnsInOrderBy'`	Maximum number of database columns for sorting the data	`10`
`'URL'`	JDBC database URL for establishing a connection	`'jdbc:odbc:dbdemo'`

When `CatalogName` and `TableName` contain the value `{'' ''}`, databases do not return metadata for catalog and table names.

Data Types: `char` | `string`

Output Arguments

`s` — Object properties

structure

Object properties, returned as a structure that contains the object and its corresponding properties.

`v` — Object property value

character vector | numeric | cell array | object

Object property value, returned as a character vector, numeric value, cell array, or object.

See Also

`close` | `columns` | `database` | `dmd` | `exec` | `fetch` | `getdatasources` | `rows` | `set`

Topics

“Display Database Metadata” on page 5-37
“Display Information About Imported Data” on page 5-49

Introduced before R2006a

getdatasources

Return names of ODBC and JDBC data sources

Syntax

```
d = getdatasources
```

Description

`d = getdatasources` returns the names of valid ODBC and JDBC data sources on the system.

Examples

Retrieve Data Source Names

Connect to a database using its data source name.

Retrieve all ODBC and JDBC data source names on the system.

```
d = getdatasources
```

```
d =

  1×11 cell array

  Columns 1 through 3

    'Excel Files'    'MS Access Database'    'MS SQL Server'

...
```

`d` is a cell array of character vectors. Each character vector is a data source name that is defined on the system.

Use the data source name in the `database` function to connect to a database at the command line. Or, in the Database Explorer app, click **New Query** and then select the data source name from the **Data Source** list.

Output Arguments

`d` — Data sources

cell array of character vectors

Data sources, returned as a cell array of character vectors.

`d` is empty when the `ODBC.INI` file is valid, but no defined data sources exist.

For ODBC data sources, the `getdatasources` function retrieves data source names from the `ODBC.INI` file located in the folder returned by running:

```
myODBCdir = getenv('WINDIR')
```

The function also retrieves the names of data sources that are in the system registry but not in the `ODBC.INI` file.

For JDBC data sources, the `getdatasources` function retrieves data source names that you define using the JDBC Data Source Configuration dialog box in the Database Explorer app.

Note If you define a JDBC data source with the same name as an existing ODBC data source, the Database Explorer app appends `_JDBC` to the data source name.

See Also

Functions

`database`

Apps

Database Explorer

Topics

“Connecting to Database” on page 2-140

“Configuring Driver and Data Source” on page 2-15

Introduced before R2006a

importedkeys

(To be removed) Return information about imported foreign keys

Note The `importedkeys` function will be removed in a future release.

Syntax

```
i = importedkeys(dbmeta, 'cata', 'sch')
i = importedkeys(dbmeta, 'cata', 'sch', 'tab')
```

Description

`i = importedkeys(dbmeta, 'cata', 'sch')` returns foreign imported key information, that is, information about fields that reference primary keys in other tables, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

`i = importedkeys(dbmeta, 'cata', 'sch', 'tab')` returns foreign imported key information in the table `tab`. In turn, fields in `tab` reference primary keys in other tables in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Examples

Get foreign key information for the schema `SCOTT` in the catalog `orcl`, for `dbmeta`.

```
i = importedkeys(dbmeta,'orcl','SCOTT')
i =
  Columns 1 through 7
    'orcl'   'SCOTT'   'DEPT'   'DEPTNO'    'orcl'...
    'SCOTT'    'EMP'
  Columns 8 through 13
    'DEPTNO'    '1'    'null'    '1'    'FK_DEPTNO'...
    'PK_DEPT'
```

The results show foreign imported key information as described in the following table.

Column	Description	Value
1	Catalog containing primary key, referenced by foreign imported key	`orcl`
2	Schema containing primary key, referenced by foreign imported key	`SCOTT`
3	Table containing primary key, referenced by foreign imported key	`DEPT`
4	Column name of primary key, referenced by foreign imported key	`DEPTNO`
5	Catalog that has foreign imported key	`orcl`
6	Schema that has foreign imported key	`SCOTT`
7	Table that has foreign imported key	`EMP`
8	Foreign key column name, that is the column name that references the primary key in another table	`DEPTNO`
9	Sequence number within foreign key	`1`
10	Update rule, that is, what happens to the foreign key when the primary key updates	`null`
11	Delete rule, that is, what happens to the foreign key when the primary key is deleted	`1`
12	Foreign imported key name	`FK_DEPTNO`
13	Primary key name in referenced table	`PK_DEPT`

In the schema `SCOTT`, there is only one foreign imported key. The table `EMP` contains a field, `DEPTNO`, that references the primary key in the `DEPT` table, the `DEPTNO` field.

`EMP` is the referencing table and `DEPT` is the referenced table.

`DEPTNO` is a foreign imported key in the `EMP` table. Reciprocally, the `DEPTNO` field in the table `DEPT` is an exported foreign key and the primary key.

For a description of the codes for update and delete rules, see the `getImportedKeys` property on the Oracle Java Web site:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

See Also

`dmd` | `exportedkeys` | `get` | `primarykeys`

Topics

“Display Database Metadata” on page 5-37

Introduced before R2006a

indexinfo

(To be removed) Return indices and statistics for database tables

Note The `indexinfo` function will be removed in a future release.

Syntax

```
x = indexinfo(dbmeta, 'cata', 'sch', 'tab')
```

Description

`x = indexinfo(dbmeta, 'cata', 'sch', 'tab')` returns indices and statistics for the table `tab`, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Examples

Get index and statistics information for the table `DEPT` in the schema `SCOTT` of the catalog `orcl`, for `dbmeta`.

```
x = indexinfo(dbmeta,'','SCOTT','DEPT')
x =
 Columns 1 through 8
 'orcl'  'SCOTT'  'DEPT'  '0'  'null'  'null'    '0'  '0'
 'orcl'  'SCOTT'  'DEPT'  '0'  'null'  'PK_DEPT' '1'  '1'

  Columns 9 through 13
  'null'    'null'  '4'  '1'  'null'
  'DEPTNO'  'null'  '4'  '1'  'null'
```

The results contain two rows, meaning there are two index columns. The statistics for the first index column appear in the following table.

Column	Description	Value
1	Catalog	`orcl`
2	Schema	`SCOTT`
3	Table	`DEPT`
4	Not unique: `0` if index values can be not unique, `1` otherwise	`0`
5	Index catalog	`null`
6	Index name	`null`
7	Index type	`0`
8	Column sequence number within index	`0`
9	Column name	`null`
10	Column sort sequence	`null`
11	Number of rows in the index table or number of unique values in the index	`4`
12	Number of pages used for the table or number of pages used for the current index	`1`
13	Filter condition	`null`

For details about the index information, see the `getIndexInfo` property on the Oracle Java Web site:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

See Also

`dmd` | `get` | `tables`

Topics

"Display Database Metadata" on page 5-37

Introduced before R2006a

insert

Add MATLAB data to database tables

Syntax

```
insert(conn,tablename,colnames,data)
```

Description

`insert(conn,tablename,colnames,data)` exports data from the MATLAB workspace and inserts it into an existing database table using the database connection `conn`. You can specify the database table name and column names, and specify the data for insertion into the database.

If `conn` is a JDBC database connection, then the `insert` function has the same functionality as the `fastinsert` function.

Examples

Insert Table Record Using Native ODBC

Create an ODBC database connection to the Microsoft Access database. This code assumes that you are connecting to a data source named `dbdemo` with `admin` as the user name and password.

```
conn = database('dbdemo','admin','admin');
```

This database contains the table `productTable` with these columns:

- `productNumber`
- `stockNumber`
- `supplierNumber`

- unitCost
- productDescription

Select and display the data from the productTable table. The cursor object contains the executed query. Import the data from the executed query using the fetch function.

```
curs = exec(conn,'SELECT * FROM productTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     9               125970         1003              13          'Victorian Doll'
     8               212569         1001               5          'Train Set'
     7               389123         1007              16          'Engine Kit'
     2               400314         1002               9          'Painting Set'
     4               400339         1008              21          'Space Cruiser'
     1               400345         1001              14          'Building Blocks'
     5               400455         1005               3          'Tin Soldier'
     6               400876         1004               8          'Sail Boat'
     3               400999         1009              17          'Slinky'
    10               888652         1006              24          'Teddy Bear'
```

Store the column names of productTable in a cell array.

```
colnames = {'productNumber','stockNumber','supplierNumber',...
                    'unitCost','productDescription'};
```

Store data for insertion in the cell array data that contains these values:

- productNumber equal to 11
- stockNumber equal to 400565
- supplierNumber equal to 1010
- unitCost equal to $10
- productDescription equal to 'Rubik''s Cube'

Then, convert the cell array to the table data_table.

```
data = {11,400565,1010,10,'Rubik''s Cube'};
data_table = cell2table(data,'VariableNames',colnames)
```

```
data_table =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    11               400565         1010              10          'Rubik's Cube'
```

Insert the table data into `productTable`.

```
tablename = 'productTable';
insert(conn,tablename,colnames,data_table)
```

Display the data from `productTable` again.

```
curs = exec(conn,'SELECT * FROM productTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     9               125970         1003              13          'Victorian Doll'
     8               212569         1001               5          'Train Set'
     7               389123         1007              16          'Engine Kit'
     2               400314         1002               9          'Painting Set'
     4               400339         1008              21          'Space Cruiser'
     1               400345         1001              14          'Building Blocks'
     5               400455         1005               3          'Tin Soldier'
     6               400876         1004               8          'Sail Boat'
     3               400999         1009              17          'Slinky'
    10               888652         1006              24          'Teddy Bear'
    11               400565         1010              10          'Rubik's Cube'
```

A new row appears in `productTable` with the data from `data_table`.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Insert Contents of Cell Array

Create an ODBC database connection to the Microsoft Access database. This code assumes that you are connecting to a data source named `dbdemo` with blank user name and password.

```
conn = database('dbdemo','','');
```

This database contains the table `yearlySales` with these columns: `Month`, `salesTotal`, and `Revenue`.

Select and display the data from the `yearlySales` table. The `cursor` object contains the executed query. Import the data from the executed query using the `fetch` function.

```
curs = exec(conn,'SELECT * FROM yearlySales');
curs = fetch(curs);
curs.Data
```

```
ans =

      Month       salesTotal    Revenue
    _________    __________    _______
    'January'    130           1200
    'Feb'         25            250
```

Store the column names of `yearlySales` in a cell array.

```
colnames = {'Month','salesTotal','Revenue'};
```

Store the data for insertion in a cell array. The data contains `Month` equal to `'March'`, `salesTotal` equal to $50, and `Revenue` equal to $2000.

```
data = {'March',50,2000};
```

Insert the data into `yearlySales`.

```
tablename = 'yearlySales';
insert(conn,tablename,colnames,data)
```

Display the data from `yearlySales` again.

```
curs = exec(conn,'SELECT * FROM yearlySales');
curs = fetch(curs);
curs.Data
```

```
ans =

      Month       salesTotal    Revenue
    _________    __________    _______
    'January'    130           1200
    'Feb'         25            250
    'March'       50           2000
```

A new row appears in `yearlySales` with the data from `data`.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Insert Table Record Using MATLAB® Interface to SQLite

Create a table in a new SQLite database file and insert a new row of data into the table.

Create a SQLite connection `conn` to a new SQLite database file `tutorial.db`. Specify the file name in the current working folder.

```
dbfile = fullfile(pwd,'tutorial.db');

conn = sqlite(dbfile,'create');
```

Create the table `inventoryTable` using `exec`.

```
createInventoryTable = ['create table inventoryTable ' ...
    '(productNumber NUMERIC, Quantity NUMERIC, ' ...
    'Price NUMERIC, inventoryDate VARCHAR)'];

exec(conn,createInventoryTable)
```

`inventoryTable` is an empty table in `tutorial.db`.

Insert a row of data into `inventoryTable`.

```
colnames = {'productNumber','Quantity','Price','inventoryDate'};

insert(conn,'inventoryTable',colnames, ...
    {20,150,50.00,'11/3/2015 2:24:33 AM'})
```

Close the SQLite connection.

```
close(conn)
```

- “Export Data to New Record in Database” on page 5-20
- “Export Multiple Records from MATLAB Workspace” on page 5-26
- “Export Data Using Bulk Insert” on page 5-31

- “Import Data Using MATLAB® Interface to SQLite” on page 5-67
- “Roll Back Data After Updating Record” on page 5-17

Input Arguments

`conn` — Database connection

`connection` object | `sqlite` object

Database connection, specified as a `connection` object or `sqlite` object created using the `database` or `sqlite` functions.

`tablename` — Database table name

character vector | string scalar

Database table name, specified as a character vector or string scalar denoting the name of a table in your database.

Data Types: `char` | `string`

`colnames` — Database table column names

cell array of character vectors | string array

Database table column names, specified as a cell array of one or more character vectors or string array to denote the columns in the existing database table `tablename`.

Example: `{'col1','col2','col3'}`

Data Types: `cell` | `string`

`data` — Insert data

cell array | numeric matrix | table | dataset | structure

Insert data, specified as a cell array, numeric matrix, table, dataset array, or structure. These values depend on the type of database connection.

For a `connection` object, you do not specify the type of data that you are exporting. The `insert` function exports the data in its current MATLAB format. If `data` is a structure, then field names in the structure must match `colnames`. If `data` is a table or a dataset array, then the variable names in the table or dataset array must match `colnames`. If `data` is a structure, table, or dataset array, then specify each field or variable as a:

- Cell array
- Double vector of size m-by-1, where m is the number of rows to insert

For a `sqlite` object, the dataset array is not supported. Only `double`, `int64`, and `char` data types are supported.

Alternative Functionality

To export MATLAB data into a database, you can use the `datainsert` and `fastinsert` functions. For maximum performance, use `datainsert`.

For the MATLAB interface to SQLite, use only `insert`. For details, see "Working with MATLAB Interface to SQLite" on page 2-6.

For other differences among these functions, see "Inserting Data Using Command Line" on page 2-146.

See Also

`close` | `commit` | `database` | `fastinsert` | `rollback`

Topics

"Export Data to New Record in Database" on page 5-20
"Export Multiple Records from MATLAB Workspace" on page 5-26
"Export Data Using Bulk Insert" on page 5-31
"Import Data Using MATLAB® Interface to SQLite" on page 5-67
"Roll Back Data After Updating Record" on page 5-17
"Inserting Data Using Command Line" on page 2-146
"Connecting to Database Using Native ODBC Interface" on page 3-17
"Working with MATLAB Interface to SQLite" on page 2-6
"Data Type Support" on page 1-3

External Websites

SQL Tutorial

Introduced before R2006a

isreadonly

(To be removed) Determine if database connection is read-only

Note `isreadonly` will be removed in a future release. Use the `ReadOnly` `connection` object property instead.

Syntax

```
a = isreadonly(conn)
```

Description

`a = isreadonly(conn)` returns `1` if the database connection `conn` is read-only. Otherwise, it returns `0`.

Examples

Check whether `conn` is read-only.

```
a = isreadonly(conn)
```

For ODBC connections, you can use the native ODBC interface. For details, see `database`.

The result indicates that the database connection `conn` is read-only:

```
a =
     1
```

Therefore, you cannot run `datainsert`, `fastinsert`, `insert`, or `update` functions on this database.

See Also

`database` | `isopen`

Topics

"Import Data from Databases into MATLAB" on page 5-2
"Export Data to New Record in Database" on page 5-20
"Connecting to Database" on page 2-140
"Connecting to Database Using Native ODBC Interface" on page 3-17

Introduced before R2006a

logintimeout

(To be removed) Set or get time allowed to establish database connection

Note `logintimeout` will be removed in a future release. Use the name-value pair argument `LoginTimeout` of the `database` function instead.

Syntax

```
timeout = logintimeout('driver',time)
timeout = logintimeout(time)
timeout = logintimeout('driver')
timeout = logintimeout
```

Description

`timeout = logintimeout('driver',time)` sets the amount of time, in seconds, for a MATLAB session to connect to a database via a given JDBC `driver`. Use `logintimeout` before running the `database` function. If the MATLAB session cannot connect to the database within the specified time, it stops trying.

`timeout = logintimeout(time)` sets the amount of time, in seconds, allowed for a MATLAB session to try to connect to a database via an ODBC connection. Use `logintimeout` before running the `database` function. If the MATLAB session cannot connect within the allowed time, it stops trying.

`timeout = logintimeout('driver')` returns the `time`, in seconds, that was previously specified for the JDBC `driver`. A returned value of 0 means that the timeout value was not previously set. The MATLAB session stops trying to connect to the database if it is not immediately successful.

`timeout = logintimeout` returns the `time`, in seconds, that you previously specified for an ODBC connection. A returned value of 0 means that the timeout value was not previously set; the MATLAB software session stops trying to make a connection if it is not immediately successful.

Note If you do not specify a value for `logintimeout` and the MATLAB session cannot establish a database connection, your MATLAB session might freeze.

Note Apple Mac platforms do not support `logintimeout`.

Examples

Example 1 — Get Timeout Value for ODBC Connection

View the current connection timeout value.

```
logintimeout
ans =
     0
```

This indicates that you have not specified a timeout value.

Example 2 — Set Timeout Value for ODBC Connection

Set the timeout value to 5 seconds.

```
logintimeout(5)
ans =
     5
```

Example 3 — Get and Set Timeout Value for JDBC Connection

1. Check the timeout value for a database connection that is established using an Oracle JDBC driver.

   ```
   logintimeout('oracle.jdbc.driver.OracleDriver')
   ans =
        0
   ```

   This indicates that the timeout value is currently `0`.

2. Set the timeout to 5 seconds.

   ```
   timeout = ...
   logintimeout('oracle.jdbc.driver.OracleDriver',5)
   ```

```
timeout =
     5
```

3 Verify the timeout value.

```
logintimeout('oracle.jdbc.driver.OracleDriver')
ans =
     5
```

See Also

`database` | `get` | `isopen` | `isreadonly` | `set`

Topics

"Connecting to Database" on page 2-140
"Connecting to Database Using Native ODBC Interface" on page 3-17

Introduced before R2006a

namecolumn

(To be removed) Map resultset column name to resultset column index

Note `namecolumn` has been removed.

Syntax

```
x = namecolumn(rset,n)
```

Description

`x = namecolumn(rset,n)` maps a resultset column name `n` to its resultset column index. `rset` is the resultset and `n` is a character vector or cell array of character vectors containing the column names.

Examples

1 Get the indices for the column names `DNAME` and `LOC` resultset object `rset`.

```
x  =  namecolumn(rset, {'DNAME';'LOC'})
x =
     2     3
```

The results show that `DNAME` is column `2` and `LOC` is column `3`.

2 Get the index only for the `LOC` column.

```
x  =  namecolumn(rset, 'LOC')
```

See Also

`columnnames`

Topics

“Display Information About Imported Data” on page 5-49

Introduced before R2006a

ping

(To be removed) Retrieve status information about database connection

---

Note `ping` will be removed in a future release. Use these `connection` object properties instead:

- `MaxDatabaseConnections`
- `DatabaseProductName`
- `DatabaseProductVersion`
- `DriverName`
- `DriverVersion`

Syntax

```
ping(conn)
```

Description

`ping(conn)` retrieves the status of the database connection `conn`.

Examples

Retrieve Status of ODBC Connection

Create an Oracle connection using an ODBC driver. This code assumes that you are connecting a data source named `dbname` with user name `username` and password `pwd`.

```
conn = database(dbname,username,pwd);
```

Retrieve the status of the Oracle connection.

```
ping(conn)

ans =

  struct with fields:

       DatabaseProductName: 'Oracle'
    DatabaseProductVersion: '12.01.0020'
           ODBCDriverName: 'SQORA32.DLL'
        ODBCDriverVersion: '11.02.0004'
    MaxDatabaseConnections: 0
          CurrentUserName: 'username'
              DatabaseURL: ''
    AutoCommitTransactions: 'on'
```

`ping` returns these fields:

- Database name
- Database version
- JDBC driver name
- JDBC driver version
- Maximum number of database connections allowed
- User name for the current connection
- Database URL

The last field denotes if the current database connection permits automatic commit of transactions.

Close the database connection.

```
close(conn)
```

Retrieve Status of JDBC Connection

Create a Microsoft SQL Server connection using a JDBC driver. For example, the following code assumes that you are connecting a data source named `dbname` with user name `username`, password `pwd`, database server name `sname`, and port number `123456`.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server','Server','sname',...
                'AuthType','Server','PortNumber',123456);
```

Retrieve the status of the Microsoft SQL Server connection.

```
ping(conn)
```

```
ans =

       DatabaseProductName: 'Microsoft SQL Server'
    DatabaseProductVersion: '11.00.3000'
           JDBCDriverName: 'Microsoft JDBC Driver 4.0 for SQL Server'
        JDBCDriverVersion: '4.0.2206.100'
    MaxDatabaseConnections: 0
          CurrentUserName: 'username'
              DatabaseURL: 'jdbc:sqlserver:...'
    AutoCommitTransactions: 'True'
```

`ping` returns these fields:

- Database name
- Database version
- JDBC driver name
- JDBC driver version
- Maximum number of database connections allowed
- User name for the current connection
- Database URL

The last field denotes if the current database connection permits automatic commit of transactions.

Close the database connection.

```
close(conn)
```


- “Import Data from Databases into MATLAB” on page 5-2
- “Export Data to New Record in Database” on page 5-20

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

Tips

- When you use a `connection` object that is already closed in the `ping` function, the function returns the following error: Invalid connection. Create another connection to your database and try the `ping` function again.

See Also

`close` | `database` | `dmd` | `get` | `isopen` | `set` | `supports`

Topics

"Import Data from Databases into MATLAB" on page 5-2
"Export Data to New Record in Database" on page 5-20
"Connecting to Database" on page 2-140
"Connecting to Database Using Native ODBC Interface" on page 3-17

Introduced before R2006a

primarykeys

(To be removed) Get primary key information for database table or schema

Note The `primarykeys` function will be removed in a future release.

Syntax

```
k = primarykeys(dbmeta, 'cata', 'sch')
k = primarykeys(dbmeta, 'cata', 'sch', 'tab')
```

Description

`k = primarykeys(dbmeta, 'cata', 'sch')` returns primary key information for all tables in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

`k = primarykeys(dbmeta, 'cata', 'sch', 'tab')` returns primary key information for the table `tab`, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Examples

Get primary key information for the `DEPT` table:

```
k = primarykeys(dbmeta,'orcl','SCOTT','DEPT')
k =
   'orcl'   'SCOTT'   'DEPT'   'DEPTNO'   '1'   'PK_DEPT'
```

The results show the primary key information as described in the following table.

Column	Description	Value
1	Catalog	`orcl`
2	Schema	`SCOTT`

Column	Description	Value
3	Table	`DEPT`
4	Column name of primary key	`DEPTNO`
5	Sequence number within primary key	`1`
6	Primary key name	`PK_DEPT`

See Also

`dmd` | `exportedkeys` | `get` | `importedkeys`

Topics

“Display Database Metadata” on page 5-37

Introduced before R2006a

procedurecolumns

(To be removed) Get stored procedure parameters and result columns of catalogs

Note The `procedurecolumns` function will be removed in a future release.

Syntax

```
pc = procedurecolumns(dbmeta, 'cata', 'sch')
pc = procedurecolumns(dbmeta, 'cata')
```

Description

`pc = procedurecolumns(dbmeta, 'cata', 'sch')` returns the stored procedure parameters and result columns for the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

`pc = procedurecolumns(dbmeta, 'cata')` returns stored procedure parameters and result columns for the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Running the stored procedure generates results. One row is returned for each column.

Examples

Get stored procedure parameters for the schema `ORG`, in the catalog `tutorial`, for the database metadata object `dbmeta`:

```
pc = procedurecolumns(dbmeta,'tutorial', 'ORG')
pc =
  Columns 1 through 7
   [1x19 char]   'ORG'   'display'  'Month'   '3'...
   '12'  'TEXT'
   [1x19 char]   'ORG'   'display'  'Day'     '3'...
   '4'  'INTEGER'
```

```
Columns 8 through 13
  '50'    '50'    'null'    'null'    '1'    'null'
  '50'     '4'    'null'    'null'    '1'    'null'
```

The results show stored procedure parameter and result information. Because two rows of data are returned, there are two columns of data in the results. The results show that running the stored procedure `display` returns the `Month` and `Day` columns.

Following is a full description of the `procedurecolumns` results for the first row (`Month`).

Column	Description	Value for First Row
1	Catalog	`'D:\orgdatabase\orcl'`
2	Schema	`'ORG'`
3	Procedure name	`'display'`
4	Column/parameter name	`'MONTH'`
5	Column/parameter type	`'3'`
6	SQL data type	`'12'`
7	SQL data type name	`'TEXT'`
8	Precision	`'50'`
9	Length	`'50'`
10	Scale	`'null'`
11	Radix	`'null'`
12	Nullable	`'1'`
13	Remarks	`'null'`

For details about the `procedurecolumns` results, see the `getProcedureColumns` property on the Oracle Java Web site:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

See Also

`dmd` | `get` | `procedures`

Topics

"Display Database Metadata" on page 5-37

Introduced before R2006a

procedures

(To be removed) Get stored procedures for catalogs

Note The `procedures` function will be removed in a future release.

Syntax

```
p = procedures(dbmeta,'cata')
p = procedures(dbmeta,'cata','sch')
```

Description

`p = procedures(dbmeta,'cata')` returns stored procedures in the catalog `cata` for the database whose database metadata object is `dbmeta`.

`p = procedures(dbmeta,'cata','sch')` returns the stored procedures in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Stored procedures are SQL statements that are saved with the database. Use the `exec` function to run a stored procedure. Specify the stored procedure as the `sqlquery` argument instead of explicitly entering the `sqlquery` statement as the argument.

Examples

Get the names of stored procedures for the catalog `DBA` for the database metadata object `dbmeta`:

```
p = procedures(dbmeta,'DBA')
p =
    'sp_contacts'
    'sp_customer_list'
    'sp_customer_products'
```

```
    'sp_product_info'
    'sp_retrieve_contacts'
    'sp_sales_order'
```

Execute the stored procedure `sp_customer_list` for the database connection, and fetch all data:

```
curs = exec(conn,'sp_customer_list');
curs = fetch(curs);
```

View the results:

```
curs.Data
ans =
    [101]    'The Power Group'
    [102]    'AMF Corp.'
    [103]    'Darling Associates'
    [104]    'P.S.C.'
    [105]    'Amo & Sons'
    [106]    'Ralston Inc.'
    [107]    'The Home Club'
    [108]    'Raleigh Co.'
    [109]    'Newton Ent.'
    [110]    'The Pep Squad'
```

See Also

`dmd` | `exec` | `get` | `procedurecolumns`

Topics

"Display Database Metadata" on page 5-37

Introduced before R2006a

querytimeout

Get time specified for SQL queries to succeed

Syntax

```
timeout = querytimeout(curs)
```

Description

`timeout = querytimeout(curs)` returns the amount of time, in seconds, allowed for SQL queries of the open `cursor` object `curs` to succeed. If a given query cannot complete in the specified time, the toolbox stops trying to perform the query.

The database administrator defines timeout values. If the timeout value is zero, queries must complete immediately.

Examples

Get the current database timeout setting for `curs`.

```
querytimeout(curs)
ans =
     10
```

To create a `cursor` object using an ODBC connection, you can use the native ODBC interface. For details, see `database`.

Limitations

- This error message displays if a given database does not have a database timeout feature:

  ```
  [Driver]Optional feature not implemented
  ```

- ODBC drivers for Microsoft Access and Oracle do not support `querytimeout`.

See Also

`exec` | `fetch`

Topics

"Display Information About Imported Data" on page 5-49

Introduced before R2006a

resultset

(To be removed) Construct resultset object

Note `resultset` has been removed.

Syntax

```
rset = resultset(curs)
```

Description

`rset = resultset(curs)` creates a resultset object `rset` for the `cursor` object `curs`. To get properties of `rset`, create a resultset metadata object using `rsmd`, or make calls to `rset` using applications based on Oracle Java.

Run `namecolumn` on `rset`. Use `close` to close the resultset, which frees up resources.

Examples

Construct a resultset object `rset`.

```
rset = resultset(curs)
rset =

  resultset with properties:

    Handle: [1×1 com.microsoft.sqlserver.jdbc.SQLServerResultSet]
```

See Also

`close` | `exec` | `namecolumn` | `rsmd`

Topics

“Display Information About Imported Data” on page 5-49

Introduced before R2006a

rollback

Undo database changes

Syntax

```
rollback(conn)
```

Description

`rollback(conn)` reverses changes made to a database using `datainsert`, `fastinsert`, `insert`, or `update` via the database connection `conn`. The `rollback` function reverses all changes made since the last `COMMIT` or `ROLLBACK` operation. To use `rollback`, the `AutoCommit` flag for `conn` must be `off`.

Note If the database engine is not `InnoDB`, `rollback` does not roll back data in MySQL databases.

Examples

1. Ensure that the `AutoCommit` flag for connection `conn` is `off` by running:

   ```
   get(conn,'AutoCommit')
   ans =
       off
   ```

2. Insert data contained in `exdata` into the columns `DEPTNO`, `DNAME`, and `LOC`, in the table `DEPT`, for the data source `conn`.

   ```
   datainsert(conn,'DEPT',...
   {'DEPTNO';'DNAME';'LOC'},exdata)
   ```

3. Roll back the data `exdata` that you inserted into the database by running:

   ```
   rollback(conn)
   ```

   The database contains the original data present before running `datainsert`.

Tips

For ODBC connections, you can use the `rollback` function with the native ODBC interface. For details, see `database`.

See Also

`commit` | `database` | `datainsert` | `get` | `insert` | `update`

Topics

"Roll Back Data After Updating Record" on page 5-17
"Export Data to New Record in Database" on page 5-20
"Replace Existing Data in Database" on page 5-24

Introduced before R2006a

rows

Return number of rows in fetched data set

Syntax

```
numrows = rows(curs)
```

Description

`numrows = rows(curs)` returns the number of rows in the fetched data set `curs`.

Examples

Return Number of Rows in `cursor` Object

After executing an SQL statement, return the number of rows in the `cursor` object generated by `fetch`.

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Execute a `SELECT` query on the `productTable` for product numbers 1 through 5 inclusive.

```
curs = exec(conn,['SELECT * FROM productTable'...
            ' WHERE productNumber >= 1 AND productNumber <= 5']);
```

`exec` returns the `cursor` object `curs`.

Fetch the data in `curs`.

```
curs = fetch(curs);
```

The `Data` property of `curs` contains the fetched data from the `SELECT` query.

Return the number of rows in the `Data` property of `curs`.

```
numrows = rows(curs)
```

```
numrows =

     5
```

Display the rows of data in the `Data` property of `curs`.

```
curs.Data
```

```
ans =

    [2]    [400314]    [1002]    [ 9]    'Painting Set'
    [4]    [400339]    [1008]    [21]    'Space Cruiser'
    [1]    [400345]    [1001]    [14]    'Building Blocks'
    [5]    [400455]    [1005]    [ 3]    'Tin Soldier'
    [3]    [400999]    [1009]    [17]    'Slinky'
```

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the connection.

```
close(conn)
```

• “Display Information About Imported Data” on page 5-49

Input Arguments

`curs` — Database cursor

`cursor` object

Database cursor, specified as a `cursor` object created using the `exec` function.

Output Arguments

`numrows` — Number of rows in database cursor
numeric scalar

Number of rows in the database cursor, returned as a numeric scalar.

See Also

`close` | `cols` | `database` | `exec` | `fetch` | `get` | `rsmd`

Topics

“Display Information About Imported Data” on page 5-49

Introduced before R2006a

rsmd

(To be removed) Construct resultset metadata object

Note `rsmd` has been removed.

Syntax

```
rsmeta = rsmd(rset)
```

Description

`rsmeta = rsmd(rset)` creates a resultset metadata object `rsmeta`, for the resultset object `rset`. Get properties of `rsmeta` using `get` or make calls to `rsmeta` using applications that are based on Oracle Java.

Examples

Create a resultset metadata object `rsmeta`.

```
rsmeta=rsmd(rset)
rsmeta =

  rsmd with properties:

    Handle: [1×1 com.mathworks.toolbox.database.DatabaseResultsetMetaData]
```

Use `v = get(rsmeta)` and `v.property` to view properties of the resultset metadata object.

See Also

`exec` | `get` | `resultset`

Topics

“Display Information About Imported Data” on page 5-49

Introduced before R2006a

runsqlscript

Run SQL script on database

Syntax

```
results = runsqlscript(conn,scriptfile)
results = runsqlscript(___,Name,Value)
```

Description

`results = runsqlscript(conn,scriptfile)` returns a `cursor` object array that contains a `cursor` object for each executed SQL command in the SQL script file `scriptfile` using the database connection. The `runsqlscript` function executes all SQL commands in the SQL script file.

`results = runsqlscript(___,Name,Value)` specifies additional options using one or more name-value pair arguments. For example, `'RowInc',5` returns results from the executed SQL statements in the SQL script file in increments of five rows at a time.

Examples

Run SQL Script

First, connect to the Microsoft® SQL Server® database. Then, run two SQL `SELECT` statements from a SQL script file. Perform simple sales data analysis. Close the database connection.

To find the SQL script file, navigate to `\toolbox\database\dbdemos\compare_sales.sql` in your MATLAB® root folder. Copy and paste the path into your current working folder.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Run the SQL script. The SQL script has two queries. When the SQL script executes, it returns two `cursor` objects that contain the imported data from each query in a `cursor` object array.

```
scriptfile = 'compare_sales.sql';

results = runsqlscript(conn,scriptfile)
```

```
results =

  1×2 cursor array with properties:

    Data
    RowLimit
    SQLQuery
    Message
    Type
    Statement
    Position
```

Display the `cursor` object for the second query.

```
results(2)
```

```
ans =

  cursor with properties:
```

```
        Data: [9×6 table]
    RowLimit: 0
    SQLQuery: 'select      productDescription, supplierName, city, January as Jan_Sale
     Message: []
        Type: 'ODBCCursor Object'
   Statement: [1×1 database.internal.ODBCStatementHandle]
```

Display the imported data for the second query.

```
data = results(2).Data
```

```
data =

  9×6 table

    productDescription             supplierName                  city       Jan_Sales
    __________________    _____________________________    __________    _________

    'Victorian Doll'      'Wacky Widgets'                  'Adelaide'    1400
    'Painting Set'        'Terrific Toys'                  'London'      3000
    'Sail Boat'           'Incredible Machines'            'Dublin'      3000
    'Slinky'              'Doll's Galore'                  'London'      3000
    'Convertible'         'Incredible Machines'            'Dublin'      6000
    'Hugsy'               'The Great Teddy Bear Company'   'Belfast'     1800
    'Pancakes'            'Aunt Jemimas'                   'New York'    3100
    'Shawl'               'Indian Export'                  'Mumbai'       235
    'Snacks'              'Indian Export'                  'Mumbai'       123
```

Retrieve the column names for the second query.

```
names = columnnames(results(2))
```

```
names =

    ''productDescription','supplierName','city','Jan_Sales','Feb_Sales','Mar_Sales''
```

Determine the highest sales amount in January.

```
max(data.Jan_Sales)
```

```
ans =
```

```
        6000
```

Close the `cursor` object array and database connection.

```
close(results)
close(conn)
```

Run SQL Script in Row Increments

First, connect to the Microsoft® SQL Server® database. Then, run two SQL `SELECT` statements from a SQL script file. Import data in one-row increments. Perform simple sales data analysis. Close the database connection.

To find the SQL script file, navigate to `\toolbox\database\dbdemos\compare_sales.sql` in your MATLAB® root folder. Copy and paste the path into your current working folder.

Create an ODBC database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Check the database connection. If the `Message` property is empty, then the connection is successful.

```
conn.Message
```

```
ans =

     []
```

Run the SQL script and specify one-row increments. The SQL script has two queries. When the SQL script executes, it returns two `cursor` objects that contain the imported data from each query in a `cursor` object array.

```
results = runsqlscript(conn,'compare_sales.sql','RowInc',1)
```

```
results =

  1×2 cursor array with properties:

    Data
    RowLimit
    SQLQuery
    Message
    Type
    Statement
    Position
```

Display the imported data for the second query.

```
results(2).Data
```

```
ans =

  1×6 table

    productDescription     supplierName         city       Jan_Sales    Feb_Sales    Ma
    ___________________    _______________    __________    _________    _________    __

    'Victorian Doll'       'Wacky Widgets'    'Adelaide'    1400         1100         98
```

Because of the one-row increment specification, only the first row of data is displayed.

Import the next row of data using the `fetch` function and display it.

```
curs = fetch(results(2),1);
curs.Data
```

```
ans =

  1×6 table

    productDescription     supplierName        city      Jan_Sales    Feb_Sales    Mar_
    ___________________    _______________    ________    _________    _________    ____

    'Painting Set'         'Terrific Toys'    'London'    3000         2400         1800
```

Determine the highest sales amount among the months of January, February, and March.

```
data = curs.Data;
max([data.Jan_Sales data.Feb_Sales data.Mar_Sales])
```

```
ans =

        3000
```

Close the `cursor` object array, `cursor` object, and database connection.

```
close(results)
close(curs)
close(conn)
```

- “Import Data from Databases into MATLAB” on page 5-2

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`scriptfile` — SQL script file name

character vector | string scalar

SQL script file name that contains SQL statements to run, specified as a character vector or sting scalar. The file must be a text file and can contain comments along with SQL queries. Start single-line comments with `--`. Enclose multiline comments in `/*...*/`.

Example: `'C:\work\sql_file.sql'`

Data Types: `char` | `string`

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single

quotes (' '). You can specify several name and value pair arguments in any order as Name1,Value1,...,NameN,ValueN.

Example: results = runsqlscript(conn,scriptfile,'RowInc',3,'QTimeOut', 60);

RowInc — Row limit

0 (default) | numeric scalar

Row limit indicating the number of rows to retrieve at a time, specified as the comma-separated pair consisting of 'RowInc' and a positive numeric scalar. Use this name-value pair argument when importing large amounts of data. Importing data in increments helps reduce overall retrieval time.

By default, the runsqlscript function imports all rows of data from the executed SQL statements. The value 0 specifies to import all rows of data.

Example: 'RowInc',5

Data Types: double

QTimeOut — Query timeout

0 (default) | numeric scalar

Query timeout in seconds, specified as the comma-separated pair consisting of 'QTimeOut' and a positive numeric scalar. By default, the runsqlscript function waits an unlimited number of seconds to execute SQL statements in the SQL script file. The value 0 specifies to wait an unlimited amount of time.

Example: 'QTimeOut',180

Data Types: double

Output Arguments

results — Query results

cursor object array

Query results from executing the SQL commands in the SQL script file, returned as a cursor object array. The number of elements in results is equal to the number of batches on page 8-266 in the file scriptfile.

`results(M)` contains the results from executing the `M`th batch in the SQL script. If the batch returns a result set, then it is stored in `results(M).Data`.

Limitations

- Use `runsqlscript` to import data into MATLAB, especially if you have long and complex SQL queries that are difficult to convert into MATLAB character vectors or string scalars. `runsqlscript` is not designed to handle SQL scripts containing continuous PL/SQL blocks with `BEGIN` and `END`, such as stored procedure definitions or trigger definitions. However, table definitions do work.
- An SQL script containing any of the following can produce unexpected results:
  - Apostrophes that are not escaped, including the ones in comments. For example, write the character vector `'Here's the code'` as `'Here''s the code'`.
  - Nested comments.
- An SQL script containing more than 25,000 characters causes `runsqlscript` to return an error.

Definitions

Batch

One or more SQL statements terminated by either a semicolon or the keyword `GO`; for example:

```
SELECT productDescription, supplierName
FROM suppliers A, productTable B
WHERE A.SupplierNumber = B.SupplierNumber;

SELECT supplierName, Country
FROM suppliers;
```

Tips

- Any values assigned to `RowInc` or `QTimeOut` apply to all queries in the SQL script. For example, if `'RowInc'` is set to `5`, then all queries in the script return at most five rows in their respective query results.
- You can set preferences for the query results using the `setdbprefs` function. Preference settings apply to all queries in the SQL script. For example, if the `'DataReturnFormat'` is set to numeric, all query results return as numeric matrices.

See Also

`close` | `database` | `fetch` | `setdbprefs`

Topics

"Import Data from Databases into MATLAB" on page 5-2
"Configuring Driver and Data Source" on page 2-15
"Generate SQL Query and MATLAB Script" on page 4-17
"Data Import Using Database Explorer App or Command Line" on page 2-143

Introduced in R2012a

runstoredprocedure

Call stored procedure with and without input and output arguments

This function calls a stored procedure that has no input arguments, no output arguments, or any combination of input and output arguments. Define and instantiate this stored procedure in your database.

You can use this function if you connect to your database using a JDBC driver. For details, see “Connecting to Database” on page 2-140. If you are using the native ODBC interface to connect to your database, use `exec` to call the stored procedure.

Syntax

```
results = runstoredprocedure(conn,spname)
results = runstoredprocedure(conn,spname,inputargs)
results = runstoredprocedure(conn,spname,inputargs,outputtypes)
```

Description

`results = runstoredprocedure(conn,spname)` calls the stored procedure `spname` using the database connection `conn`. `results` is a logical `1` if the stored procedure returns a data set. Otherwise, `results` is a logical `0`.

`results = runstoredprocedure(conn,spname,inputargs)` calls the stored procedure that accepts one or more input arguments `inputargs`.

`results = runstoredprocedure(conn,spname,inputargs,outputtypes)` calls the stored procedure that returns output arguments by specifying the output argument data types `outputtypes`. `results` is a cell array that contains one or more output arguments.

Examples

Call a Stored Procedure Without Input and Output Arguments

Define a stored procedure named `create_table` that creates a table named `test_table` by executing this code. This procedure has no input or output arguments. This code assumes you are using a Microsoft SQL Server database.

```
CREATE PROCEDURE create_table

AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

CREATE TABLE test_table
     (
        CATEGORY_ID     INTEGER     IDENTITY PRIMARY KEY,
        CATEGORY_DESC   CHAR(50)    NOT NULL
        );

END
GO
```

Create a Microsoft SQL Server database connection `conn` using the JDBC driver. For details, see “Connecting to Database” on page 2-140. Then, call the stored procedure `create_table` using the database connection `conn`.

```
results = runstoredprocedure(conn,'create_table')

results =

   0
```

`results` returns 0 because calling `create_table` does not return a data set.

Check your database for a new table named `test_table`.

Close the database connection `conn`.

```
close(conn)
```

Call a Stored Procedure with Input Arguments

Define a stored procedure named `insert_data` that inserts a category description into a table named `test_create` by executing this code. This procedure has one input argument `data`. This code assumes you are using a Microsoft SQL Server database.

```
CREATE PROCEDURE insert_data
    @data varchar(50)

AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

    INSERT INTO test_create (CATEGORY_DESC)
    VALUES (@data)
END
GO
```

Create a Microsoft SQL Server database connection `conn` using the JDBC driver. For details, see “Connecting to Database” on page 2-140. Then, call the stored procedure `insert_data` using the database connection `conn` with the category description `Apples` as the input argument.

```
inputarg = {'Apples'};

results = runstoredprocedure(conn,'insert_data',inputarg)

results =

   0
```

`results` returns 0 because calling `insert_data` does not return a data set.

The table `test_create` adds a row where the column `CATEGORY_ID` equals `1` and the column `CATEGORY_DESCRIPTION` equals `Apples`.

`CATEGORY_ID` is the primary key of the table `test_create`. This primary key increments automatically. `CATEGORY_ID` equals `1` when calling `insert_data` for the first time.

Close the database connection `conn`.

```
close(conn)
```

Call a Stored Procedure with Output Arguments

Define a stored procedure named `maxDecVolume` that selects the maximum sales volume in December by executing this code. This procedure has one output argument `data` and no input arguments. This code assumes you are using a Microsoft SQL Server database.

```
CREATE PROCEDURE maxDecVolume
    @data int OUTPUT
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

     SELECT @data = max(December) FROM salesVolume
END

GO
```

Create a Microsoft SQL Server database connection `conn` using the JDBC driver. For details, see “Connecting to Database” on page 2-140. Then, call the stored procedure using:

- Database connection `conn`
- Stored procedure `maxDecVolume`
- Empty brackets to denote no input arguments
- Numeric Java data type `outputtype`

```
outputtype = {java.sql.Types.NUMERIC};

results = runstoredprocedure(conn,'maxDecVolume',[],outputtype)

results =

    [1x1 java.math.BigDecimal]
```

`results` returns a cell array that contains the maximum sales volume as a Java decimal data type.

Display the value in `results`.

```
results{1}
```

```
ans =

35000
```

The maximum sales volume in December is 35,000.

Close the database connection `conn`.

```
close(conn)
```

Call a Stored Procedure with Input and Output Arguments

Define a stored procedure named `getSuppCount` that counts the number of suppliers for a specified city by executing this code. This procedure has one input argument `cityName` and one output argument `suppCount`. This code assumes you are using a Microsoft SQL Server database.

```
CREATE PROCEDURE getSuppCount
    (@cityName varchar(20),
     @suppCount int OUTPUT)
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

    SELECT @suppCount = count(supplierNumber)
 FROM suppliers WHERE City = @cityName;

END
GO
```

Create a Microsoft SQL Server database connection `conn` using the JDBC driver. For details, see “Connecting to Database” on page 2-140. Then, call the stored procedure `getSuppCount` using the database connection `conn`. The input argument `inputarg` is a cell array containing the character vector `'New York'`. The output Java data type `outputtype` is numeric.

```
inputarg = {'New York'};
outputtype = {java.sql.Types.NUMERIC};

results = runstoredprocedure(conn,'getSuppCount',inputarg,outputtype)

results =

    [1x1 java.math.BigDecimal]
```

`results` is a cell array that contains the supplier count as a Java decimal data type.

Display the value in `results`.

```
results{1}

ans =

6.0000
```

There are six suppliers in New York.

Close the database connection `conn`.

```
close(conn)
```

Call a Stored Procedure with Multiple Input and Output Arguments

Define a stored procedure named `productsWithinUnitCost` that returns the product number and description for products that have a unit cost in a specified range by executing this code. This procedure has two input arguments `minUnitCost` and `maxUnitCost`. This procedure has two output arguments `productno` and `productdesc`. This code assumes you are using a Microsoft SQL Server database.

```
CREATE PROCEDURE productsWithinUnitCost
    (@minUnitCost INT,
    @maxUnitCost INT,
    @productno INT OUTPUT,
    @productdesc VARCHAR(50) OUTPUT)
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
```

```
    SET NOCOUNT ON;

 SELECT @productno = productNumber, @productdesc = productDescription
 FROM productTable
    WHERE unitCost > @minUnitCost AND unitCost < @maxUnitCost
END


GO
```

Create a Microsoft SQL Server database connection `conn` using the JDBC driver. For details, see “Connecting to Database” on page 2-140. Then, call the stored procedure using:

- Database connection `conn`
- Stored procedure `productsWithinUnitCost`
- Input arguments `inputargs` to specify a unit cost between 19 and 21
- Output Java data types `outputtypes` to specify numeric and string data types for product number and description

```
inputargs = {19,21};
outputtypes = {java.sql.Types.NUMERIC,java.sql.Types.VARCHAR};

results = runstoredprocedure(conn,'productsWithinUnitCost',...
                             inputargs,outputtypes)

results =

    [1x1 java.math.BigDecimal]
    'Snacks'
```

`results` returns a cell array that contains the product number as a Java decimal data type and the product description as a string.

Display the product number in `results`.

```
results{1}

ans =

15
```

The product with product number 15 has a unit cost between 19 and 21.

Display the product description in `results`.

```
results{2}
```

```
ans =

Snacks
```

The product with product number 15 has the product description `Snacks`.

Here, the narrow unit cost range returns only one product. If the unit cost range is wider, then more than one product might satisfy this condition. To return a data set with numerous products, use `exec` and `fetch` to call this stored procedure. Otherwise, `runstoredprocedure` returns only the last row in the data set.

Close the database connection `conn`.

```
close(conn)
```

• "Call Stored Procedure That Returns Data" on page 5-40

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`spname` — Stored procedure name

character vector

Stored procedure name, specified as a character vector that contains the name of the stored procedure that is defined and instantiated in your database.

Data Types: `char`

`inputargs` — Input arguments

cell array

Input arguments, specified as a cell array of one or more values for each input argument of the stored procedure. Input arguments can be only basic data types such as double, character vector, logical, and so on.

Data Types: `cell`

`outputtypes` — Output types
cell array

Output types, specified as a cell array of one or more Java data types for the output arguments of the stored procedure. Some JDBC drivers do not support all `java.sql.Types`. Consult your JDBC driver documentation to find the supported types. Match them to the data types found in your stored procedure.

Example: `{java.sql.Types.NUMERIC}`

Data Types: `cell`

Output Arguments

`results` — Stored procedure results
logical | cell array

Stored procedure results, returned as a logical or cell array.

`runstoredprocedure` returns a logical `1` when calling the stored procedure returns a data set. Otherwise, `runstoredprocedure` returns a logical `0`. If the stored procedure returns a data set, use `exec` and `fetch` to call the stored procedure and retrieve the data set. For details, see “Call Stored Procedure That Returns Data” on page 5-40.

`runstoredprocedure` returns a cell array when you specify one or more output Java data types for the output arguments of the stored procedure. Use cell array indexing to retrieve the output argument values.

See Also

`close` | `database` | `exec` | `fetch`

Topics

“Call Stored Procedure That Returns Data” on page 5-40

“Connecting to Database” on page 2-140

External Websites

SQL Tutorial

Introduced in R2006b

schemas

(To be removed) Get database schema names

Note `schemas` will be removed in a future release. Use the `Schemas` `connection` object property instead.

Syntax

```
s = schemas(conn)
```

Description

`s = schemas(conn)` retrieves schema names in a database using the database connection `conn`.

Examples

Retrieve Schema Names in the Database

Create a database connection `conn` to the Oracle database using the JDBC driver. Use the `Vendor` name-value pair argument of `database` to specify a connection to an Oracle database. To connect without Windows authentication, use the `DriverType` name-value pair argument of `database` to specify a connection to the database server by specifying the `thin` value. Here, this code assumes that you are connecting to a database named `dbname` with user name `username` and password `pwd`. This code assumes that you are using the database server named `sname` and port number `123456`.

```
conn = database('dbname','username','pwd',...
                'Vendor','Oracle','DriverType','thin',...
                'Server','sname','PortNumber',123456);
```

Alternatively, use the native ODBC interface for an ODBC connection. For details, see `database`.

Retrieve the schema names in the database named `dbname` using the database connection `conn`.

```
s = schemas(conn)

s =

  Columns 1 through 4

    'ANONYMOUS'    'APEX_040200'    'APEX_PUBLIC_USER'    'APPQOSSYS'

  Columns 5 through 10

    'AUDSYS'    'CTXSYS'    'DBSNMP'    'DIP'    'DVF'    'DVSYS'

  ...
```

`s` returns a cell array of schema names in the Oracle database.

Close the connection.

```
close(conn)
```

- “Display Database Metadata” on page 5-37

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

Output Arguments

`s` — Schema names

cell array

Schema names, returned as a cell array containing the names of the schemas in the database. The contents of `s` that you see depend upon your permission settings in the database.

See Also

`catalogs` | `close` | `columns` | `database` | `tables`

Topics

“Display Database Metadata” on page 5-37

Introduced in R2010a

select

Execute SQL `SELECT` statement and import data into MATLAB

Syntax

```
data = select(conn,selectquery)
data = select(conn,selectquery,Name,Value)
[data,metadata] = select(___)
```

Description

`data = select(conn,selectquery)` returns imported data from the database connection `conn` for the specified SQL `SELECT` statement `selectquery`.

`data = select(conn,selectquery,Name,Value)` specifies additional options using one or more name-value pair arguments. For example, `'MaxRows',10` sets the maximum number of rows to return to 10 rows.

`[data,metadata] = select(___)` returns information about the imported data using any of the input argument combinations in the previous syntaxes. Use this information to change missing values in the imported data and view data types for each variable.

Examples

Import and Access Data Immediately

Import data from a database in one step using the `select` function. You can access data and perform immediate data analysis.

The code assumes that you have a database table `Patients` stored on a Microsoft® SQL Server® database. This table contains patient data in 10 columns and rows. The table definition is:

```
CREATE TABLE Patients(
      LastName VARCHAR(50),
      Gender VARCHAR(10),
      Age TINYINT,
      Location VARCHAR(300),
      Height SMALLINT,
      Weight SMALLINT,
      Smoker BIT,
      Systolic FLOAT,
      Diastolic NUMERIC,
      SelfAssessedHealthStatus VARCHAR(20))
```

This example uses a Microsoft® SQL Server® Version 11.00.2100 database and the Microsoft® SQL Server® Driver 11.00.5058.

Create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Import all data from the `Patients` table by executing the SQL `SELECT` statement using the `select` function. `data` is a table that contains the imported data.

```
selectquery = 'SELECT * FROM Patients';

data = select(conn,selectquery)
```

```
data =

  10×10 table

    LastName      Gender     Age            Location                 Height    Weight
    __________    ________    ___    ____________________________    ______    ______

    'Smith'       'Male'      38     'Country General Hospital'      -32768       176
    'Johnson'     'Male'      43     'VA Hospital'                       69       163
    'Williams'    'Female'    38     ''                                  64       131
    'Jones'       'Female'     0     'VA Hospital'                       67       133
    'Broen'       'Female'    49     'Country General Hospital'          64       119
    'Davis'       'Female'    46     'St Mary's Medical Center'          68       142
    'Miller'      'Female'    33     'VA Hospital'                       64       142
    'Wilson'      'Male'      40     'VA Hospital'                   -32768       180
    'Moore'       'Male'      28     'St Mary's Medical Center'          68    -32768
```

```
    'Taylor'      'Female'    31     'Country General Hospital'        68       132
```

Determine the number of male patients by immediately accessing the data. Use the `count` function to find occurrences in the gender data of the character vector that represents a male. Determine the total number of occurrences.

```
males = count(data.Gender,'Male');
sum(males)
```

```
ans =

     4
```

Close the database connection.

```
close(conn)
```

Limit Number of Rows in Imported Data

Import a limited number of rows from a database in one step using the `select` function. Database Toolbox™ imports the data using MATLAB® numeric data types that correspond to data types in the database table. After importing data, you can access data and perform immediate data analysis.

The code assumes that you have a database table `Patients` stored on a Microsoft® SQL Server® database. This table contains patient data in 10 columns and rows. The table definition is:

```
CREATE TABLE Patients(
      LastName VARCHAR(50),
      Gender VARCHAR(10),
      Age TINYINT,
      Location VARCHAR(300),
      Height SMALLINT,
      Weight SMALLINT,
      Smoker BIT,
      Systolic FLOAT,
      Diastolic NUMERIC,
      SelfAssessedHealthStatus VARCHAR(20))
```

Here, connect to a Microsoft® SQL Server® Version 11.00.2100 database using the Microsoft® SQL Server® Driver 11.00.5058.

Create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Import data from the `Patients` table by executing the SQL `SELECT` statement using the `select` function. Limit the number of imported rows using the name-value pair argument `'MaxRows'`.

`data` is a table. The MATLAB® data types in the table correspond to the data types in the database. Here, `Age` has data type `uint8` that corresponds to `TINYINT` in the table definition.

`metadata` is a table that contains additional information about each variable in `data`.

- `VariableType` -- MATLAB® data type
- `MissingValue` -- `NULL` value representation
- `MissingRows` -- Vector of row indices that contain a missing value

```
selectquery = 'SELECT * FROM Patients';

[data,metadata] = select(conn,selectquery,'MaxRows',5)


data =

  5×10 table

    LastName      Gender     Age            Location                 Height    Weight
    __________    ________    ___    ____________________________    ______    ______

    'Smith'       'Male'      38     'Country General Hospital'      -32768     176
    'Johnson'     'Male'      43     'VA Hospital'                       69     163
    'Williams'    'Female'    38     ''                                  64     131
    'Jones'       'Female'     0     'VA Hospital'                       67     133
    'Broen'       'Female'    49     'Country General Hospital'          64     119


metadata =
```

```
10×3 table

                           VariableType    MissingValue    MissingRows
                           ____________    ____________    ____________

    LastName               'char'          ''              [0×1 double]
    Gender                 'char'          ''              [0×1 double]
    Age                    'uint8'         [     0]        [         4]
    Location               'char'          ''              [0×1 double]
    Height                 'int16'         [-32768]        [         1]
    Weight                 'int16'         [-32768]        [0×1 double]
    Smoker                 'logical'       [     0]        [0×1 double]
    Systolic               'single'        [   NaN]        [         2]
    Diastolic              'double'        [   NaN]        [0×1 double]
    SelfAssessedHealthStatus    'char'     ''              [0×1 double]
```

Determine the number of male patients by immediately accessing the data. Use the `count` function to find occurrences in the gender data of the character vector that represents a male. Determine the total number of occurrences.

```
males = count(data.Gender,'Male');
sum(males)
```

```
ans =

     2
```

Close the database connection.

```
close(conn)
```

View Information About Imported Data

Import data from a database in one step using the `select` function. Database Toolbox™ imports the data using MATLAB® numeric data types that correspond to data types in the database table. You can view data type information in the imported data. You can also access data and perform immediate data analysis.

The code assumes that you have a database table `Patients` stored on a Microsoft® SQL Server® database. This table contains patient data in 10 columns and rows. The table definition is:

```
CREATE TABLE Patients(
      LastName VARCHAR(50),
      Gender VARCHAR(10),
      Age TINYINT,
      Location VARCHAR(300),
      Height SMALLINT,
      Weight SMALLINT,
      Smoker BIT,
      Systolic FLOAT,
      Diastolic NUMERIC,
      SelfAssessedHealthStatus VARCHAR(20))
```

Here, connect to a Microsoft® SQL Server® Version 11.00.2100 database using the Microsoft® SQL Server® Driver 11.00.5058.

Create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Import all data from the `Patients` table by executing the SQL `SELECT` statement using the `select` function.

`data` is a table. The MATLAB® data types in the table correspond to the data types in the database. Here, `Age` has the MATLAB® data type `uint8` that corresponds to `TINYINT` in the table definition.

`metadata` is a table that contains additional information about each variable in `data`.

- `VariableType` -- MATLAB® data type
- `MissingValue` -- Null value representation
- `MissingRows` -- Vector of row indices that contain a missing value

```
selectquery = 'SELECT * FROM Patients';

[data,metadata] = select(conn,selectquery)


data =
```

```
  10×10 table

     LastName      Gender     Age            Location              Height    Weight
    __________    ________    ___    ____________________________    ______    ______

    'Smith'       'Male'      38     'Country General Hospital'    -32768       176
    'Johnson'     'Male'      43     'VA Hospital'                     69       163
    'Williams'    'Female'    38     ''                                64       131
    'Jones'       'Female'     0     'VA Hospital'                     67       133
    'Broen'       'Female'    49     'Country General Hospital'        64       119
    'Davis'       'Female'    46     'St Mary's Medical Center'        68       142
    'Miller'      'Female'    33     'VA Hospital'                     64       142
    'Wilson'      'Male'      40     'VA Hospital'                 -32768       180
    'Moore'       'Male'      28     'St Mary's Medical Center'        68    -32768
    'Taylor'      'Female'    31     'Country General Hospital'        68       132


metadata =

  10×3 table

                              VariableType    MissingValue    MissingRows
                              ____________    ____________    ___________

    LastName                  'char'          ''              [0×1 double]
    Gender                    'char'          ''              [0×1 double]
    Age                       'uint8'         [     0]        [         4]
    Location                  'char'          ''              [0×1 double]
    Height                    'int16'         [-32768]        [2×1 double]
    Weight                    'int16'         [-32768]        [         9]
    Smoker                    'logical'       [     0]        [0×1 double]
    Systolic                  'single'        [   NaN]        [2×1 double]
    Diastolic                 'double'        [   NaN]        [         6]
    SelfAssessedHealthStatus  'char'          ''              [0×1 double]
```

View data types of each variable in the table.

```
metadata.VariableType
```

```
ans =

  10×1 cell array
```

```
    'char'
    'char'
    'uint8'
    'char'
    'int16'
    'int16'
    'logical'
    'single'
    'double'
    'char'
```

Determine the number of male patients by immediately accessing the data. Use the `count` function to find occurrences in the gender data of the character vector that represents a male. Determine the total number of occurrences.

```
males = count(data.Gender,'Male');
sum(males)
```

```
ans =

     4
```

Close the database connection.

```
close(conn)
```

Change Missing Values in Imported Data Using for Loop

Import data from a database in one step using the `select` function. During import, the `select` function sets default values for missing data in each row. Use the information about the imported data to change the default values.

The code assumes that you have a database table `Patients` stored on a Microsoft® SQL Server® database. This table contains patient data in 10 columns and rows. The table definition is:

```
CREATE TABLE Patients(
      LastName VARCHAR(50),
```

```
    Gender VARCHAR(10),
    Age TINYINT,
    Location VARCHAR(300),
    Height SMALLINT,
    Weight SMALLINT,
    Smoker BIT,
    Systolic FLOAT,
    Diastolic NUMERIC,
    SelfAssessedHealthStatus VARCHAR(20))
```

Here, connect to a Microsoft® SQL Server® Version 11.00.2100 database using the Microsoft® SQL Server® Driver 11.00.5058.

Create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Import all data from the `Patients` table by executing the SQL `SELECT` statement using the `select` function.

`data` is a table that contains the imported data.

`metadata` is a table that contains additional information about each variable in `data`.

- `VariableType` -- MATLAB® data type
- `MissingValue` -- `NULL` value representation
- `MissingRows` -- Vector of row indices that indicate the location of missing values

```
selectquery = 'SELECT * FROM Patients';

[data,metadata] = select(conn,selectquery)


data =

  10×10 table array

    LastName      Gender     Age             Location                 Height    Weight
    __________    ________    ___    ____________________________    ______    ______

    'Smith'       'Male'      38     'Country General Hospital'      -32768       176
```

```
    'Johnson'     'Male'      43     'VA Hospital'                    69       163
    'Williams'    'Female'    38     ''                               64       131
    'Jones'       'Female'     0     'VA Hospital'                    67       133
    'Broen'       'Female'    49     'Country General Hospital'       64       119
    'Davis'       'Female'    46     'St Mary's Medical Center'       68       142
    'Miller'      'Female'    33     'VA Hospital'                    64       142
    'Wilson'      'Male'      40     'VA Hospital'                 -32768       180
    'Moore'       'Male'      28     'St Mary's Medical Center'       68    -32768
    'Taylor'      'Female'    31     'Country General Hospital'       68       132


metadata =

  10×3 table array

                              VariableType    MissingValue    MissingRows
                              ____________    ____________    ___________

    LastName                  'char'          ''              [0×1 double]
    Gender                    'char'          ''              [0×1 double]
    Age                       'uint8'         [     0]        [         4]
    Location                  'char'          ''              [0×1 double]
    Height                    'int16'         [-32768]        [2×1 double]
    Weight                    'int16'         [-32768]        [         9]
    Smoker                    'logical'       [     0]        [0×1 double]
    Systolic                  'single'        [   NaN]        [2×1 double]
    Diastolic                 'double'        [   NaN]        [         6]
    SelfAssessedHealthStatus  'char'          ''              [0×1 double]
```

Retrieve indices that indicate the location of missing values in the `Height` variable using the `metadata` output argument.

```
values = metadata.MissingRows{'Height'}


values =

     1
     8
```

Change the default value for missing data from `-32768` to `0` using a for loop. Access the imported data using the indices.

```
for i = 1:length(values)
    data.Height(values(i)) = 0;
end
```

View the imported data.

```
data.Height
```

```
ans =

  10×1 int16 column vector

    0
   69
   64
   67
   64
   68
   64
    0
   68
   68
```

Missing values appear as `0`.

Close the database connection.

```
close(conn)
```

Change Missing Values in Imported Data Using Vector Indexing

Import data from a database in one step using the `select` function. During import, the `select` function sets default values for missing data in each row. Use the information about the imported data to change default values by indexing into the vector.

The code assumes that you have a database table `Patients` stored on a Microsoft® SQL Server® database. This table contains patient data in 10 columns and rows. The table definition is:

```
CREATE TABLE Patients(
      LastName VARCHAR(50),
```

```
    Gender VARCHAR(10),
    Age TINYINT,
    Location VARCHAR(300),
    Height SMALLINT,
    Weight SMALLINT,
    Smoker BIT,
    Systolic FLOAT,
    Diastolic NUMERIC,
    SelfAssessedHealthStatus VARCHAR(20))
```

Here, connect to a Microsoft® SQL Server® Version 11.00.2100 database using the Microsoft® SQL Server® Driver 11.00.5058.

Create a database connection to a Microsoft® SQL Server® database with Windows® authentication. Specify a blank user name and password.

```
datasource = 'MS SQL Server Auth';
conn = database(datasource,'','');
```

Import all data from the `Patients` table by executing the SQL `SELECT` statement using the `select` function.

`data` is a table that contains the imported data.

`metadata` is a table that contains additional information about each variable in `data`.

- `VariableType` -- MATLAB® data type
- `MissingValue` -- `NULL` value representation
- `MissingRows` -- Vector of row indices that indicate the location of missing values

```
selectquery = 'SELECT * FROM Patients';

[data,metadata] = select(conn,selectquery)


data =

  10×10 table array

    LastName      Gender     Age             Location                 Height    Weight
    __________    ________    ___    ____________________________    ______    ______

    'Smith'       'Male'      38     'Country General Hospital'      -32768       176
```

```
    'Johnson'     'Male'      43     'VA Hospital'                    69       163
    'Williams'    'Female'    38     ''                               64       131
    'Jones'       'Female'     0     'VA Hospital'                    67       133
    'Broen'       'Female'    49     'Country General Hospital'       64       119
    'Davis'       'Female'    46     'St Mary's Medical Center'       68       142
    'Miller'      'Female'    33     'VA Hospital'                    64       142
    'Wilson'      'Male'      40     'VA Hospital'                 -32768       180
    'Moore'       'Male'      28     'St Mary's Medical Center'       68    -32768
    'Taylor'      'Female'    31     'Country General Hospital'       68       132


metadata =

  10×3 table array

                              VariableType    MissingValue    MissingRows
                              ____________    ____________    ___________

    LastName                  'char'          ''              [0×1 double]
    Gender                    'char'          ''              [0×1 double]
    Age                       'uint8'         [     0]        [         4]
    Location                  'char'          ''              [0×1 double]
    Height                    'int16'         [-32768]        [2×1 double]
    Weight                    'int16'         [-32768]        [         9]
    Smoker                    'logical'       [     0]        [0×1 double]
    Systolic                  'single'        [   NaN]        [2×1 double]
    Diastolic                 'double'        [   NaN]        [         6]
    SelfAssessedHealthStatus  'char'          ''              [0×1 double]
```

Retrieve indices that indicate the location of missing values in the `Height` variable using the `metadata` output argument.

```
values = metadata(5,3)
valuesindex = values.MissingRows{1}


values =

  table

              MissingRows
              ___________

    Height    [2×1 double]
```

```
valuesindex =

     1
     8
```

Change the default value for missing data from `-32768` to `0` using vector indexing.

```
data.Height(valuesindex) = 0;
```

View the imported data.

```
data.Height
```

```
ans =

  10×1 int16 column vector

    0
   69
   64
   67
   64
   68
   64
    0
   68
   68
```

Missing values appear as `0`.

Close the database connection.

```
close(conn)
```

Input Arguments

conn — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`selectquery` — SQL `SELECT` statement
character vector | string

SQL `SELECT` statement, specified as a character vector or string. The `select` function only executes SQL `SELECT` statements. To execute other SQL statements, use the `exec` function.

Example: `'SELECT * FROM inventoryTable'`

Data Types: `char` | `string`

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `'MaxRows',100,'QueryTimeOut',5` returns 100 rows of data and waits 5 seconds to execute the SQL `SELECT` statement.

`MaxRows` — Maximum number of rows to return
positive numeric scalar

Maximum number of rows to return, specified as the comma-separated pair consisting of `'MaxRows'` and a positive numeric scalar. By default, the `select` function returns all rows from the executed SQL `SELECT` statement. Use this name-value pair argument to limit the number of rows imported into MATLAB from the SQL query execution.

Example: `'MaxRows',10`

Data Types: `double`

`QueryTimeOut` — SQL query timeout
positive numeric scalar

SQL query timeout, specified as the comma-separated pair consisting of `'QueryTimeOut'` and a positive numeric scalar. By default, the `select` function ignores the timeout value. Use this name-value pair argument to specify the number of seconds to wait for executing the SQL query `selectquery`.

Example: `'QueryTimeOut',15`

Output Arguments

`data` — Imported data

table

Imported data, returned as a table. The rows of the table correspond to the rows of data returned from the executed SQL query `selectquery`. The variable names of the table specify the columns in the SQL query.

The `select` function returns date or time data as character vectors in the table. This function returns text as character vectors or a cell array of character vectors. Strings are not supported in the table.

If no data to import exists, then `data` is an empty table.

`metadata` — Information about imported data

table

Information about imported data, returned as a table. The row names of `metadata` are variable names in `data`. This function stores each variable name in the `metadata` table as a cell array. `metadata` has these variable names:

- `VariableType` — Data types of each variable in `data`
- `MissingValue` — Representation of missing value for each variable in `data`
- `MissingRows` — Vector of row indices that indicate locations of missing values for each variable in `data`

This table shows how MATLAB represents `NULL` values in the database by default after data import.

Database Data Type	Default `NULL` Value
`SIGNED TINYINT`	`-128`
`UNSIGNED TINYINT`	`0`
`SIGNED SMALLINT`	`-32768`
`UNSIGNED SMALLINT`	`0`

Database Data Type	Default `NULL` Value
`SIGNED INT`	`-2147483648`
`UNSIGNED INT`	`0`
`SIGNED BIGINT`	`-9223372036854775808`
`UNSIGNED BIGINT`	`0`
`REAL`	`NaN`
`FLOAT`	`NaN`
`DOUBLE`	`NaN`
`DECIMAL`	`NaN`
`NUMERIC`	`NaN`
Boolean	`false`
Date, time, or text	`''`

To change the `NULL` value representation in the imported data, replace the default value by looping through the imported data or using vector indexing.

Limitations

- You cannot customize missing values in the output argument `data` using the `select` function. Index into the imported data using the `metadata` output argument instead.
- The output argument `data` does not support `cell` and `struct` data types. The `select` function only supports `table`.

Alternative Functionality

Use the `exec` and `fetch` functions for full functionality when importing data. For differences between the `select` function and this alternative, see “Data Import Using Database Explorer App or Command Line” on page 2-143.

See Also

`close` | `count` | `database` | `exec` | `fetch`

Topics

“Data Import Using Database Explorer App or Command Line” on page 2-143
“Data Import Approaches and Memory Management” on page 5-45
“Import Data from Databases into MATLAB” on page 5-2

External Websites

SQL Tutorial

Introduced in R2017a

set

(To be removed) Set properties for database or `cursor` object

Note `set` will be removed in a future release. To set database data to read-only or automatically commit updates, use the `ReadOnly` and `AutoCommit` properties of the `connection` object instead.

`drivermanager` has been removed.

Syntax

```
set(object,'property',value)
set(object)
```

Description

`set(object,'property',value)` sets the value of *`property`* to `value` for the specified `object`.

`set(object)` displays all properties for `object`.

Valid values for `object` are:

- "connection Objects" on page 8-300 (Create using `database`.)
- "cursor Objects" on page 8-300 (Create using `exec` or `fetch`.)

Not all databases support all the properties. When you try to set a property that your database does not support, you receive an error message.

For `connection` objects and `cursor` objects, you can use the native ODBC interface with `set`. For details about establishing a connection using the native ODBC interface, see `database`.

`connection` Objects

Valid values for the *`property`* and `value` arguments for a `connection` object are as follows.

Property	Value	Description
`'AutoCommit'`	`'on'`	The software writes and automatically commits database data when you run `datainsert`, `fastinsert`, `insert`, or `update`. You cannot use `rollback` to reverse this process.
	`'off'`	The software does not automatically commit database data when you run `datainsert`, `fastinsert`, `insert`, or `update`. Use `rollback` to reverse this process. When you are sure that your data is correct, use the `commit` function to commit it to the database. Alternatively, use `exec` to roll back or commit data to the database.
`'ReadOnly'`	`'off'`	Not read-only; that is, writable
	`'on'`	Read-only

Note For some databases, if you insert data and close the database connection without committing the data to the database, then the data gets committed automatically. Your database administrator can tell you whether your database behaves this way.

`cursor` Objects

Valid values for the *`property`* and `value` arguments for a `cursor` object are as follows.

Property	Value	Description
'RowLimit'	positive integer	Set the RowLimit for fetch. Specify this property instead of passing RowLimit as an argument to the fetch function. When you define RowLimit for fetch by using set, then fetch behaves differently depending on what type of database you are using.

Examples

Example 1 — Set RowLimit for `cursor` Object

Establish a JDBC connection to a data source. Run `fetch` to retrieve data from the table `EMP`, and then set the row limit to `5`.

```
conn = database('orcl','scott','tiger',...
    'oracle.jdbc.driver.OracleDriver',...
    'jdbc:oracle:thin:@144.212.123.24:1822:');
curs = exec(conn,'SELECT * FROM EMP');
set(curs,'RowLimit',5)
curs = fetch(curs)
curs =

  cursor with properties:

     Attributes: []
           Data: {5x8 cell}
 DatabaseObject: [1x1 database]
       RowLimit: 5
       SQLQuery: 'SELECT * FROM EMP'
        Message: []
           Type: 'Database Cursor Object'
      ResultSet: [1x1 oracle.jdbc.driver.OracleResultSet]
         Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
      Statement: [1x1 oracle.jdbc.driver.OracleStatement]
          Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

The `RowLimit` property of `curs` is `5` and the `Data` property is `5x8 cell`, indicating that `fetch` returned five rows of data.

In this example, `RowLimit` limits the maximum number of rows you can retrieve. Therefore, rerunning the `fetch` function returns no data.

Example 2 — Set the AutoCommit Flag to On

Run `datainsert` on a database whose `AutoCommit` flag is set to `on`.

1 Determine the status of the `AutoCommit` flag for the database connection `conn`.

```
get(conn,'AutoCommit')

ans =
off
```

The flag is `off`.

2 Set the flag status to `on` and verify its value.

```
set(conn,'AutoCommit','on');
get(conn,'AutoCommit')

ans =
on
```

3 Insert a cell array `exdata` into column names `colnames` in the table `Growth`.

```
datainsert(conn,'Growth',colnames,exdata)
```

The software inserts the data and commits the inserted data to the database.

Example 3 — Set the AutoCommit Flag to Off and Commit Data

Insert and commit data into a database whose `AutoCommit` flag is `off`.

1 First set the `AutoCommit` flag to `off` for database connection `conn`.

```
set(conn,'AutoCommit','off');
```

2 Insert a cell array `exdata` into the column names `colnames` in the table `Avg_Freight_Cost`.

```
datainsert(conn,'Avg_Freight_Cost',colnames,exdata)
```

3 Commit the data to the database.

```
commit(conn)
```

Example 4 — Set the AutoCommit Flag to Off and Roll Back Data

Update data in a database whose `AutoCommit` flag is `off`. Then use `rollback` to roll back the data.

1. Set the `AutoCommit` flag to `off` for database connection `conn`.

   ```
   set(conn,'AutoCommit','off');
   ```

2. Update the data in `colnames` in the `Avg_Freight_Weight` table, for the record selected by `whereclause`, with data from the cell array `exdata`.

   ```
   update(conn,'Avg_Freight_Weight',colnames,exdata,...
          whereclause)
   ```

   The software updates the data in the table but does not commit the data to the database.

3. Roll back the data.

   ```
   rollback(conn)
   ```

   The database contains the original data present before running `update`.

See Also

`commit` | `database` | `datainsert` | `exec` | `fetch` | `get` | `logintimeout` | `rollback` | `update`

Topics

"Roll Back Data After Updating Record" on page 5-17

Introduced before R2006a

setdbprefs

Set preferences for retrieval format, errors, NULLs, and more

Syntax

```
setdbprefs
v = setdbprefs
setdbprefs(preference)

setdbprefs(preference,value)
setdbprefs(s)
```

Description

`setdbprefs` returns current values for database preferences.

`v = setdbprefs` returns current values to the structure `v`.

`setdbprefs(preference)` returns the current value for the specified `preference`.

Note This syntax has been removed: `setdbprefs('JDBCDataSourceFile')`.

`setdbprefs(preference,value)` sets the specified `preference` to `value`. After database preferences are set, they are retained across MATLAB sessions.

Note These syntaxes have been removed:

- `setdbprefs('DefaultRowPreFetch','10000')`
- `setdbprefs('UseRegistryForSources','""')`
- `setdbprefs('TempDirForRegistryOutput','""')`

This syntax has been removed: `setdbprefs('ErrorHandling','empty')`. Use `setdbprefs('ErrorHandling','report')` instead.

These syntaxes will be removed in a future release:
`setdbprefs('FetchInBatches','yes')` and
`setdbprefs('FetchBatchSize','1000')`.

This syntax will be removed in a future release:
`setdbprefs('DataReturnFormat','dataset')`. Use
`setdbprefs('DataReturnFormat','table')` instead.

`setdbprefs(s)` sets preferences specified in the structure `s` to values that you specify.

Examples

Display Current Values

View the current values of all database preferences

Display all database preference properties and their current values.

```
setdbprefs
```

```
ans =

  struct with fields:

    DataReturnFormat: 'table'
       ErrorHandling: 'store'
      NullNumberRead: 'NaN'
     NullNumberWrite: 'NaN'
      NullStringRead: 'null'
     NullStringWrite: 'null'
      FetchInBatches: 'no'
      FetchBatchSize: '1000'
```

Change Preference Setting

Set a database preference to another value.

Display the current value of the `NullNumberRead` database preference.

```
setdbprefs('NullNumberRead')

ans =

    'NaN'
```

Each `NULL` number in the database is read into the MATLAB workspace as `NaN`.

Change the value of this preference to `0`.

```
setdbprefs('NullNumberRead','0')
```

Each `NULL` number in the database is read into the MATLAB workspace as `0`.

Change DataReturnFormat Preference

Change the way data returns to the MATLAB workspace by altering the database `DataReturnFormat` preference.

Specify that database data be imported into MATLAB cell arrays.

```
setdbprefs('DataReturnFormat','cellarray')
```

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`. This database contains the table `producttable` with these columns: `productnumber` and `productdescription`.

```
conn = database('MySQL','username','pwd');
```

Import data into the MATLAB workspace.

```
sqlquery = 'SELECT productnumber,productdescription FROM producttable';
curs = exec(conn,sqlquery);
curs = fetch(curs,3);
curs.Data

ans =

    [9]    'Victorian Doll'
    [8]    'Train Set'
    [7]    'Engine Kit'
```

Resulting data displays as a cell array.

Change the data return format from `cellarray` to `numeric`.

```
setdbprefs('DataReturnFormat','numeric')
```

Import data into the MATLAB workspace.

```
sqlquery = 'SELECT productnumber,productdescription FROM producttable';
curs = exec(conn,sqlquery);
curs = fetch(curs,3);
curs.Data

ans =

     9   NaN
     8   NaN
     7   NaN
```

In the database, the values for `productDescription` are character strings, as seen in the previous example when `DataReturnFormat` was set to `cellarray`. The `productDescription` values cannot be read when they are imported into the MATLAB workspace using the `numeric` format. Therefore, MATLAB treats these values as `NULL` numbers and assigns them the current value for the `NullNumberRead` preference setting of `NaN`.

Change the data return format to `structure`.

```
setdbprefs('DataReturnFormat','structure')
```

Import data into the MATLAB workspace.

```
sqlquery = 'SELECT productnumber,productdescription FROM producttable';
curs = exec(conn,sqlquery);
curs = fetch(curs,3);
curs.Data

ans =

          productnumber: [3x1 double]
    productdescription: {3x1 cell}
```

Resulting data displays as a structure.

View the contents of the structure `curs.Data` to see the data.

```
curs.Data.productdescription
curs.Data.productnumber

ans =

    'Victorian Doll'
    'Train Set'
    'Engine Kit'

ans =

     9
     8
     7
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Change Write Format for NULL Numbers

Enable the insertion of a `NaN` as a `NULL` in the database by altering the write format setting for `NULL` numbers.

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`. This database contains the table `inventoryTable` with these columns: `productNumber`, `Quantity`, `Price`, and `inventoryDate`.

```
conn = database('MySQL','username','pwd');
```

Specify `NaN` for the `NullNumberWrite` format.

```
setdbprefs('NullNumberWrite','NaN')
```

Numbers represented as `NaN` in the MATLAB workspace are exported to databases as `NULL`.

Select data in the table `inventoryTable`.

```
sqlquery = 'SELECT * FROM inventoryTable';
curs = exec(conn,sqlquery);
```

```
curs = fetch(curs);
curs.Data

ans =

    ...
    [14]    [2000]    [19.1000]    '2014-10-22 10:52...'
    [15]    [1200]    [20.3000]    '2014-10-22 10:52...'
    [16]    [1400]    [34.3000]    '1999-12-31 00:00...'
```

Specify data `ex_data` to export into `inventoryTable`. The variable `ex_data` contains a `NaN`. For the inventory date, specify the date as the current moment.

```
ex_data = {24,NaN,30.00,datestr(now,'yyyy-mm-dd HH:MM:SS')};
```

Insert `ex_data` into the database using `fastinsert` with column names: `productNumber`, `Quantity`, `Price`, and `inventoryDate`.

```
colnames = {'productNumber','Quantity','Price','inventoryDate'};

fastinsert(conn,'inventoryTable',colnames,ex_data)
```

Select data in the table `inventoryTable` to see the last row with `NaN` data.

```
sqlquery = 'SELECT * FROM inventoryTable';
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data

ans =

    ...
    [15]    [1200]    [20.3000]    '2014-10-22 10:52...'
    [16]    [1400]    [34.3000]    '1999-12-31 00:00...'
    [24]    [ NaN]    [     30]    '2014-10-22 11:19...'
```

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Specify Error Handling Settings

Change the display of errors in MATLAB by altering the database error handling preferences.

Specify the `store` format for the `ErrorHandling` preference.

```
setdbprefs('ErrorHandling','store')
```

Database Toolbox stores errors generated by running `database` or `exec` in the `Message` property of the returned `connection` or `cursor` object.

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`. This database contains the table `productTable` with the column `productdescription`.

```
conn = database('MySQL','username','pwd');
```

The `cursor` object contains the executed query. Close the `cursor` object. Fetch data from a closed `cursor` object.

```
sqlquery = 'SELECT productdescription FROM productTable';
curs = exec(conn,sqlquery);
close(curs)
curs = fetch(curs,3)

curs =

  cursor with properties:

        Data: 0
    RowLimit: 0
    SQLQuery: 'SELECT productdescription FROM productTable'
     Message: 'Invalid Cursor: Invalid Cursor'
        Type: 'ODBCCursor Object'
   Statement: [1×1 database.internal.ODBCStatementHandle]
```

The error generated by this operation appears in the `Message` field.

Specify the `report` format for the `ErrorHandling` preference.

```
setdbprefs('ErrorHandling','report')
```

With the `ErrorHandling` preference setting set to `report`, errors generated by running `database` or `exec` appear immediately in the Command Window.

The `cursor` object `curs` contains the executed query. Close the `cursor` object. Fetch data from a closed `cursor` object.

```
sqlquery = 'SELECT productdescription FROM productTable';
curs = exec(conn,sqlquery);
close(curs)
curs = fetch(curs,3);

Error using database.odbc.cursor/fetch (line 54)
Invalid Cursor
```

The error generated by this operation appears immediately in the Command Window.

After you finish working with the `cursor` object, close it. Close the database connection.

```
close(curs)
close(conn)
```

Change Multiple Settings

Change multiple database preference simultaneously using `setdbprefs`.

Specify that `NULL` strings are read from the database into a MATLAB matrix of doubles as `'NaN'`.

```
setdbprefs({'NullStringRead';'DataReturnFormat'},...
{'NaN';'numeric'})
```

For details about another way to change multiple settings, see “Assign Values to Structure” on page 8-311.

Assign Values to Structure

Assign values for specific preferences in a structure to let you change multiple database preferences simultaneously.

Assign values for preferences to fields in the structure `s`.

```
s.DataReturnFormat = 'numeric';
s.NullNumberRead = '0';
s
```

```
s =

  struct with fields:

    DataReturnFormat: 'numeric'
      NullNumberRead: '0'
```

Set preferences using the values in `s`.

```
setdbprefs(s)
```

Run `setdbprefs` to check your preferences settings.

```
setdbprefs
```

```
ans =

  struct with fields:

    DataReturnFormat: 'numeric'
       ErrorHandling: 'store'
      NullNumberRead: '0'
     NullNumberWrite: 'NaN'
      NullStringRead: 'null'
     NullStringWrite: 'null'
      FetchInBatches: 'no'
      FetchBatchSize: '1000'
```

Return Values to Structure

Capture all preferences and their values in a structure.

Assign values for all preferences to `s`.

```
s = setdbprefs
```

```
s =

  struct with fields:
```

```
    DataReturnFormat: 'numeric'
       ErrorHandling: 'store'
      NullNumberRead: '0'
     NullNumberWrite: 'NaN'
      NullStringRead: 'null'
     NullStringWrite: 'null'
      FetchInBatches: 'no'
      FetchBatchSize: '1000'
```

Use the MATLAB tab completion feature when obtaining the value for a preference.

```
s.D
```

Press the **Tab** key, and then **Enter**. MATLAB completes the field and displays the value.

```
s.DataReturnFormat

ans =

    'numeric'
```

Save Preferences

You can save your preferences to a MAT-file to use them in future MATLAB sessions.

Assign the preferences to the variable `ImportData` and save them to a MAT-file `ImportDataPrefs` in your current folder.

```
ImportData = setdbprefs;
save ImportDataPrefs.mat ImportData
```

Later, load the data and restore the preferences.

```
load ImportDataPrefs.mat
setdbprefs(ImportData)
```

- “Import Data from Databases into MATLAB” on page 5-2

Input Arguments

`preference` — Database preference

character vector | cell array

Database preference, specified as a character vector. To set multiple database preferences, enter the preference values in a cell array of character vectors. Then, match the order with the corresponding values in the `value` argument.

- `'DataReturnFormat'` — Format for data to import into the MATLAB workspace using the preference values listed here. Set the format based on the type of data being retrieved, memory considerations, and your preferred method of working with retrieved data. For example, to specify the format as a table, enter `setdbprefs('DataReturnFormat','table')`.

Allowable Values	Description
`'cellarray'` (default)	Import nonnumeric data into MATLAB cell arrays.
`'table'`	Import data into a MATLAB `table`. Use for all data types. Facilitates working with returned columns.
`'dataset'`	**Note** This value will be removed in a future release. Use `'table'` instead. Import data into a MATLAB `dataset` array. Use for all data types. Facilitates working with returned columns. This value requires Statistics and Machine Learning Toolbox™.
`'numeric'`	Import data into a MATLAB matrix of doubles. Nonnumeric data types are considered `NULL` and appear as specified in the `'NullNumberRead'` property. Use only when data to retrieve is in numeric format, or when nonnumeric data to retrieve is not relevant.

Allowable Values	Description
`'structure'`	Import data into a MATLAB structure. Use for all data types. Facilitates working with returned columns.

- `'ErrorHandling'` — Specify how to handle errors when importing data using the preference values listed here. Set this parameter before you run `database` or `exec`. For example, to specify storing errors in the `Message` field of the returned `connection` object, enter `setdbprefs('ErrorHandling','store')`.

Allowable Values	Description
`'store'` (default)	Store errors from running `database` in the `Message` field of the returned `connection` object. Store errors from running `exec` in the `Message` property of the returned `cursor` object.
`'report'`	Immediately display errors from running `database` or `exec` in the Command Window.

- `NULL` data — Specify how to import or export `NULL` data in the MATLAB workspace or the database using the preference values listed here. For example, to import data and display all `NULL` numbers in the database as a `0` in the MATLAB workspace, enter `setdbprefs('NullNumberRead','0')`.

Database Preference	Allowable Values	Description
`'NullNumberRead'`	Character vector; for example, `'0'`	How `NULL` numbers appear after being imported from a database into the MATLAB workspace. `NaN` is the default value. • If `'DataReturnFormat'` is set to `'numeric'`, then values such as `'NULL'` cannot be set. • If `'DataReturnFormat'` is set to `'cellarray'`, then numbers appear as `NaN` and not as empty brackets. Set this parameter before running `fetch`.
`'NullNumberWrite'`	Character vector; for example, `'NaN'` (default)	How numbers appear in the database after being exported from the MATLAB workspace to a database. Regardless of the value of `'NullNumberWrite'`, a `NULL` value is always written to the database when you input `[]` or `NaN` for a numeric data type.

Database Preference	Allowable Values	Description
`'NullStringRead'`	Character vector; for example, `'null'` (default)	How `NULL` strings appear after being imported from a database into the MATLAB workspace. Set this parameter before running `fetch`.
`'NullStringWrite'`	Character vector; for example, `'null'` (default)	Specify the character vector that represents a `NULL` string in a database after exporting it from the MATLAB workspace to the database. For character vector inputs, a `NULL` value is written to the database only when the input value matches the value of `'NullStringWrite'`.

- Fetching data — Specify how to import data using the preference values listed here. Control the number of rows that are imported from the database at a time. For example, to automate fetching data in batches, enter `setdbprefs('FetchInBatches','yes')`.

Note These database preferences will be removed in a future release.

Database Preference	Allowable Values	Description
`'FetchInBatches'`	`'yes'` or `'no'` (default)	Automates fetching in batches for large data sets where you can run into Java heap memory errors in MATLAB. When the value is `'yes'`, `fetch` and `runsqlscript` import the data in batches in size of `'FetchBatchSize'`. For an example, see `fetch`.
`'FetchBatchSize'`	Input numeric value, default value is `'1000'`. Supported values are `1000` through `1000000`.	Automates fetching in batches for large data sets when used with `'FetchInBatches'`. When the value of `'FetchInBatches'` is `'yes'`, `fetch` and `runsqlscript` import the data in batches in size of `'FetchBatchSize'`. For an example, see `fetch`.

Example: `'DataReturnFormat'`

Example: `{'DataReturnFormat';'NullStringRead'}`

Data Types: `char`

`value` — Database preference value
character vector | cell array

Database preference value, specified as a character vector. To set multiple database preferences, enter the preference values in a cell array of character vectors. Then, match the order with the corresponding preferences in the `preference` argument. For allowable values, see the tables in `preference`.

Example: `'NaN'`

Example: `{'numeric';'NaN'}`

Data Types: `char`

`s` — Database preferences

structure

Database preferences, specified as a structure to include all the database preferences that you specify.

Data Types: `struct`

Output Arguments

`v` — Database preferences

structure

Database preferences, returned as a structure containing database preference settings and values.

Alternative Functionality

For a visual way to set database preferences, click **Preferences** in the MATLAB toolstrip and click **Database Toolbox**. Enter values for each database preference.

See Also

`clear` | `close` | `database` | `exec` | `fastinsert` | `fetch` | `getdatasources`

Topics

“Import Data from Databases into MATLAB” on page 5-2
“Working with Database Toolbox Preferences” on page 2-152

Introduced before R2006a

splitsqlquery

Package: database.odbc

Split SQL query using paging

Syntax

```
querybasket = splitsqlquery(conn,sqlquery)
querybasket = splitsqlquery(conn,sqlquery,'SplitSize',splitsize)
```

Description

`querybasket = splitsqlquery(conn,sqlquery)` splits a SQL query into a basket of multiple SQL queries. By default, each SQL query in the basket returns 100,000 rows in a batch. The resulting number of SQL queries in the basket depends on the size of the original SQL query results.

`querybasket = splitsqlquery(conn,sqlquery,'SplitSize',splitsize)` specifies a custom batch size for the number of rows returned by each SQL query in the basket.

Examples

Access Large Data from SQL Query Using Database Toolbox™

Determine the minimum arrival delay using a large set of flight data stored in a database. Here, access the database in a serial MATLAB® environment.

Using the `splitsqlquery` function, you can split the original SQL query into multiple SQL page queries. Then, you can access large data in chunks using the `fetch` function.

To run this example, ensure that the current folder contains the JDBC driver file `sqljdbc4.jar`. To find this file, see “Microsoft SQL Server JDBC for Windows” on page 2-31.

Add the JDBC driver file to the Java® class path.

```
javaaddpath 'sqljdbc4.jar';
```

Connect to the Microsoft® SQL Server® database using the database name `toy_store`, database server `dbtb04`, port number `54317`, and Windows® authentication.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Define the SQL query. Here, select all columns from the `airlinesmall` table, which contains 123,523 rows and 29 columns.

```
sqlquery = 'SELECT * FROM airlinesmall';
```

Split the original SQL query into multiple page queries and display them.

```
querybasket = splitsqlquery(conn,sqlquery)
```

```
querybasket =

  2×1 string array

    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 0 ROWS FETCH NE
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 100000 ROWS FET
```

The query basket contains the page queries in a string array. The `splitsqlquery` function splits these queries using the default number of rows (100,000).

Define the `airlinesdata` variable.

```
airlinesdata = [];
```

Define the minimum arrival delay `minArrDelay` variable.

```
minArrDelay = [];
```

Use a `for` loop to execute the SQL page queries in `querybasket` and import the data in chunks. Execute SQL page queries in the query basket and import large data using the `fetch` function. Find the local minimum arrival delay for a chunk. Store the local minimum arrival delay for each chunk.

```
for i = 1: length(querybasket)

    local_airlinesdata = fetch(conn,querybasket(i));

    local_minArrDelay = min(local_airlinesdata.ArrDelay);

    minArrDelay = [minArrDelay; local_minArrDelay];

end
```

Find the minimum arrival delay from all the stored delays.

```
minArrDelay = min(minArrDelay)
```

```
minArrDelay =

   -64
```

Close the database connection.

```
close(conn)
```

Access Large Data from SQL Query Using Database Toolbox™ and Parallel Computing Toolbox™

Determine the minimum arrival delay using a large set of flight data stored in a database. Here, access the database using a parallel pool.

Using the `splitsqlquery` function, you can split the original SQL query into multiple SQL page queries. Then, you can access large data in chunks by executing each SQL page query on a separate worker.

The definition of large data can vary. Performance for importing large data depends on the SQL query, amount of data, machine specifications, and type of data analysis. To manage the performance, use the `splitsize` input argument of the `splitsqlquery` function.

To run this example, ensure that the current folder contains the JDBC driver file `sqljdbc4.jar`. To find this file, see “Microsoft SQL Server JDBC for Windows” on page 2-31.

If you have a MATLAB® Distributed Computing Server™ license, then you can replace the name of the cluster in the `parpool` function with the cluster profile of your choice.

Add the JDBC driver file to the Java® class path.

```
javaaddpath 'sqljdbc4.jar';
```

Connect to the Microsoft® SQL Server® database using the database name `toy_store`, database server `dbtb04`, port number `54317`, and Windows® authentication.

```
conn = database('toy_store','','','Vendor','Microsoft SQL Server', ...
    'Server','dbtb04','PortNumber',54317,'AuthType','Windows');
```

Define the SQL query. Here, select all columns from the `airlinesmall` table, which contains 123,523 rows and 29 columns.

```
sqlquery = 'SELECT * FROM airlinesmall';
```

Split the original SQL query into multiple page queries and display them. Use a split size of 10,000 rows.

```
splitsize = 10000;
querybasket = splitsqlquery(conn,sqlquery,'SplitSize',splitsize)
```

```
querybasket =

  13×1 string array

    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 0 ROWS FETCH NE
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 10000 ROWS FETC
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 20000 ROWS FETC
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 30000 ROWS FETC
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 40000 ROWS FETC
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 50000 ROWS FETC
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 60000 ROWS FETC
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 70000 ROWS FETC
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 80000 ROWS FETC
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 90000 ROWS FETC
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 100000 ROWS FET
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 110000 ROWS FET
    " SELECT * FROM (SELECT * FROM airlinesmall) temp ORDER BY 1 OFFSET 120000 ROWS FET
```

The query basket contains the page queries in a string array. Each SQL query in the basket, except the last one, returns 10,000 rows.

Close the database connection.

```
close(conn)
```

Start parallel pool using the local profile.

```
p = parpool('local');
```

```
Starting parallel pool (parpool) using the 'local' profile ...
connected to 6 workers.
```

Attach the required JDBC driver file `sqljdbc4.jar`.

```
addAttachedFiles(p,{'sqljdbc4.jar'});
```

Define the `airlinesdata` variable.

```
airlinesdata = [];
```

Define the minimum arrival delay `minArrDelay` variable.

```
minArrDelay = [];
```

Add the JDBC driver file to the Java® class path, and build the connection once for each worker.

```
parfevalOnAll(@javaaddpath,0,'sqljdbc4.jar');
c = parallel.pool.Constant( ...
    @() database('toy_store','','','Vendor','Microsoft SQL Server', ...
        'Server','dbtb04','PortNumber',54317,'AuthType', ...
        'Windows'),@close);
```

Use the `parfor` function to parallelize data access using the query basket.

For each worker:

- Retrieve the database connection object.
- Execute the SQL page query from the query basket and import data locally.
- Find the local minimum arrival delay.
- Store the local minimum arrival delay.

```
parfor i = 1: length(querybasket)

    conn = c.Value;

    local_airlinesdata = fetch(conn,querybasket(i));

    local_minArrDelay = min(local_airlinesdata.ArrDelay);

    minArrDelay = [minArrDelay; local_minArrDelay];

end
```

Find the minimum arrival delay using the stored delays from each worker.

```
minArrDelay = min(minArrDelay)
```

```
minArrDelay =

   -64
```

Close the parallel pool.

```
p.delete;
```

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`sqlquery` — SQL statement

character vector | string scalar

SQL statement, specified as a character vector or string scalar.

For information about the SQL query language, see the SQL Tutorial.

Example: `SELECT * FROM invoice` selects all columns and rows from the `invoice` table.

Data Types: `char` | `string`

`splitsize` — SQL query split size
`100000` (default) | numeric scalar

SQL query split size, specified as a numeric scalar. Specify this number to split a SQL query into a custom number of rows for each batch.

If the total number of rows returned from the original SQL query is less than 100,000 (the default), then the `splitsqlquery` function returns the original SQL query. Use this input argument to specify a smaller number of rows in a batch.

Data Types: `double`

Output Arguments

`querybasket` — SQL query basket
string array

SQL query basket, returned as a string array. Each SQL query in the basket is returned as a string scalar in the string array.

You can execute each SQL query in the basket using the `fetch` function. Or, you can run a parallel pool and assign each SQL query to a worker for execution.

Limitations

- The `splitsqlquery` function supports these databases only:
  - Microsoft SQL Server 2012 and later
  - Oracle
  - MySQL
  - PostgreSQL
  - SQLite
  - Amazon Redshift®
  - Amazon Aurora®

- Google® Cloud SQL that runs an instance of MySQL or PostgreSQL
- MariaDB®

If the `connection` object uses an unsupported database, the `splitsqlquery` function displays a warning and returns the original SQL query.

- The `splitsqlquery` function does not support the MATLAB interface to SQLite.

See Also

`addAttachedFiles` | `close` | `database` | `fetch` | `javaaddpath` | `parallel.pool.Constant` | `parfevalOnAll` | `parpool`

Topics

"Analyze Large Data in Database Using Tall Arrays"

External Websites

SQL Tutorial

Introduced in R2017b

sqlite

SQLite connection

Description

The `sqlite` function creates a `sqlite` object. You can use this object to connect to a SQLite database file using the MATLAB interface to SQLite. The MATLAB interface to SQLite lets you work with SQLite database files without installing and administering a database or driver. For details, see “Working with MATLAB Interface to SQLite” on page 2-6.

Creation

Syntax

```
conn = sqlite(dbfile)
conn = sqlite(dbfile,mode)
```

Description

`conn = sqlite(dbfile)` connects to an existing SQLite database file `dbfile`.

`conn = sqlite(dbfile,mode)` also can create a database file depending on the mode type `mode`.

Input Arguments

`dbfile` — SQLite database file

character vector | string scalar

SQLite database file, specified as a character vector or string scalar. You can use the database file to store data and import and export it to MATLAB.

Data Types: `char` | `string`

`mode` — SQLite database file mode

`'connect'` (default) | `'readonly'` | `'create'`

SQLite database file mode, specified as one of these values.

Value	Description
`'connect'`	Connect to an existing SQLite database file.
`'readonly'`	Create a read-only connection to an existing SQLite database file.
`'create'`	Create and connect to a new SQLite database file.

The file mode determines whether you connect to an existing SQLite database file or create a new one. For existing database files, the file mode determines whether the database connection is read-only.

Properties

`Database` — SQLite database file name

character vector

SQLite database file name, specified as a character vector that contains the full path to the SQLite database file. To specify the SQLite database file name, use `dbfile`.

Example: `'C:\tutorial.db'`

Data Types: `char`

`IsOpen` — Database connection indicator

`0` (default) | `1`

Database connection indicator, specified as a logical `0` when the database connection is closed or invalid or a logical `1` when the database connection is open.

Data Types: `logical`

`IsReadOnly` — Read-only database file

`0` (default) | `1`

Read-only database file, specified as a logical `0` when the SQLite database file can be modified or logical `1` when the database file is read-only. To specify a read-only database file, use `mode`.

Data Types: `logical`

Object Functions

insert	Add MATLAB data to database tables
exec	Execute SQL statement and open cursor
fetch	Import data into MATLAB workspace from database cursor or from execution of SQL statement
close	Close and invalidate database and driver resource utilizer

Examples

Create SQLite Connection to Existing Database File

Create a SQLite connection to the MATLAB® interface to SQLite using the existing database file `tutorial.db`. Specify the file name in the current working folder.

```
dbfile = fullfile(pwd,'tutorial.db');

conn = sqlite(dbfile)
```

```
conn =

  sqlite with properties:

      Database: 'C:\TEMP\Bdoc17b_705616_35336\ib3A4F7C\21\tp080bc09a\ex96650978\tutoria
        IsOpen: 1
    IsReadOnly: 0
```

`conn` is a `sqlite` object with these properties:

- `Database` -- SQLite database file name.
- `IsOpen` -- SQLite connection is open.

- `IsReadOnly` -- SQLite connection is writable.

Close the SQLite connection.

```
close(conn)
```

Create SQLite Connection Using New Database File

Create a SQLite connection to the MATLAB® interface to SQLite using a new database file `tutorial.db`. Specify the file name in the current working folder.

```
dbfile = fullfile(pwd,'tutorial.db');

conn = sqlite(dbfile,'create')
```

```
conn =

  sqlite with properties:

      Database: 'C:\TEMP\Bdoc17b_705616_35336\ib3A4F7C\21\tp080bc09a\ex61952421\tutoria
        IsOpen: 1
    IsReadOnly: 0
```

`conn` is a `sqlite` object with these properties:

- `Database` -- SQLite database file name.
- `IsOpen` -- SQLite connection is open.
- `IsReadOnly` -- SQLite connection is writable.

Close the SQLite connection.

```
close(conn)
```

Create Read-Only SQLite Connection

Create a read-only SQLite connection to the MATLAB® interface to SQLite using the existing database file `tutorial.db`. Specify the file name in the current working folder.

```
dbfile = fullfile(pwd,'tutorial.db');

conn = sqlite(dbfile,'readonly')


conn =

  sqlite with properties:

      Database: 'C:\TEMP\Bdoc17b_705616_35336\ib3A4F7C\21\tp080bc09a\ex41829813\tutoria
        IsOpen: 1
    IsReadOnly: 1
```

`conn` is a `sqlite` object with these properties:

- `Database` -- SQLite database file name.
- `IsOpen` -- SQLite connection is open.
- `IsReadOnly` -- SQLite connection is read-only.

Close the SQLite connection.

```
close(conn)
```

Alternative Functionality

A `sqlite` object is one of the two available database connection types. The other creates a `connection` object using the `database` function. This object lets you connect to various relational databases using ODBC and JDBC drivers that you install and administer.

The `sqlite` object provides limited Database Toolbox functionality. For full functionality, create a database connection to the SQLite database file using the JDBC driver. To use the JDBC driver, close the SQLite connection and create a database connection using the URL string. For details, see these links depending on your platform.

- “SQLite JDBC for Windows” on page 2-76
- “SQLite JDBC for macOS” on page 2-125
- “SQLite JDBC for Linux” on page 2-131

See Also

Topics

“Access Relational Database Data in MATLAB” on page 2-3
“Working with MATLAB Interface to SQLite” on page 2-6
“Import Data Using MATLAB® Interface to SQLite” on page 5-67
“Configuring Driver and Data Source” on page 2-15

Introduced in R2016a

sql2native

(To be removed) Convert JDBC SQL grammar to SQL grammar native to system

Note `sql2native` will be removed in a future release.

Syntax

```
n = sql2native(conn,'sqlquery')
```

Description

`n = sql2native(conn,'sqlquery')` converts the SQL statement `sqlquery` from JDBC SQL grammar into the database system's native SQL grammar for the connection `conn`. The native SQL statement is assigned to `n`.

See Also

`database`

Topics

“Data Import Using Database Explorer App or Command Line” on page 2-143

Introduced before R2006a

supports

(To be removed) Detect whether property is supported by database metadata object

Note The `supports` function will be removed in a future release.

Syntax

```
a = supports(dbmeta)
a = supports(dbmeta, 'property')
```

Description

`a = supports(dbmeta)` returns a structure that contains the properties of `dbmeta` and its property values, `1` or `0`. A value of `1` indicates that the property is supported, and `0` indicates that the property is not supported.

`a = supports(dbmeta, 'property')` returns `1` or `0` for the `property` field of `dbmeta`. A value of `1` indicates that the property is supported, and `0` indicates that the property is not supported.

Examples

1. Check if `dbmeta` supports group-by clauses.

   ```
   a = supports(dbmeta, 'GroupBy')
   a =
        1
   ```

2. View the value of all properties of `dbmeta`.

   ```
   a = supports(dbmeta)
   ```

   The returned result is a list of properties and their values.

3. After creating `a` using the `supports` function, you can access the value of any property in `a`. Display the `GroupBy` property by running:

```
a.GroupBy
a =
     1
```

See Also

`database` | `dmd` | `get` | `ping`

Topics

“Display Database Metadata” on page 5-37

Introduced before R2006a

tableprivileges

Return database table privileges

Syntax

```
tp = tableprivileges(dbmeta,'cata')
tp = tableprivileges(dbmeta,'cata','sch')
tp = tableprivileges(dbmeta,'cata','sch','tab')
```

Description

`tp = tableprivileges(dbmeta,'cata')` returns a list of table privileges for all tables in the catalog `cata` for the database whose database metadata object is `dbmeta` resulting from a `connection` object.

`tp = tableprivileges(dbmeta,'cata','sch')` returns a list of table privileges for all tables in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta` resulting from a `connection` object.

`tp = tableprivileges(dbmeta,'cata','sch','tab')` returns a list of privileges for the table `tab`, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta` resulting from a `connection` object.

Examples

Get table privileges for the `builds` table in the schema `geck` for the catalog `msdb`, for the database metadata object `dbmeta`.

```
tp = tableprivileges(dbmeta,'msdb','geck', 'builds')
tp =
      'DELETE'    'INSERT'    'REFERENCES'...
         'SELECT'    'UPDATE'
```

See Also

`dmd` | `get` | `tables`

Topics

“Display Database Metadata” on page 5-37

Introduced before R2006a

tables

Return database table names

Syntax

```
t = tables(conn,catalog)
t = tables(conn,catalog,schema)

t = tables(dbmeta,catalog)
t = tables(dbmeta,catalog,schema)
```

Description

`t = tables(conn,catalog)` returns a list of all table names and table types for all schemas in the specified catalog named `catalog`.

Note The syntax `tables(conn)` has been removed. Use syntaxes with at least two input arguments instead.

`t = tables(conn,catalog,schema)` returns a list of all table names and table types in the specified catalog named `catalog` and schema named `schema`.

`t = tables(dbmeta,catalog)` returns a list of all table names and table types in the specified catalog named `catalog` using the database metadata object `dbmeta`.

`t = tables(dbmeta,catalog,schema)` returns a list of all table names and table types in the specified catalog named `catalog` and schema named `schema`.

Examples

Retrieve Table List for Catalog Using Database Connection

Create a database connection `conn` using the native ODBC interface to the Microsoft SQL Server database. This code assumes that you are connecting to a data source named `MS SQL Server` with user name `username` and password `pwd`.

```
conn = database('MS SQL Server','username','pwd');
```

Retrieve the list of all table names and table types in the catalog using `conn`. Here, this code assumes that the database contains the catalog name `toy_store`.

```
catalog = 'toy_store';

t = tables(conn,catalog)
```

```
t =

   'productTable'                          'TABLE'
   'salesVolume'                           'TABLE'
   'COLUMNS'                               'VIEW'
   ...
```

`t` returns a cell array with the table names in the first column and the table types in the second column.

Close the database connection `conn`.

```
close(conn)
```

Retrieve Table List for Catalog and Schema Using Database Connection

Create a database connection `conn` using the native ODBC interface to the Microsoft SQL Server database. This code assumes that you are connecting to a data source named `MS SQL Server` with user name `username` and password `pwd`.

```
conn = database('MS SQL Server','username','pwd');
```

Retrieve the list of all table names and table types in the catalog and schema using `conn`. Here, this code assumes that the database contains the catalog name `toy_store` and schema name `sch`.

```
catalog = 'toy_store';
schema = 'sch';
```

```
t = tables(conn,catalog,schema)

t =

    'productTable'                'TABLE'
    'salesVolume'                 'TABLE'
    'suppliers'                   'TABLE'
    ...
```

`t` returns a cell array with the table names in the first column and the table types in the second column.

Close the database connection `conn`.

```
close(conn)
```

Retrieve Table List for Catalog Using Database Metadata Object

Create a database connection `conn`. This code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server', ...
    'Server','sname', ...
    'PortNumber',123456);
```

Create the database metadata object `dbmeta` using `conn`.

```
dbmeta = dmd(conn);
```

Retrieve the list of all table names and table types in the catalog using `dbmeta`. Here, this code assumes that the database contains the catalog name `toy_store`.

```
catalog = 'toy_store';

t = tables(dbmeta,catalog)

t =

    'productTable'                'TABLE'
    'salesVolume'                 'TABLE'
```

```
    'suppliers'                    'TABLE'
    ...
```

`t` returns a cell array with the table names in the first column and the table types in the second column.

Close the database connection `conn`.

```
close(conn)
```

Retrieve Table List for Catalog and Schema Using Database Metadata Object

Create a database connection `conn`. This code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd', ...
    'Vendor','Microsoft SQL Server', ...
    'Server','sname', ...
    'PortNumber',123456);
```

Create the database metadata object `dbmeta` using `conn`.

```
dbmeta = dmd(conn);
```

Retrieve the list of all table names and table types in the catalog and schema using `dbmeta`. Here, this code assumes that the database contains the catalog name `toy_store` and schema name `sch`.

```
catalog = 'toy_store';
schema = 'sch';

t = tables(dbmeta,catalog,schema)

t =

    'productTable'                 'TABLE'
    'salesVolume'                  'TABLE'
    'suppliers'                    'TABLE'
    ...
```

`t` returns a cell array with the table names in the first column and the table types in the second column.

Close the database connection `conn`.

```
close(conn)
```

- “Display Database Metadata” on page 5-37
- “Import Data from Databases into MATLAB” on page 5-2
- “Export Data to New Record in Database” on page 5-20

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`dbmeta` — Database metadata

database metadata object

Database metadata, specified as a database metadata object created using `dmd`. To use this object, create a database connection using the `database` function first.

`catalog` — Database catalog name

character vector | string scalar

Database catalog name, specified as a character vector or string scalar.

Data Types: `char` | `string`

`schema` — Database schema name

character vector | string scalar

Database schema name, specified as a character vector or string scalar.

Data Types: `char` | `string`

Output Arguments

`t` — Table information

cell array

Table information, returned as a cell array with two columns. The first column contains the table names. The second column contains the table types.

See Also

`catalogs` | `close` | `database` | `dmd` | `get` | `schemas`

Topics

“Display Database Metadata” on page 5-37
“Import Data from Databases into MATLAB” on page 5-2
“Export Data to New Record in Database” on page 5-20
“Connecting to Database” on page 2-140
“Connecting to Database Using Native ODBC Interface” on page 3-17

Introduced in R2010a

update

Replace data in database table with MATLAB data

Syntax

```
update(conn,tablename,colnames,data,whereclause)
```

Description

`update(conn,tablename,colnames,data,whereclause)` exports the MATLAB variable `data` in its current format into the database table `tablename` using the database connection `conn`. You can use the SQL `WHERE` statement to specify which existing records in the database to replace.

Examples

Update Existing Record Using Cell Array

First, connect to a Microsoft Access database. Store the data that you are updating in a cell array. Then, update one column of data in the database table. Close the database connection.

Create a database connection `conn` to the Microsoft Access database. This code assumes that you are connecting to a data source named `dbdemo` with blank user name and password.

```
conn = database('dbdemo','','');
```

This database contains the table `inventoryTable` that contains these columns:

- `productNumber`
- `Quantity`

- Price
- inventoryDate

Import all data from the inventoryTable using conn. Store the data in a cell array contained in the Data property of the cursor object. Display the data from inventoryTable in this property.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    [ 1]    [1700]    [14.5000]    '2014-09-23 09:38...'
    [ 2]    [1200]    [       9]    '2014-07-08 22:50...'
    [ 3]    [ 356]    [      17]    '2014-05-14 07:14...'
    ...
```

Define a cell array containing the column name that you are updating.

```
colnames = {'Quantity'};
```

Define a cell array containing the new data 2000.

```
data = {2000};
```

Update the column Quantity in the inventoryTable for the product with productNumber equal to 1.

```
tablename = 'inventoryTable';
whereclause = 'WHERE productNumber = 1';

update(conn,tablename,colnames,data,whereclause)
```

Import the data again and view the updated contents in the inventoryTable.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    [ 1]    [2000]    [14.5000]    '2014-09-23 09:38...'
    [ 2]    [1200]    [       9]    '2014-07-08 22:50...'
    [ 3]    [ 356]    [      17]    '2014-05-14 07:14...'
    ...
```

In the `inventoryTable` data, the product with the product number equal to `1` has an updated quantity of `2000` units.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Update Existing Record Using Table

First, connect to a Microsoft Access database. Store the data that you are updating as a table. Then, update multiple columns of data in the database table. Close the database connection.

Create a database connection `conn` to the Microsoft Access database. This code assumes that you are connecting to a data source named `dbdemo` with blank user name and password.

```
conn = database('dbdemo','','');
```

This database contains the table `inventoryTable` that contains these columns:

- `productNumber`
- `Quantity`
- `Price`
- `inventoryDate`

Import all data from the `inventoryTable` using `conn`. Store the data in a cell array contained in the `cursor` object property `Data`. Display the data from `inventoryTable` in this property.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [ 1]    [1700]    [14.5000]    '2014-09-23 09:38...'
```

```
    [ 2]    [1200]    [      9]    '2014-07-08 22:50...'
    [ 3]    [ 356]    [     17]    '2014-05-14 07:14...'
    ...
```

Define a cell array containing the column names that you are updating in `inventoryTable`.

```
colnames = {'Price','inventoryDate'};
```

Define a table that contains the data for insertion. Update the price to $15 and set the inventory timestamp to `'2014-12-01 8:50:15.0'`.

```
data = table(15,{'2014-12-01 8:50:15.0'},...
             'VariableNames',{'Price','inventoryDate'});
```

Update the columns `Price` and `inventoryDate` in the table `inventoryTable` for the product number equal to `1`.

```
tablename = 'inventoryTable';
whereclause = 'WHERE productNumber = 1';

update(conn,tablename,colnames,data,whereclause)
```

Import the data again and view the updated contents in the `inventoryTable`.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [ 1]    [1700]    [     15]    '2014-12-01 08:50...'
    [ 2]    [1200]    [      9]    '2014-07-08 22:50...'
    [ 3]    [ 356]    [     17]    '2014-05-14 07:14...'
    ...
```

The product with the product number equal to `1` has an updated price of $15 and timestamp `'2014-12-01 8:50:15.0'`.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Update Multiple Records with Multiple Conditions

First, connect to a Microsoft Access database. Store the data that you are updating in a cell array. Then, update multiple records of data in the table using multiple `WHERE` clauses. Close the database connection.

Create a database connection `conn` to the Microsoft Access database. This code assumes that you are connecting to a data source named `dbdemo` with blank user name and password.

```
conn = database('dbdemo','','');
```

This database contains the table `inventoryTable` that contains these columns:

- `productNumber`
- `Quantity`
- `Price`
- `inventoryDate`

Import all data from the `inventoryTable` using `conn`. Store the data in a cell array contained in the `Data` property of the `cursor` object. Display the data from `inventoryTable` in this property.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    ...
    [ 5]    [9000]    [      3]    '2012-09-14 15:00...'
    [ 6]    [4540]    [      8]    '2013-12-25 19:45...'
    [ 7]    [6034]    [     16]    '2014-08-06 08:38...'
    [ 8]    [8350]    [      5]    '2011-06-18 11:45...'
    ...
```

Define a cell array containing the column name that you are updating called `Quantity`.

```
colnames = {'Quantity'};
```

Define a cell array containing the new data. Update quantities for two products.

```
A = 10000;     % new quantity for product number 5
B = 5000;      % new quantity for product number 8

data = {A;B}; % cell array with the new quantities
```

Update the column `Quantity` in the `inventoryTable` for the products with product numbers equal to `5` and `8`. Create a cell array `whereclause` that contains two `WHERE` clauses for both products.

```
tablename = 'inventoryTable';
whereclause = {'WHERE productNumber = 5';'WHERE productNumber = 8'};

update(conn,tablename,colnames,data,whereclause)
```

Import the data again and view the updated contents in `inventoryTable`.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    ...
    [ 5]    [10000]    [      3]    '2012-09-14 15:00...'
    [ 6]    [ 4540]    [      8]    '2013-12-25 19:45...'
    [ 7]    [ 6034]    [     16]    '2014-08-06 08:38...'
    [ 8]    [ 5000]    [      5]    '2011-06-18 11:45...'
    ...
```

The product with the product number equal to `5` has an updated quantity of `10000` units. The product with the product number equal to `8` has an updated quantity of `5000` units.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Update Multiple Columns with Multiple Conditions

First, connect to a Microsoft Access database. Store the data that you are updating in a cell array. Then, update multiple columns of data in the table using multiple `WHERE` clauses. Close the database connection.

Create a database connection `conn` to the Microsoft Access database. This code assumes that you are connecting to a data source named `dbdemo` with blank user name and password. This database contains the table `inventoryTable` that contains these columns:

- `productNumber`
- `Quantity`
- `Price`
- `inventoryDate`

```
conn = database('dbdemo','','');
```

Import all data from `inventoryTable` using `conn`. Store the data in a cell array contained in the `Data` property of the `cursor` object. Display the data from `inventoryTable` in this property.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    ...
    [ 5]    [9000]    [      3]    '2012-09-14 15:00...'
    [ 6]    [4540]    [      8]    '2013-12-25 19:45...'
    [ 7]    [6034]    [     16]    '2014-08-06 08:38...'
    [ 8]    [8350]    [      5]    '2011-06-18 11:45...'
    ...
```

Define a cell array containing the column names that you are updating called `Quantity` and `Price`.

```
colnames = {'Quantity','Price'};
```

Define a cell array containing the new data. Update quantities and prices for two products.

```
% new quantities and prices for product numbers 5 and 8
% are separated by a semicolon in the cell array
data = {10000,5.5;9000,10};
```

Update the columns `Quantity` and `Price` in the `inventoryTable` for the products with product numbers equal to `5` and `8`. Create a cell array `whereclause` that contains two `WHERE` clauses for both products.

```
tablename = 'inventoryTable';
whereclause = {'WHERE productNumber = 5';'WHERE productNumber = 8'};

update(conn,tablename,colnames,data,whereclause)
```

Import the data again and view the updated contents in the `inventoryTable`.

```
curs = exec(conn,'SELECT * FROM inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    ...
    [ 5]    [10000]    [ 5.5000]    '2012-09-14 15:00...'
    [ 6]    [ 4540]    [      8]    '2013-12-25 19:45...'
    [ 7]    [ 6034]    [     16]    '2014-08-06 08:38...'
    [ 8]    [ 9000]    [     10]    '2011-06-18 11:45...'
    ...
```

The product with the product number equal to `5` has an updated quantity of `10000` units and price equal to `5.50`. The product with the product number equal to `8` has an updated quantity of `9000` units and price equal to `10`.

After you finish working with the `cursor` object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

- “Replace Existing Data in Database” on page 5-24
- “Roll Back Data After Updating Record” on page 5-17
- “Import Data from Databases into MATLAB” on page 5-2

Input Arguments

`conn` — Database connection

`connection` object

Database connection, specified as a `connection` object created using the `database` function.

`tablename` — Database table name

character vector | string scalar

Database table name, specified as a character vector or string scalar denoting the name of a table in your database.

Data Types: `char` | `string`

`colnames` — Database table column names

cell array of character vectors | string array

Database table column names, specified as a cell array of one or more character vectors or string array to denote the columns in the existing database table `tablename`.

Example: `{'col1','col2','col3'}`

Data Types: `cell` | `string`

`data` — Update data

cell array | numeric matrix | table | structure | dataset

Update data, specified as a cell array, numeric matrix, table, structure, or dataset array.

If you are connecting to a database using a JDBC driver, convert the update data to a supported format before running `update`. If `data` contains MATLAB dates, times, or timestamps, use this formatting:

- Dates must be character vectors of the form `yyyy-mm-dd`.
- Times must be character vectors of the form `HH:MM:SS`.
- Timestamps must be character vectors of the form `yyyy-mm-dd HH:MM:SS.FFF`.

The database preference settings `NullNumberWrite` and `NullStringWrite` do not apply to this function. If `data` contains `null` entries and `NaN`s, convert these entries to an empty value `''`.

- If `data` is a structure, then field names in the structure must match `colnames`.
- If `data` is a table or a dataset array, then the variable names in the table or dataset array must match `colnames`.

`whereclause` — SQL `WHERE` clause
character vector | cell array of character vectors | string scalar | string array

SQL `WHERE` clause, specified as a character vector or string scalar for one condition or a cell array of character vectors or string array for multiple conditions.

Example: `'WHERE productTable.productNumber = 1'`

Data Types: `char` | `cell` | `string`

Tips

- The value of the `AutoCommit` property in the `connection` object determines whether `update` automatically commits the data to the database.
  - To view the `AutoCommit` value, access it using the `connection` object; for example, `conn.AutoCommit`.
  - To set the `AutoCommit` value, use the corresponding name-value pair argument in the `database` function.
  - To commit the data to the database, use the `commit` function or issue an SQL `COMMIT` statement using the `exec` function.
  - To roll back the data, use `rollback` or issue an SQL `ROLLBACK` statement using the `exec` function.
- You can use `datainsert` to add new rows instead of replacing existing data.
- To update multiple records, the number of SQL `WHERE` clauses in `whereclause` must match the number of records in `data`.
- If the order of records in your database is not constant, then you can use values of column names to identify records.
- If this error message appears when your database table is open in edit mode:

```
[Vendor][ODBC Product Driver] The database engine could
not lock table 'TableName' because it is already in use
by another person or process.
```

Then, close the table and rerun the `update` function.

- Running the same update operation again can cause this error message to appear.

```
??? Error using ==> database.update
Error:Commit/Rollback Problems
```

See Also

`close` | `commit` | `database` | `datainsert` | `get` | `rollback` | `set`

Topics

"Replace Existing Data in Database" on page 5-24
"Roll Back Data After Updating Record" on page 5-17
"Import Data from Databases into MATLAB" on page 5-2
"Connecting to Database Using Native ODBC Interface" on page 3-17
"Data Type Support" on page 1-3

External Websites

SQL Tutorial

Introduced before R2006a

width

Return field size of column in fetched data set

Syntax

```
colsize = width(curs,colnum)
```

Description

`colsize = width(curs,colnum)` returns the field size of the specified column number `colnum` in the fetched data set `curs`.

Examples

Retrieve the width of the first column of the fetched data set `curs`.

```
colsize = width(curs,1)

colsize =

    11
```

The field size of column one is 11 characters (bytes).

To create fetched data sets using an ODBC connection, you can use the native ODBC interface. For details, see `database`.

See Also

`attr` | `cols` | `columnnames` | `fetch` | `get`

Topics

“Display Information About Imported Data” on page 5-49

Introduced before R2006a

Neo4jConnect

Neo4j database connection

Description

Create a Neo4j database connection using the MATLAB interface to Neo4j. Explore the graph database or perform graph analytics using the MATLAB directed graph.

With a `Neo4jConnect` object, you can perform these tasks:

- Explore the graph database for nodes and relationships.
- Search the graph database for nodes, relationships, or a subgraph.
- Execute a Cypher query.

Creation

Create a `Neo4jConnect` object using `neo4j`.

Properties

`URL` — Neo4j database connection URL

character vector

Neo4j database connection URL that contains the server, port number, and web location of the Neo4j database, specified as a character vector.

Example: `http://localhost:7474/db/data` where `localhost` is the server, `7474` is the port number, `/db/data` is the web location of the database

Data Types: `char`

`UserName` — User name

character vector

User name for accessing the Neo4j database, specified as a character vector.

Data Types: `char`

`Message` — Error message

character vector

Error message, specified as a character vector. If this property is empty, the database connection is successful.

Data Types: `char`

Object Functions

nodeLabels	All node labels in Neo4j database
relationTypes	All relationship types in Neo4j database
propertyKeys	All property keys in Neo4j database
searchNodeByID	Search for Neo4j database node by node identifier
searchNode	Search Neo4j database nodes by label or by property key and value
searchRelation	Search relationships for Neo4j database node
searchGraph	Search for subgraph or entire graph in Neo4j database
executeCypher	Execute Cypher query on Neo4j database

Examples

Connect to Neo4j® Database

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password)
```

```
neo4jconn =

  Neo4jConnect with properties:

         URL: 'http://localhost:7474/db/data/'
```

```
    UserName: 'neo4j'
     Message: []
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message
```

```
ans =

     []
```

The blank `Message` property indicates a successful connection.

`neo4j` returns a `Neo4jConnect` object with these properties:

- `URL` -- The Neo4j® database web location
- `UserName` -- The user name used to connect to the database
- `Message` -- Any database connection error messages

The blank `Message` property indicates a successful Neo4j® database connection.

- "Determine Dependencies of Services in Network"
- "Find Shortest Path Between People in Social Neighborhood"
- "Find Friends of Friends in Social Neighborhood"
- "Explore Graph Database Structure" on page 6-2

See Also

Topics

"Determine Dependencies of Services in Network"
"Find Shortest Path Between People in Social Neighborhood"
"Find Friends of Friends in Social Neighborhood"
"Explore Graph Database Structure" on page 6-2
"Working with the MATLAB Interface to Neo4j" on page 6-8
"Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10

Introduced in R2016b

Neo4jNode

Neo4j database node

Description

After creating a Neo4j database connection using the MATLAB interface to Neo4j, explore nodes in the database. With a `Neo4jNode` object, you can explore the node degree and relationship types of the nodes in the database.

Creation

Create a `Neo4jNode` object using `searchNodeByID` or `searchNode`.

Properties

`NodeID` — Node identifier
double

Node identifier for the unique node in the Neo4j database, specified as a double.

Data Types: `double`

`NodeData` — Node data
structure

Node data consisting of property keys and values for the unique node in the Neo4j database, specified as a structure.

Data Types: `struct`

`NodeLabels` — Node labels
character vector | cell array of character vectors

Node labels of the unique Neo4j database node, specified as a character vector for one label or as a cell array of character vectors for multiple labels.

Data Types: `char` | `cell`

Object Functions

nodeDegree	In- and out-degree for each associated relationship type for Neo4j database node
nodeRelationTypes	Associated relationship types for Neo4j database node

Examples

Search Neo4j® Database by Node Identifier

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =

     []
```

The blank `Message` property indicates a successful connection.

Search the database for the node with node identifier `2` using the Neo4j® database connection `neo4jconn`.

```
nodeid = 2;

nodeinfo = searchNodeByID(neo4jconn,nodeid)
```

```
nodeinfo =

  Neo4jNode with properties:

        NodeID: 2
      NodeData: [1×1 struct]
    NodeLabels: 'Person'
```

`nodeinfo` is a `Neo4jNode` object that contains these properties:

- Node identifier
- Node data
- Node labels

Access the property keys and values of the node using the property `NodeData`.

```
nodeinfo.NodeData


ans =

  struct with fields:

    name: 'User2'
```

- “Explore Graph Database Structure” on page 6-2

See Also

Topics

“Explore Graph Database Structure” on page 6-2
“Working with the MATLAB Interface to Neo4j” on page 6-8
“Searching Graph Database Using MATLAB Interface to Neo4j” on page 6-10

Introduced in R2016b

neo4j

Connect to Neo4j database

The `neo4j` function creates connections to a Neo4j database. For relational database connections, see “Connecting to Database” on page 2-140.

Syntax

```
neo4jconn = neo4j(url,username,password)
```

Description

`neo4jconn = neo4j(url,username,password)` creates a `Neo4jConnect` object using the URL, user name, and password for the Neo4j database. To retrieve graph data from the Neo4j database, use this object.

Examples

Connect to Neo4j® Database

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password)
```

```
neo4jconn =

  Neo4jConnect with properties:
```

```
        URL: 'http://localhost:7474/db/data/'
    UserName: 'neo4j'
     Message: []
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message
```

```
ans =

     []
```

The blank `Message` property indicates a successful connection.

`neo4j` returns a `Neo4jConnect` object with these properties:

- `URL` -- The Neo4j® database web location
- `UserName` -- The user name used to connect to the database
- `Message` -- Any database connection error messages

The blank `Message` property indicates a successful Neo4j® database connection.

- "Determine Dependencies of Services in Network"
- "Find Shortest Path Between People in Social Neighborhood"
- "Find Friends of Friends in Social Neighborhood"
- "Explore Graph Database Structure" on page 6-2

Input Arguments

`url` — Neo4j database connection URL

character vector | string scalar

Neo4j database connection URL that contains the server, port number, and web location of the Neo4j database, specified as a character vector or string scalar.

Example: `http://localhost:7474/db/data` where `localhost` is the server, `7474` is the port number, `/db/data` is the web location of the database

Data Types: `char` | `string`

`username` — User name

character vector | string scalar

User name for accessing the Neo4j database, specified as a character vector or string scalar. If no database authentication is required, specify an empty character vector.

Data Types: `char` | `string`

`password` — Password

character vector | string scalar

Password for accessing the Neo4j database, specified as a character vector or string scalar. If no database authentication is required, specify an empty character vector or string scalar.

Data Types: `char` | `string`

Output Arguments

`neo4jconn` — Neo4j database connection

`Neo4jConnect` object

Neo4j database connection, returned as a `Neo4jConnect` object.

See Also

`neo4j` | `nodeLabels` | `propertyKeys` | `relationTypes`

Topics

"Determine Dependencies of Services in Network"
"Find Shortest Path Between People in Social Neighborhood"
"Find Friends of Friends in Social Neighborhood"
"Explore Graph Database Structure" on page 6-2
"Working with the MATLAB Interface to Neo4j" on page 6-8
"Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10
"MATLAB Interface to Neo4j Error Messages" on page 6-13

Introduced in R2016b

nodeLabels

All node labels in Neo4j database

Syntax

```
nlabels = nodeLabels(neo4jconn)
```

Description

`nlabels = nodeLabels(neo4jconn)` returns all node labels in the Neo4j database using the Neo4j database connection `neo4jconn`. You can retrieve the entire graph or search for a subgraph using the node labels. To search the graph database for relationship types instead, see `relationTypes`.

Examples

Retrieve Node Labels in Neo4j® Database

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =
```

```
     []
```

The blank `Message` property indicates a successful connection.

Retrieve all node labels using the Neo4j® database connection `neo4jconn`.

```
nlabels = nodeLabels(neo4jconn)
```

```
nlabels =

  cell

    'Person'
```

The cell array `nlabels` contains a character vector for the one node label in the Neo4j® database.

- “Explore Graph Database Structure” on page 6-2

Input Arguments

`neo4jconn` — Neo4j database connection

`Neo4jConnect` object

Neo4j database connection, specified as a `Neo4jConnect` object created using the function `neo4j`.

Output Arguments

`nlabels` — Node labels

cell array of character vectors

Node labels in the Neo4j database, returned as a cell array of character vectors. Each character vector denotes a node label.

See Also

`neo4j` | `propertyKeys` | `relationTypes`

Topics

"Explore Graph Database Structure" on page 6-2
"Working with the MATLAB Interface to Neo4j" on page 6-8
"Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10
"MATLAB Interface to Neo4j Error Messages" on page 6-13

Introduced in R2016b

relationTypes

All relationship types in Neo4j database

Syntax

```
rtypes = relationTypes(neo4jconn)
```

Description

`rtypes = relationTypes(neo4jconn)` returns all relationship types in the Neo4j database using the Neo4j database connection `neo4jconn`. You can retrieve the entire graph or search for a subgraph using the relationship types. To search the graph database for node labels instead, see `nodeLabels`.

Examples

Retrieve Relationship Types in Neo4j® Database

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =
```

```
     []
```

The blank `Message` property indicates a successful connection.

Retrieve all relationship types using the Neo4j® database connection `neo4jconn`.

```
rtypes = relationTypes(neo4jconn)
```

```
rtypes =

  cell

    'knows'
```

The cell array `rtypes` contains a character vector for the one relationship type in the Neo4j® database.

- "Explore Graph Database Structure" on page 6-2

Input Arguments

`neo4jconn` — Neo4j database connection

`Neo4jConnect` object

Neo4j database connection, specified as a `Neo4jConnect` object created using the function `neo4j`.

Output Arguments

`rtypes` — Relationship types

cell array of character vectors

Relationship types in the Neo4j database, returned as a cell array of character vectors. Each character vector denotes a relationship type.

See Also

`neo4j` | `nodeLabels` | `propertyKeys`

Topics

“Explore Graph Database Structure” on page 6-2
“Working with the MATLAB Interface to Neo4j” on page 6-8
“Searching Graph Database Using MATLAB Interface to Neo4j” on page 6-10
“MATLAB Interface to Neo4j Error Messages” on page 6-13

Introduced in R2016b

propertyKeys

All property keys in Neo4j database

Syntax

```
propkeys = propertyKeys(neo4jconn)
```

Description

`propkeys = propertyKeys(neo4jconn)` returns all property keys in the Neo4j database using the Neo4j database connection `neo4jconn`.

Examples

Retrieve Property Keys in Neo4j® Database

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =

     []
```

The blank `Message` property indicates a successful connection.

Retrieve all property keys using the Neo4j® database connection `neo4jconn`.

```
propkeys = propertyKeys(neo4jconn)
```

```
propkeys =

  2×1 cell array

    'name'
    'property'
```

The cell array `propkeys` contains a character vector for the one property key in the Neo4j® database.

- “Explore Graph Database Structure” on page 6-2

Input Arguments

`neo4jconn` — Neo4j database connection

`Neo4jConnect` object

Neo4j database connection, specified as a `Neo4jConnect` object created using the function `neo4j`.

Output Arguments

`propkeys` — Property keys

cell array of character vectors

Property keys in the Neo4j database, returned as a cell array of character vectors. Each character vector denotes a property key.

See Also

`neo4j` | `nodeLabels` | `relationTypes`

Topics

“Explore Graph Database Structure” on page 6-2
“Working with the MATLAB Interface to Neo4j” on page 6-8
“MATLAB Interface to Neo4j Error Messages” on page 6-13

Introduced in R2016b

searchNodeByID

Search for Neo4j database node by node identifier

Syntax

```
nodeinfo = searchNodeByID(neo4jconn,nodeid)
```

Description

`nodeinfo = searchNodeByID(neo4jconn,nodeid)` creates the `Neo4jNode` object using the Neo4j database connection `neo4jconn` and the node identifier `nodeid`.

Examples

Search Neo4j® Database by Node Identifier

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message
```

```
ans =

     []
```

The blank `Message` property indicates a successful connection.

Search the database for the node with node identifier `2` using the Neo4j® database connection `neo4jconn`.

```
nodeid = 2;

nodeinfo = searchNodeByID(neo4jconn,nodeid)
```

```
nodeinfo =

  Neo4jNode with properties:

        NodeID: 2
      NodeData: [1×1 struct]
    NodeLabels: 'Person'
```

`nodeinfo` is a `Neo4jNode` object that contains these properties:

- Node identifier
- Node data
- Node labels

Access the property keys and values of the node using the property `NodeData`.

```
nodeinfo.NodeData
```

```
ans =

  struct with fields:

    name: 'User2'
```

- “Explore Graph Database Structure” on page 6-2

Input Arguments

`neo4jconn` — Neo4j database connection

`Neo4jConnect` object

Neo4j database connection, specified as a `Neo4jConnect` object created using the function `neo4j`.

`nodeid` — Neo4j database node identifier

numeric scalar

Neo4j database node identifier, specified as a numeric scalar that denotes one specific node in the Neo4j database. If a node identifier is unknown, search for nodes using `searchNode` and relationships using `searchRelation`.

Data Types: `double`

Output Arguments

`nodeinfo` — Node information

`Neo4jNode` object

Node information for one node in the Neo4j database, returned as a `Neo4jNode` object. You can use this node as the origin node for searching the Neo4j database.

See Also

`neo4j` | `nodeDegree` | `nodeRelationTypes`

Topics

“Explore Graph Database Structure” on page 6-2
“Working with the MATLAB Interface to Neo4j” on page 6-8
“Searching Graph Database Using MATLAB Interface to Neo4j” on page 6-10

Introduced in R2016b

searchNode

Search Neo4j database nodes by label or by property key and value

Syntax

```
nodeinfo = searchNode(neo4jconn,nlabel)
nodeinfo = searchNode(neo4jconn,nlabel,Name,Value)
```

Description

`nodeinfo = searchNode(neo4jconn,nlabel)` returns node information for nodes with a specific node label using the Neo4j database connection `neo4jconn`.

`nodeinfo = searchNode(neo4jconn,nlabel,Name,Value)` narrows the search for nodes with additional options specified by the `Name,Value` pair arguments.

Examples

Search Nodes by Node Label

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =
```

```
     []
```

The blank `Message` property indicates a successful connection.

Search the database for nodes that have node label `Person` using the Neo4j® database connection `neo4jconn`.

```
nlabel = 'Person';

nodeinfo = searchNode(neo4jconn,nlabel)
```

```
nodeinfo =

         NodeLabels      NodeData                NodeObject
         __________    ____________    ___________________________________

    0    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    1    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    2    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    3    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    4    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    5    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    6    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
```

`nodeinfo` is a table that contains information for each database node:

- Each row name is a node identifier.
- Variable `NodeLabels` is the node label.
- Variable `NodeData` is the node information.
- Variable `NodeObject` is the `Neo4jNode` object.

Access the node information for the first node in the table.

```
node = nodeinfo.NodeData(1);
node{1}
```

```
ans =
```

```
  struct with fields:

    name: 'User1'
```

The structure contains one property key and value.

Access the node information using the row name as an index.

```
nodeinfo.NodeData{'0'}
```

```
ans =

  struct with fields:

    name: 'User1'
```

The structure contains one property key and value.

Find the node degree for the first database node in the table. Specify outgoing relationships.

```
degree = nodeDegree(nodeinfo.NodeObject(1),'out')
```

```
degree =

  struct with fields:

    knows: 2
```

There are two outgoing relationships from the first node in the table with relationship type `knows`.

Search Nodes by Property Key and Value

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
```

```
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message
```

```
ans =

     []
```

The blank `Message` property indicates a successful connection.

Search the database for nodes that have node label `Person` using the Neo4j® database connection `neo4jconn`. Filter the results further by the property key and value for a specific person named `User2`.

```
nlabel = 'Person';

nodeinfo = searchNode(neo4jconn,nlabel,'PropertyKey','name', ...
    'PropertyValue','User2')
```

```
nodeinfo =

  Neo4jNode with properties:

        NodeID: 2
      NodeData: [1×1 struct]
    NodeLabels: 'Person'
```

`nodeinfo` is a `Neo4jNode` object that contains node information.

Access the node information.

```
nodeinfo.NodeData
```

```
ans =

  struct with fields:
```

```
    name: 'User2'
```

The structure contains a property key and value for `User2`.

Find the node degree of the outgoing relationships.

```
degree = nodeDegree(nodeinfo,'out')
```

```
degree =

  struct with fields:

    knows: 1
```

There is one outgoing relationship type `knows` for `User2`.

- “Explore Graph Database Structure” on page 6-2

Input Arguments

`neo4jconn` — Neo4j database connection

`Neo4jConnect` object

Neo4j database connection, specified as a `Neo4jConnect` object created using the function `neo4j`.

`nlabel` — Neo4j database node label

character vector | string scalar

Neo4j database node label, specified as a character vector or string scalar.

Data Types: `char` | `string`

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single

quotes (' '). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `nodeinfo = searchNode(neo4jconn,'Person','PropertyKey','name','PropertyValue','User2');`

`PropertyKey` — Property key
character vector | string scalar

Property key, specified as a comma-separated pair consisting of `'PropertyKey'` and a character vector or string scalar. A property key must have a corresponding property value. To specify the property value, use the name-value pair argument `'PropertyValue'`.

Example: `'PropertyKey','name'`

Data Types: `char | string`

`PropertyValue` — Property value
character vector | string scalar

Property value, specified as a comma-separated pair consisting of `'PropertyValue'` and a character vector or string scalar. A property value must have a corresponding property key. To specify the property key, use the name-value pair argument `'PropertyKey'`.

Example: `'PropertyValue','User1'`

Data Types: `char | string`

Output Arguments

`nodeinfo` — Node information
`Neo4jNode` object | table

Node information in the Neo4j database that matches the search criteria, returned as a `Neo4jNode` object for one node or a table for multiple nodes.

For multiple nodes, the table contains:

- Row names, which are Neo4j node identifiers of each database node.
- The variable `NodeLabels`, which is a cell array of character vectors that contains the node labels for each database node.
- The variable `NodeData`, which is a cell array of structures that contain node information such as property keys.
- The variable `NodeObject`, which is the `Neo4jNode` object for each database node.

See Also

`neo4j` | `nodeDegree` | `nodeRelationTypes` | `searchGraph` | `searchNodeByID` | `searchRelation`

Topics

"Explore Graph Database Structure" on page 6-2
"Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10
"Working with the MATLAB Interface to Neo4j" on page 6-8
"MATLAB Interface to Neo4j Error Messages" on page 6-13

Introduced in R2016b

searchRelation

Search relationships for Neo4j database node

Syntax

```
relinfo = searchRelation(neo4jconn,nodeinfo,direction)
relinfo = searchRelation(neo4jconn,nodeinfo,direction,Name,Value)
```

Description

`relinfo = searchRelation(neo4jconn,nodeinfo,direction)` returns relationship information for the origin node `nodeinfo` and relationship direction using the Neo4j database connection `neo4jconn`. The search starts from the origin node. To find an origin node, use `searchNode` or `searchNodeByID`.

`relinfo = searchRelation(neo4jconn,nodeinfo,direction,Name,Value)` returns relationship information with additional options specified by one or more `Name,Value` pair arguments.

Examples

Search Incoming Relationships

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message

ans =

     []
```

The blank `Message` property indicates a successful connection.

Retrieve the origin node `nodeinfo` using the Neo4j® database connection `neo4jconn` and node identifier `nodeid`.

```
nodeid = 3;

nodeinfo = searchNodeByID(neo4jconn,nodeid);
```

Search for incoming relationships using the Neo4j® database connection `neo4jconn` and origin node `nodeinfo`.

```
direction = 'in';

relinfo = searchRelation(neo4jconn,nodeinfo,direction)


relinfo =

  struct with fields:

      Origin: 3
       Nodes: [2×3 table]
   Relations: [1×4 table]
```

`relinfo` is a structure that contains the results of the search:

- `Origin` -- The node identifier for the specified origin node.
- `Nodes` -- A table containing all starting and ending nodes for each matched relationship.
- `Relations` -- A table containing all matched relationships.

Access the table of nodes.

```
relinfo.Nodes
```

```
ans =

         NodeLabels       NodeData                NodeObject
         __________    _____________    ___________________________________

    1    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    3    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
```

Access the table of relationships.

```
relinfo.Relations
```

```
ans =

         StartNodeID    RelationType    EndNodeID    RelationData
         ___________    ____________    _________    ____________

    3    1              'knows'         3            [1×1 struct]
```

Search Relationships by Type and Distance

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message
```

```
ans =

     []
```

The blank `Message` property indicates a successful connection.

Retrieve the origin node `nodeinfo` using the Neo4j® database connection `neo4jconn` and node identifier `nodeid`.

```
nodeid = 3;

nodeinfo = searchNodeByID(neo4jconn,nodeid);
```

Search for incoming relationships using the Neo4j® database connection `neo4jconn` and origin node `nodeinfo`. Refine the search by filtering for the relationship type `knows` and for nodes at a distance of two or less.

```
direction = 'in';
reltypes = {'knows'};

relinfo = searchRelation(neo4jconn,nodeinfo,direction, ...
    'RelationTypes',reltypes,'Distance',2)


relinfo =

  struct with fields:

      Origin: 3
       Nodes: [4×3 table]
   Relations: [3×4 table]
```

`relinfo` is a structure that contains the results of the search:

- `Origin` -- The node identifier for the specified origin node.
- `Nodes` -- A table containing all starting and ending nodes for each matched relationship.
- `Relations` -- A table containing all matched relationships.

Access the table of nodes.

```
relinfo.Nodes


ans =
```

```
        NodeLabels      NodeData              NodeObject
        ___________    ____________    ___________________________________

    0    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    1    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    2    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    3    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
```

Access the table of relationships.

```
relinfo.Relations
```

```
ans =

        StartNodeID    RelationType    EndNodeID    RelationData
        ___________    ____________    _________    ____________

    3    1              'knows'         3            [1×1 struct]
    2    2              'knows'         1            [1×1 struct]
    1    0              'knows'         1            [1×1 struct]
```

- “Explore Graph Database Structure” on page 6-2

Input Arguments

`neo4jconn` — Neo4j database connection

`Neo4jConnect` object

Neo4j database connection, specified as a `Neo4jConnect` object created using the function `neo4j`.

`nodeinfo` — Origin node information

`Neo4jNode` object | numeric scalar

Origin node information, specified as a `Neo4jNode` object or numeric scalar that denotes a node identifier.

Data Types: `double`

`direction` — Relationship direction

`'in' | 'out'`

Relationship direction, specified as one of these values. The relationships are associated with the specified origin node.

Value	Description
`'in'`	Incoming relationship
`'out'`	Outgoing relationship

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `relinfo = searchRelation(neo4jconn,nodeinfo,'in','RelationTypes', {'knows'},'Distance',2);`

`RelationTypes` — Relationship types

cell array of character vectors | string array

Relationship types, specified as a comma-separated pair consisting of `'RelationTypes'` and a cell array of character vectors or string array. To denote one relationship, specify one character vector or string scalar in the cell array. To denote multiple relationships, specify a string array or multiple character vectors in the cell array.

Example: `'RelationTypes',{'knows'}`

Data Types: `cell | string`

`Distance` — Node distance

numeric scalar

Node distance, specified as a comma-separated pair consisting of `'Distance'` and a positive numeric scalar. For example, if the node distance is three, `searchRelation` returns information for nodes that are less than four nodes away from the origin node `nodeinfo`.

Example: `'Distance',3`

Data Types: `double`

Output Arguments

`relinfo` — Relationship information

structure

Relationship information in the Neo4j database that matches the search criteria from the origin node `nodeinfo`, returned as a structure with these fields.

Field	Description
`Origin`	Node identifier of the origin node `nodeinfo`.
`Nodes`	Table that contains node information for each node in the `Relations` table. The `Nodes` table contains: • Row names in the table, which are Neo4j node identifiers of the matched database nodes. • The variable `NodeLabels`, which is a character vector that denotes the node label for each matched database node. • The variable `NodeData`, which is a structure array that contains node information such as property keys for each matched database node. • The variable `NodeObject`, which is the `Neo4jNode` object for each matched database node.

Field	Description
`Relations`	Table that contains relationship information for the nodes in the `Nodes` table. The `Relations` table contains: • Row names in the table, which are Neo4j relationship identifiers. • The variable `StartNodeID`, which is the node identifier for the start node for each matched relationship. • The variable `RelationType`, which is a character vector that denotes the relationship type for each matched relationship. • The variable `EndNodeID`, which is the node identifier for the end node for each matched relationship. • The variable `RelationData`, which is a structure array that contains property keys associated with each matched relationship.

See Also

`neo4j` | `searchGraph` | `searchNode` | `searchNodeByID`

Topics

"Explore Graph Database Structure" on page 6-2
"Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10
"Working with the MATLAB Interface to Neo4j" on page 6-8
"MATLAB Interface to Neo4j Error Messages" on page 6-13

Introduced in R2016b

searchGraph

Search for subgraph or entire graph in Neo4j database

Syntax

```
graphinfo = searchGraph(neo4jconn,criteria)
```

Description

`graphinfo = searchGraph(neo4jconn,criteria)` returns graph information based on the search criteria using the Neo4j database connection `neo4jconn`. You can search a subgraph or the entire graph.

Examples

Search Graph by Node Labels

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =

     []
```

The blank `Message` property indicates a successful connection.

Search the graph for all nodes that are labeled as `'Person'` using the Neo4j® database connection `neo4jconn`.

```
nlabel = {'Person'};

graphinfo = searchGraph(neo4jconn,nlabel)
```

```
graphinfo =

  struct with fields:

        Nodes: [7×3 table]
    Relations: [8×4 table]
```

`graphinfo` is a structure that contains the results of the search:

- `Nodes` -- A table containing all starting and ending nodes that denote each matched relationship.
- `Relations` -- A table containing all matched relationships.

Access the table of nodes.

```
graphinfo.Nodes
```

```
ans =

         NodeLabels      NodeData                NodeObject
         __________    ____________    ____________________________________

    0    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    1    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    2    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    3    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    4    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    5    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    6    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
```

Access property keys for the first node.

```
graphinfo.Nodes.NodeData{1}
```

```
ans =

  struct with fields:

    name: 'User1'
```

Access the table of relationships.

```
graphinfo.Relations
```

```
ans =

         StartNodeID    RelationType    EndNodeID    RelationData
         ___________    ____________    _________    ____________

    1    0              'knows'         1            [1×1 struct]
    0    0              'knows'         2            [1×1 struct]
    3    1              'knows'         3            [1×1 struct]
    2    2              'knows'         1            [1×1 struct]
    5    3              'knows'         4            [1×1 struct]
    4    3              'knows'         5            [1×1 struct]
    6    5              'knows'         4            [1×1 struct]
    7    5              'knows'         6            [1×1 struct]
```

Access property keys for the first relationship.

```
graphinfo.Relations.RelationData{1}
```

```
ans =

  struct with no fields.
```

The first relationship has no property keys.

Search the graph for all node labels in the database.

```
allnodes = nodeLabels(neo4jconn);

graphinfo = searchGraph(neo4jconn,allnodes);
```

Search Graph by Relationships

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =

     []
```

The blank `Message` property indicates a successful connection.

Search the graph for the relationship type `'knows'` using the Neo4j® database connection `neo4jconn`.

```
reltype = {'knows'};

graphinfo = searchGraph(neo4jconn,reltype)


graphinfo =

  struct with fields:

        Nodes: [7×3 table]
    Relations: [8×4 table]
```

`graphinfo` is a structure that contains the results of the search:

- `Nodes` -- A table containing all starting and ending nodes that denote each matched relationship.
- `Relations` -- A table containing all matched relationships.

Access the table of nodes.

```
graphinfo.Nodes
```

```
ans =

        NodeLabels      NodeData              NodeObject
        __________    ____________    ___________________________________

    0    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    2    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    1    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    3    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    5    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    4    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
    6    'Person'      [1×1 struct]    [1x1 database.neo4j.Neo4jNode]
```

Access the table of relationships.

```
graphinfo.Relations
```

```
ans =

        StartNodeID    RelationType    EndNodeID    RelationData
        ___________    ____________    _________    ____________

    0    0              'knows'         2            [1×1 struct]
    1    0              'knows'         1            [1×1 struct]
    2    2              'knows'         1            [1×1 struct]
    3    1              'knows'         3            [1×1 struct]
    4    3              'knows'         5            [1×1 struct]
    5    3              'knows'         4            [1×1 struct]
    6    5              'knows'         4            [1×1 struct]
    7    5              'knows'         6            [1×1 struct]
```

Search the graph for all relationship types in the database.

```
allreltypes = relationTypes(neo4jconn);

graphinfo = searchGraph(neo4jconn,allreltypes);
```

- "Determine Dependencies of Services in Network"
- "Find Shortest Path Between People in Social Neighborhood"
- "Find Friends of Friends in Social Neighborhood"

Input Arguments

`neo4jconn` — Neo4j database connection

`Neo4jConnect` object

Neo4j database connection, specified as a `Neo4jConnect` object created using the function `neo4j`.

`criteria` — Search criteria

cell array of character vectors | string array

Search criteria, specified as a cell array of character vectors or string array. To search by nodes, specify one or more node labels as character vectors in the cell array. To search by relationships, specify one or more relationship types as character vectors in the cell array. Or, specify a string array for multiple node labels or relationship types.

Data Types: `cell` | `string`

Output Arguments

`graphinfo` — Graph information

structure

Graph information in the Neo4j database that matches the search criteria, returned as a structure with these fields.

Field	Description
`Nodes`	Table that contains node information for each node in the `Relations` table. The `Nodes` table contains: • Row names in the table, which are Neo4j node identifiers of the matched database nodes. • The variable `NodeLabels`, which is a character vector that denotes the node label for each matched database node. • The variable `NodeData`, which is a structure array that contains node information such as property keys for each matched database node. • The variable `NodeObject`, which is the `Neo4jNode` object for each matched database node. If `criteria` contains node labels, the output is automatically sorted by `StartNodeID` and `Label`.

Field	Description
`Relations`	Table that contains relationship information for the nodes in the `Nodes` table. The `Relations` table contains: • Row names in the table, which are Neo4j relationship identifiers. • The variable `StartNodeID`, which is the node identifier for the start node for each matched relationship. • The variable `RelationType`, which is a character vector that denotes the relationship type for each matched relationship. • The variable `EndNodeID`, which is the node identifier for the end node for each matched relationship. • The variable `RelationData`, which is a structure array that contains property keys associated with each matched relationship. If `criteria` contains relationship types, the output is automatically sorted by `RelationID`.

See Also

`neo4j` | `nodeLabels` | `relationTypes` | `searchNode` | `searchNodeByID` | `searchRelation`

Topics

"Determine Dependencies of Services in Network"
"Find Shortest Path Between People in Social Neighborhood"
"Find Friends of Friends in Social Neighborhood"
"Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10
"Working with the MATLAB Interface to Neo4j" on page 6-8

Introduced in R2016b

executeCypher

Execute Cypher query on Neo4j database

Syntax

```
results = executeCypher(neo4jconn,query)
```

Description

`results = executeCypher(neo4jconn,query)` returns data from the Neo4j database using the Neo4j database connection `neo4jconn` and a Cypher query. You can execute a Cypher query on the Neo4j database using the Cypher Query Language.

Examples

Execute Cypher® Query in Neo4j® Database

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =

     []
```

The blank `Message` property indicates a successful connection.

Create the Cypher® query that searches for the names of all nodes with the node label `Person`.

```
query = 'MATCH (node:Person) RETURN node.name';
```

Execute the query and display the results using the Neo4j® database connection `neo4jconn`.

```
results = executeCypher(neo4jconn,query)
```

```
results =

    node_name
    _________

    'User1'
    'User3'
    'User2'
    'User4'
    'User5'
    'User6'
    'User7'
```

`results` is a table that contains the column `node_name`. This column has the names of each node in the Neo4j® database.

Input Arguments

`neo4jconn` — Neo4j database connection

`Neo4jConnect` object

Neo4j database connection, specified as a `Neo4jConnect` object created using the function `neo4j`.

`query` — Cypher query

character vector | string scalar

Cypher query, specified as a character vector or string scalar.

Example: `'MATCH (movie: Movie {title: ''The Matrix''}) RETURN movie.title, movie.studio'`

Data Types: `char` | `string`

Output Arguments

`results` — Cypher query results

table

Cypher query results, returned as a table. The columns in the table match the RETURN statement in the Cypher query.

See Also

`neo4j` | `searchGraph` | `searchNode` | `searchNodeByID` | `searchRelation`

Topics

"Working with the MATLAB Interface to Neo4j" on page 6-8
"Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10
"MATLAB Interface to Neo4j Error Messages" on page 6-13

Introduced in R2016b

nodeRelationTypes

Associated relationship types for Neo4j database node

Syntax

```
nodereltypes = nodeRelationTypes(node,direction)
```

Description

`nodereltypes = nodeRelationTypes(node,direction)` returns the relationship types for the specified `Neo4jNode` object and direction.

Examples

Search Relationship Types for Node

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =

     []
```

The blank `Message` property indicates a successful connection.

Search the database for the node with node identifier `2` using the Neo4j® database connection `neo4jconn`.

```
nodeid = 2;

node = searchNodeByID(neo4jconn,nodeid);
```

Search for all incoming relationships for the node.

```
nodereltypes = nodeRelationTypes(node,'in')


nodereltypes =

  cell

    'knows'
```

`nodereltypes` returns a list of the relationship types.

- “Explore Graph Database Structure” on page 6-2

Input Arguments

`node` — Neo4j database node

`Neo4jNode` object

Neo4j database node, specified as a `Neo4jNode` object created using `searchNode` or `searchNodeByID`.

`direction` — Relationship direction

`'in'` | `'out'`

Relationship direction, specified as one of these values. The relationships are associated with the specified origin node.

Value	Description
`'in'`	Incoming relationship

Value	Description
`'out'`	Outgoing relationship

Output Arguments

`nodereltypes` — Relationship types

cell array of character vectors

Relationship types, returned as a cell array of character vectors. The cell array contains one character vector for one relationship or multiple character vectors for multiple relationships.

See Also

`nodeDegree` | `searchNode` | `searchNodeByID`

Topics

“Explore Graph Database Structure” on page 6-2
“Working with the MATLAB Interface to Neo4j” on page 6-8
“Searching Graph Database Using MATLAB Interface to Neo4j” on page 6-10

Introduced in R2016b

nodeDegree

In- and out-degree for each associated relationship type for Neo4j database node

Syntax

```
degree = nodeDegree(node,direction)
```

Description

`degree = nodeDegree(node,direction)` returns the in- or out-degree for each relationship for the specified `Neo4jNode` object. `direction` specifies the relationship direction.

Examples

Search Node Degree for Node

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =

     []
```

The blank `Message` property indicates a successful connection.

Search the database for the node with node identifier `2` using the Neo4j® database connection `neo4jconn`.

```
nodeid = 2;

node = searchNodeByID(neo4jconn,nodeid);
```

Search for the degree of all incoming relationships for the node.

```
degree = nodeDegree(node,'in')


degree =

  struct with fields:

    knows: 1
```

`degree` returns a structure with the in-degree for each relationship type.

- “Explore Graph Database Structure” on page 6-2

Input Arguments

`node` — Neo4j database node

`Neo4jNode` object

Neo4j database node, specified as a `Neo4jNode` object created using `searchNode` or `searchNodeByID`.

`direction` — Relationship direction

`'in' | 'out'`

Relationship direction, specified as one of these values. The relationships are associated with the specified origin node.

Value	Description
`'in'`	Incoming relationship

Value	Description
`'out'`	Outgoing relationship

Output Arguments

`degree` — In- or out-degree

structure

In- or out-degree, returned as a structure. Each field in the structure represents either incoming or outgoing relationship types. If there are no incoming or outgoing relationship types, the structure is empty.

See Also

`nodeRelationTypes` | `searchNode` | `searchNodeByID`

Topics

"Explore Graph Database Structure" on page 6-2
"Working with the MATLAB Interface to Neo4j" on page 6-8
"Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10

Introduced in R2016b

neo4jStruct2Digraph

Convert graph or relationship structure from Neo4j database to directed graph

Syntax

```
G = neo4jStruct2Digraph(s)
G = neo4jStruct2Digraph(s,Name,Value)
```

Description

`G = neo4jStruct2Digraph(s)` creates a directed graph from the structure `s`. With the directed graph, run graph network analytics using MATLAB. For example, to visualize the graph, see “Graph Plotting and Customization” (MATLAB).

`G = neo4jStruct2Digraph(s,Name,Value)` creates a directed graph with additional options specified by the `Name,Value` pair arguments.

Examples

Create Directed Graph Using Relationships

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message
```

```
ans =

     []
```

The blank `Message` property indicates a successful connection.

Search for incoming relationships using the Neo4j® database connection `neo4jconn` and origin node identifier `nodeid`.

```
nodeid = 1;
direction = 'in';

relinfo = searchRelation(neo4jconn,nodeid,direction);
```

Convert the relationship information into a directed graph.

```
G = neo4jStruct2Digraph(relinfo)
```

```
G =

  digraph with properties:

    Edges: [2×3 table]
    Nodes: [3×3 table]
```

`G` is a `digraph` object that contains two tables for edges and nodes.

Access the table of edges.

```
G.Edges
```

```
ans =

     EndNodes      RelationType    RelationData
    ___________    ____________    ____________

    '0'    '1'     'knows'         [1×1 struct]
    '2'    '1'     'knows'         [1×1 struct]
```

Access the table of nodes.

```
G.Nodes
```

```
ans =

    Name    NodeLabels      NodeData
    ____    __________    ____________

    '0'     'Person'      [1×1 struct]
    '1'     'Person'      [1×1 struct]
    '2'     'Person'      [1×1 struct]
```

Find the shortest path between all nodes in `G`.

```
d = distances(G)
```

```
d =

     0     1   Inf
   Inf     0   Inf
   Inf     1     0
```

Create Directed Graph Using a Subgraph

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message
```

```
ans =
```

```
     []
```

The blank `Message` property indicates a successful connection.

Search for a subgraph using the Neo4j® database connection `neo4jconn` and node label `nlabel`.

```
nlabel = {'Person'};

graphinfo = searchGraph(neo4jconn,nlabel);
```

Convert the graph information into a directed graph.

```
G = neo4jStruct2Digraph(graphinfo)
```

```
G =

  digraph with properties:

    Edges: [8×3 table]
    Nodes: [7×3 table]
```

`G` is a `digraph` object that contains two tables for edges and nodes.

Access the table of edges.

```
G.Edges
```

```
ans =

     EndNodes     RelationType    RelationData
    ___________    ____________    ____________

    '0'    '1'    'knows'         [1×1 struct]
    '0'    '2'    'knows'         [1×1 struct]
    '1'    '3'    'knows'         [1×1 struct]
    '2'    '1'    'knows'         [1×1 struct]
    '3'    '4'    'knows'         [1×1 struct]
    '3'    '5'    'knows'         [1×1 struct]
    '5'    '4'    'knows'         [1×1 struct]
```

```
    '5'    '6'    'knows'         [1×1 struct]
```

Access the table of nodes.

```
G.Nodes
```

```
ans =

    Name    NodeLabels      NodeData
    ____    __________    ____________

    '0'     'Person'      [1×1 struct]
    '1'     'Person'      [1×1 struct]
    '2'     'Person'      [1×1 struct]
    '3'     'Person'      [1×1 struct]
    '4'     'Person'      [1×1 struct]
    '5'     'Person'      [1×1 struct]
    '6'     'Person'      [1×1 struct]
```

Find the shortest path between all nodes in `G`.

```
d = distances(G)
```

```
d =

     0     1     1     2     3     3     4
   Inf     0   Inf     1     2     2     3
   Inf     1     0     2     3     3     4
   Inf   Inf   Inf     0     1     1     2
   Inf   Inf   Inf   Inf     0   Inf   Inf
   Inf   Inf   Inf   Inf     1     0     1
   Inf   Inf   Inf   Inf   Inf   Inf     0
```

Create Directed Graph Using Node Names

Create a Neo4j® database connection using the URL `http://localhost:7474/db/data`, user name `neo4j`, and password `matlab`.

```
url = 'http://localhost:7474/db/data';
username = 'neo4j';
password = 'matlab';

neo4jconn = neo4j(url,username,password);
```

Check the `Message` property of the Neo4j® connection object `neo4jconn`.

```
neo4jconn.Message


ans =

     []
```

The blank `Message` property indicates a successful connection.

Search for a subgraph using the Neo4j® database connection `neo4jconn` and node label `nlabel`.

```
nlabel = {'Person'};

graphinfo = searchGraph(neo4jconn,nlabel);
```

Convert the graph information into a directed graph using the node names in the subgraph. Convert node names into a cell array of character vectors `nodenames`.

```
names = [graphinfo.Nodes.NodeData{:}];
nodenames = {names(:).name};

G = neo4jStruct2Digraph(graphinfo,'NodeNames',nodenames)


G =

  digraph with properties:

    Edges: [8×3 table]
    Nodes: [7×3 table]
```

`G` is a `digraph` object that contains two tables for edges and nodes.

Access the table of edges.

```
G.Edges
```

```
ans =

        EndNodes          RelationType    RelationID
    ____________________    ____________    __________

    'User1'    'User3'    'knows'         1
    'User1'    'User2'    'knows'         0
    'User3'    'User4'    'knows'         3
    'User2'    'User3'    'knows'         2
    'User4'    'User5'    'knows'         5
    'User4'    'User6'    'knows'         4
    'User6'    'User5'    'knows'         6
    'User6'    'User7'    'knows'         7
```

Access the table of nodes.

```
G.Nodes
```

```
ans =

     Name       NodeLabels       NodeData
    _______    ____________    _____________

    'User1'    'Person'       [1×1 struct]
    'User3'    'Person'       [1×1 struct]
    'User2'    'Person'       [1×1 struct]
    'User4'    'Person'       [1×1 struct]
    'User5'    'Person'       [1×1 struct]
    'User6'    'Person'       [1×1 struct]
    'User7'    'Person'       [1×1 struct]
```

Find the shortest path between all nodes in `G`.

```
d = distances(G)
```

```
d =

     0     1     1     2     3     3     4
```

```
   Inf     0   Inf     1     2     2     3
   Inf     1     0     2     3     3     4
   Inf   Inf   Inf     0     1     1     2
   Inf   Inf   Inf   Inf     0   Inf   Inf
   Inf   Inf   Inf   Inf     1     0     1
   Inf   Inf   Inf   Inf   Inf   Inf     0
```

- "Determine Dependencies of Services in Network"
- "Find Shortest Path Between People in Social Neighborhood"
- "Find Friends of Friends in Social Neighborhood"

Input Arguments

`s` — Graph or relationship information

structure

Graph or relationship information, specified as a structure returned by `searchGraph` or `searchRelation`.

Data Types: `struct`

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `G = neo4jStruct2Digraph(graphinfo,'NodeNames',nodenames);`

`NodeNames` — Neo4j database node names

cell array of character vectors | string array

Neo4j database node names, specified as the comma-separated pair consisting of `'NodeNames'` and a cell array of character vectors or string array. To add the Neo4j database node names to the directed graph, specify this name-value pair argument.

Example: `'NodeNames',nodenames`

Data Types: `cell | string`

Output Arguments

G — Directed graph

`digraph` object

Directed graph, returned as a `digraph` object.

See Also

`distances` | `neo4j` | `searchGraph` | `searchNode` | `searchRelation`

Topics

"Determine Dependencies of Services in Network"
"Find Shortest Path Between People in Social Neighborhood"
"Find Friends of Friends in Social Neighborhood"
"Searching Graph Database Using MATLAB Interface to Neo4j" on page 6-10
"Working with the MATLAB Interface to Neo4j" on page 6-8

Introduced in R2016b

mongo

MongoDB connection

Description

The `mongo` function creates a `mongo` object using the Database Toolbox interface for MongoDB. With the object, you can connect to MongoDB stored on one or more database servers.

First, you must install the Database Toolbox interface for MongoDB. For details, see "Database Toolbox Interface for MongoDB Installation" on page 7-19.

Using the `mongo` object, you can manage collections in the database. You can also query documents stored in a collection and import them into the MATLAB workspace. From MATLAB, you can export MATLAB tables, structures, and objects into MongoDB. For details about MongoDB, see the MongoDB Manual.

Creation

Syntax

```
conn = mongo(server,port,dbname)
conn = mongo(server,port,dbname,'UserName',username,'Password',
password)
```

Description

`conn = mongo(server,port,dbname)` creates a MongoDB connection to the database server using a database name and sets the Port property.

`conn = mongo(server,port,dbname,'UserName',username,'Password',
password)` specifies a user name and password for connecting to MongoDB.

Input Arguments

`server` — Server name

string scalar | string array

Server name, specified as a string scalar for one database server name or a string array for multiple database server names.

Example: `"localhost"`

Data Types: `string`

`dbname` — Database name

string scalar

Database name, specified as a string scalar.

Example: `"employeesdb"`

Data Types: `string`

`username` — User name

string scalar

User name, specified as a string scalar. Contact your MongoDB administrator for access credentials.

Example: `"username"`

Data Types: `string`

`password` — Password

string scalar

Password, specified as a string scalar. Contact your MongoDB administrator for access credentials.

Example: `"pwd"`

Data Types: `string`

Properties

`Database` — Database name

character vector

This property is read-only.

Database name, specified as a character vector.

Example: `'databasename'`

Data Types: `char`

`UserName` — User name

character vector

This property is read-only.

User name, specified as a character vector.

Example: `'username'`

Data Types: `char`

`Server` — Server name

cell array of character vectors

This property is read-only.

Server name, specified as a cell array of character vectors. Each character vector in the cell array specifies one database server name.

Example: `{'server1'}`

Data Types: `cell`

`Port` — Port number

numeric scalar | numeric vector

This property is read-only.

Port number, specified as a numeric scalar for one port or a numeric vector for multiple ports.

Example: `27017`

Data Types: `double`

`CollectionNames` — Collection names
cell array of character vectors

This property is read-only.

Collection names of all collections defined in MongoDB, specified as a cell array of character vectors.

Example: `{'airlinesmall', 'employee', 'largedata' ... and 3 more}`

Data Types: `cell`

`TotalDocuments` — Count of documents in all collections
numeric scalar

This property is read-only.

Count of the documents in all collections defined in MongoDB, specified as a numeric scalar.

Data Types: `double`

Object Functions

MongoDB Connection

isopen	Determine if MongoDB connection is open
close	Close MongoDB connection

Import Document Collections into MATLAB

count	Count total number of documents in MongoDB collection
distinct	Retrieve distinct values for field in MongoDB collection
find	Retrieve documents in MongoDB collection

Export and Manage Document Collections in MongoDB

createCollection	Create MongoDB collection
dropCollection	Drop MongoDB collection
insert	Insert one or multiple documents into MongoDB collection

remove	Remove one or multiple documents from MongoDB collection
update	Update one or multiple documents in MongoDB collection

Examples

Create MongoDB Connection

Connect to MongoDB and count the total number of documents in a collection.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Determine the number of documents in the `employee` collection. There are 25 documents in the collection.

```
collection = "employee";
n = count(conn,collection)
```

```
n =

    25
```

Close the MongoDB connection.

```
close(conn)
```

Create MongoDB Connection Using User Name and Password

Connect to MongoDB and count the total number of documents in a collection. Specify a user name and password to connect to the database.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`. Specify the user name `adminuser` and password `matlab`.

```
conn = mongo("dbtb01",27017,"mongotest",'UserName',"adminuser",'Password',"matlab")
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: 'adminuser'
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is `adminuser`.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Check the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Determine the number of documents in the `employee` collection. There are 25 documents in the collection.

```
collection = "employee";
n = count(conn,collection)
```

```
n =

    25
```

Close the MongoDB connection.

```
close(conn)
```

See Also

Topics

“Database Toolbox Interface for MongoDB Installation” on page 7-19

“Import and Analyze Data from MongoDB” on page 7-2
“Import Filtered Data from MongoDB” on page 7-5
“Import Large Data from MongoDB” on page 7-8
“Export MATLAB Data into MongoDB” on page 7-11
“Import and Export MATLAB Objects Using MongoDB” on page 7-15
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

MongoDB Manual

Introduced in R2017b

close

Close MongoDB connection

Syntax

```
close(conn)
```

Description

`close(conn)` closes the MongoDB connection.

Examples

Close MongoDB Connection

Connect to MongoDB and count the total number of documents in a collection.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Determine the number of documents in the `employee` collection. There are 25 documents in the collection.

```
collection = "employee";
n = count(conn,collection)
```

```
n =

    25
```

Close the MongoDB connection.

```
close(conn)
```

Input Arguments

conn — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

See Also

`find` | `isopen` | `mongo`

Topics

“Import and Analyze Data from MongoDB” on page 7-2
“Import Filtered Data from MongoDB” on page 7-5
“Import Large Data from MongoDB” on page 7-8
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

MongoDB Manual

Introduced in R2017b

isopen

Determine if MongoDB connection is open

Syntax

```
i = isopen(conn)
```

Description

`i = isopen(conn)` returns `1` if the MongoDB connection is open and `0` if it is closed.

Examples

Verify MongoDB Connection

Connect to MongoDB and count the total number of documents in a collection.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Determine the number of documents in the `employee` collection. There are 25 documents in the collection.

```
collection = "employee";
n = count(conn,collection)
```

```
n =

    25
```

Close the MongoDB connection.

```
close(conn)
```

Verify the MongoDB connection is closed.

```
isopen(conn)
```

```
ans =

  logical
```

```
0
```

Input Arguments

conn — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

See Also

`close` | `find` | `mongo`

Topics

“Import and Analyze Data from MongoDB” on page 7-2
“Import Filtered Data from MongoDB” on page 7-5
“Import Large Data from MongoDB” on page 7-8
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

MongoDB Manual

Introduced in R2017b

createCollection

Create MongoDB collection

Syntax

```
createCollection(conn,collection)
```

Description

`createCollection(conn,collection)` creates a collection in MongoDB by using the MongoDB connection.

Examples

Create Collection in MongoDB

Connect to MongoDB and create a collection.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create a collection in the database using the MongoDB connection. Specify the collection name `taxidata`.

```
collection = "taxidata";
createCollection(conn,collection)
```

Display the collections in the database by using the `CollectionNames` property. The database contains the new collection `taxidata`.

```
conn.CollectionNames
```

```
ans =

  1×7 cell array

  Columns 1 through 5

    {'airlinesmall'}    {'employee'}    {'largedata'}    {'nyctaxi'}    {'product'}

  Columns 6 through 7
```

```
{'restaurants'}    {'taxidata'}
```

Close the MongoDB connection.

```
close(conn)
```

Input Arguments

`conn` — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

`collection` — Collection name

string scalar

Collection name, specified as a string scalar.

Example: `"taxidata"`

Data Types: `string`

See Also

`close` | `dropCollection` | `find` | `insert` | `isopen` | `mongo`

Topics

“Import and Analyze Data from MongoDB” on page 7-2
“Import Filtered Data from MongoDB” on page 7-5
“Import Large Data from MongoDB” on page 7-8
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

MongoDB Manual

Introduced in R2017b

dropCollection

Drop MongoDB collection

Syntax

```
dropCollection(conn,collection)
```

Description

`dropCollection(conn,collection)` drops an existing collection from MongoDB by using the MongoDB connection.

Examples

Drop Collection from MongoDB

Connect to MongoDB and drop a collection.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Display the collections in the database before dropping a collection by using the `CollectionNames` property.

```
conn.CollectionNames
```

```
ans =

  1×7 cell array

  Columns 1 through 5

    {'airlinesmall'}    {'employee'}    {'largedata'}    {'nyctaxi'}    {'product'}

  Columns 6 through 7

    {'restaurants'}    {'taxidata'}
```

Drop an existing collection from the database by using the MongoDB connection. Specify the collection name `taxidata`.

```
collection = "taxidata";
dropCollection(conn,collection)
```

Display the collections in the database again by using the `CollectionNames` property. The database no longer contains the collection `taxidata`.

```
conn.CollectionNames
```

```
ans =

  1×7 cell array

  Columns 1 through 5

    {'airlinesmall'}    {'employee'}    {'largedata'}    {'nyctaxi'}    {'product'}

  Columns 6

    {'restaurants'}
```

Close the MongoDB connection.

```
close(conn)
```

Input Arguments

`conn` — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

`collection` — Collection name

string scalar

Collection name, specified as a string scalar.

Example: `"taxidata"`

Data Types: `string`

See Also

`close` | `createCollection` | `find` | `isopen` | `mongo`

Topics

“Import and Analyze Data from MongoDB” on page 7-2
“Import Filtered Data from MongoDB” on page 7-5
“Import Large Data from MongoDB” on page 7-8
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

External Websites

MongoDB Manual

Introduced in R2017b

count

Count total number of documents in MongoDB collection

Syntax

```
n = count(conn,collection)
n = count(conn,collection,'Query',mongoquery)
```

Description

`n = count(conn,collection)` returns the total number of documents in a collection by using the MongoDB connection.

`n = count(conn,collection,'Query',mongoquery)` returns the total number of documents in an executed MongoDB query on a collection.

Examples

Count Documents in Collection

Connect to MongoDB and count the total number of documents in a collection.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
```

```
               Server: {'dbtb01'}
                 Port: 27017
      CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
       TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Determine the number of documents in the `employee` collection. There are 25 documents in the collection.

```
collection = "employee";
n = count(conn,collection)
```

```
n =

    25
```

Close the MongoDB connection.

```
close(conn)
```

Count Documents in MongoDB Query

Connect to MongoDB and count the total number of documents in a MongoDB query on a collection in the database. Here, each document in the collection represents an employee.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create a JSON-style query as a character vector that contains a JSON-style string. This query sets the `department` field equal to the value `Sales`.

```
mongoquery = '{"department":"Sales"}';
```

Use the MongoDB query on the `employee` collection to count the total number of employees who work in the Sales department. A total of four employees work in the Sales department.

```
collection = "employee";
n = count(conn,collection,'Query',mongoquery)
```

```
n =

     4
```

Close the MongoDB connection.

```
close(conn)
```

Input Arguments

`conn` — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

`collection` — Collection name

string scalar

Collection name, specified as a string scalar.

Example: `"taxidata"`

Data Types: `string`

`mongoquery` — MongoDB query

string scalar | character vector

MongoDB query, specified as a string scalar or character vector. Specify a JSON-style string to query the database.

Example: `'{"department":"Sales"}'` queries the database for documents where the `department` field is equal to `Sales`.

Example: `'{salary: {$gt: 90000}}'` queries the database for documents where the value of the `salary` field is greater than `90000`.

Data Types: `char` | `string`

Output Arguments

n — Total number of documents

numeric scalar

Total number of documents in a MongoDB collection or query, returned as a numeric scalar.

See Also

`close` | `distinct` | `find` | `isopen` | `mongo`

Topics

“Import and Analyze Data from MongoDB” on page 7-2
“Import Filtered Data from MongoDB” on page 7-5
“Import Large Data from MongoDB” on page 7-8
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

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MongoDB Manual

Introduced in R2017b

distinct

Retrieve distinct values for field in MongoDB collection

Syntax

```
values = distinct(conn,collection,field)
values = distinct(conn,collection,field,'Query',mongoquery)
```

Description

`values = distinct(conn,collection,field)` returns distinct values for a field in a collection by using the MongoDB connection.

`values = distinct(conn,collection,field,'Query',mongoquery)` returns distinct values for a field in an executed MongoDB query on a collection.

Examples

Retrieve Distinct Values for Field in Collection

Connect to MongoDB and retrieve a distinct set of values for a field in a collection of documents. Here, each document in the collection represents an employee.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:
```

```
            Database: 'mongotest'
            UserName: ''
              Server: {'dbtb01'}
                Port: 27017
     CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
      TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Retrieve a distinct set of values for a field in a document collection. Here, retrieve distinct salaries for all employees. `values` is a cell array of doubles.

```
collection = "employee";
field = "salary";
values = distinct(conn,collection,field);
```

Display the first three salaries in the cell array.

```
values{1:3}
```

```
ans =
```

```
        60000

ans =

        50000

ans =

        55000
```

Close the MongoDB connection.

```
close(conn)
```

Retrieve Distinct Values for Field in MongoDB Query

Connect to MongoDB and retrieve a distinct set of values for a field in a MongoDB query. Here, each document in the collection represents an employee.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.

- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create a JSON-style query as a character vector that contains a JSON-style string. This query sets the `department` field equal to the value `Sales`.

```
mongoquery = '{"department":"Sales"}';
```

Use the MongoDB query on the `employee` collection to retrieve a distinct set of values for a field. Here, retrieve distinct salaries of all employees in the Sales department. `values` is a cell array of doubles.

```
collection = "employee";
field = "salary";
values = distinct(conn,collection,field,'Query',mongoquery)
```

```
values =

  1×3 cell array

    {[60000]}    {[64440]}    {[66000]}
```

Close the MongoDB connection.

```
close(conn)
```

Input Arguments

`conn` — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

`collection` — Collection name

string scalar

Collection name, specified as a string scalar.

Example: `"taxidata"`

Data Types: `string`

`field` — Field

string scalar

Field in a collection, specified as a string scalar.

Example: `"department"`

Data Types: `string`

`mongoquery` — MongoDB query

string scalar | character vector

MongoDB query, specified as a string scalar or character vector. Specify a JSON-style string to query the database.

Example: `'{"department":"Sales"}'` queries the database for documents where the `department` field is equal to `Sales`.

Example: `'{salary: {$gt: 90000}}'` queries the database for documents where the value of the `salary` field is greater than `90000`.

Data Types: `char` | `string`

Output Arguments

`values` — Distinct values
cell array

Distinct values of a field in a MongoDB collection or query, specified as a cell array. The cell array can contain numeric scalars for numeric data, character vectors for text data, and structures for nested documents.

See Also

`close` | `count` | `find` | `isopen` | `mongo`

Topics

“Import and Analyze Data from MongoDB” on page 7-2
“Import Filtered Data from MongoDB” on page 7-5
“Import Large Data from MongoDB” on page 7-8
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

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Introduced in R2017b

find

Retrieve documents in MongoDB collection

Syntax

```
documents = find(conn,collection)
documents = find(conn,collection,Name,Value)
```

Description

`documents = find(conn,collection)` returns all documents in a collection by using the MongoDB connection.

`documents = find(conn,collection,Name,Value)` specifies additional options using one or more name-value pair arguments. For example, `'Limit',10` limits the number of documents returned to 10.

Examples

Retrieve All Documents in Collection

Connect to MongoDB, retrieve all documents in a collection, and import them into MATLAB. Here, each document in the collection represents an employee.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:
```

```
            Database: 'mongotest'
            UserName: ''
              Server: {'dbtb01'}
                Port: 27017
    CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
     TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Specify the `employee` collection for document retrieval. Retrieve all documents in the collection by using the MongoDB connection. `documents` is a structure array.

```
collection = "employee";
documents = find(conn,collection);
```

Display the first document in the collection. Each document is a structure with these fields.

Field	Description	Data Type
`x_id`	Unique identifier	Structure

Field	Description	Data Type
department	Department name	Character vector
employee	Employee identifier	Double
salary	Employee salary	Double

```
documents(1)
```

```
ans =

  struct with fields:

          x_id: [1×1 struct]
    department: 'Sales'
      employee: 1
        salary: 60000
```

Close the MongoDB connection.

```
close(conn)
```

Retrieve All Documents in MongoDB Query

Connect to MongoDB, retrieve all documents in a MongoDB query on a collection in the database, and import them into MATLAB. Here, each document in the collection represents an employee.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Specify the `employee` collection for document retrieval. Create the MongoDB query as a character vector that contains a JSON-style string. This query retrieves all employees in the Sales department.

```
collection = "employee";
mongoquery = '{"department":"Sales"}';
```

Retrieve all documents in the MongoDB query on the `employee` collection by using the MongoDB connection. `documents` is a structure array that contains a structure for each document returned by the query.

```
documents = find(conn,collection,'Query',mongoquery);
```

Close the MongoDB connection.

```
close(conn)
```

Sort Retrieved Documents in Collection

Connect to MongoDB and retrieve documents in a MongoDB query on a collection in the database. Then, sort the results by a field in the documents. Here, each document in the collection represents an employee.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Specify the `employee` collection for document retrieval. Create the MongoDB query as a character vector that contains a JSON-style string. This query retrieves all employees in the Sales department.

```
collection = "employee";
mongoquery = '{"department":"Sales"}';
```

Create the sort query as a character vector that contains a JSON-style string. Sort the documents by the `salary` field.

```
sortquery = '{"salary":1.0}';
```

Retrieve all documents in the MongoDB query on the `employee` collection by using the MongoDB connection, and sort the documents. `documents` is a structure array that contains a structure for each document returned by the query. The documents are sorted by salary in increasing order.

```
documents = find(conn,collection,'Query',mongoquery,'Sort',sortquery);
```

Display the sorted salaries for the first two employees.

```
documents(1:2).salary
```

```
ans =

       60000


ans =

       64440
```

Close the MongoDB connection.

```
close(conn)
```

Retrieve Specific Fields in Collection

Connect to MongoDB and retrieve all documents in a collection. Specify the fields to retrieve for each document. Import the documents into MATLAB. Here, each document in the collection represents an employee.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Specify the `employee` collection for document retrieval. Specify the fields to retrieve for each document by using a character vector that contains a JSON-style string. Here, return the `department` and `salary` fields.

```
collection = "employee";
fields = '{"department":1.0,"salary":1.0}';
```

Retrieve all documents in the collection. Use the name-value pair argument `'Projection'` to retrieve the specified fields for each document. `documents` is a structure array.

```
documents = find(conn,collection,'Projection',fields);
```

Display the first document in the results. In addition to the unique identifier for the document, the document contains only the specified fields, `department` and `salary`.

```
documents(1)
```

```
ans =

  struct with fields:

          x_id: [1×1 struct]
    department: 'Sales'
        salary: 60000
```

Close the MongoDB connection.

```
close(conn)
```

Retrieve Specific Number of Documents Using Offset

Connect to MongoDB and retrieve a specific number of documents in a collection in the database. Return documents from a specific position in the results using an offset value. Import the documents into MATLAB. Here, each document in the collection represents an employee.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Specify the `employee` collection for document retrieval.

```
collection = "employee";
```

Use the name-value pair argument `'Skip'` to skip the first five documents in the collection. Then, use the name-value pair argument `'Limit'` to return the next 10 documents in the collection. `documents` is structure array that contains 10 documents.

```
documents = find(conn,collection,'Skip',5,'Limit',10);
```

Close the MongoDB connection.

```
close(conn)
```

Input Arguments

`conn` — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

`collection` — Collection name

string scalar

Collection name, specified as a string scalar.

Example: `"taxidata"`

Data Types: `string`

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `'Skip',5,'Limit',10` skips the first five documents in a collection and returns the next 10 documents.

`Query` — MongoDB query

string scalar | character vector

MongoDB query, specified as the comma-separated pair consisting of `'Query'` and a string scalar or character vector. Specify a JSON-style string to query the database.

Example: `'Query','{"department":"Sales"}'` queries the database for documents where the `department` field is equal to `Sales`.

Example: `'Query','{salary: {$gt: 90000}}'` queries the database for documents where the value of the `salary` field is greater than `90000`.

Example: `'Query','{"_id":{$oid:"593fec95b78dc311e01e9204"}}'` queries the database for the document that has the identifier `593fec95b78dc311e01e9204`.

Data Types: `char` | `string`

`Projection` — Fields
string scalar | character vector

Fields to retrieve in each document, specified as the comma-separated pair consisting of `'Projection'` and a string scalar or character vector. Specify a JSON-style string to describe the fields.

Example: `'Projection','{"department":1.0,"salary":1.0}'` returns the `department` and `salary` fields.

Data Types: `char` | `string`

`Sort` — Sort field
string scalar | character vector

Sort field for documents, specified as the comma-separated pair consisting of `'Sort'` and a string scalar or character vector. Specify a JSON-style string to describe the sort field.

Example: `'Sort','{"department":1.0}'` sorts the returned documents by the `department` field.

Data Types: `char` | `string`

`Skip` — Offset
numeric scalar

Offset from the beginning of the returned documents, specified as the comma-separated pair consisting of `'Skip'` and a numeric scalar.

Example: `'Skip',5` skips the first five returned documents.

Data Types: `double`

`Limit` — Number of documents to return
numeric scalar

Number of documents to return, specified as the comma-separated pair consisting of `'Limit'` and a numeric scalar.

Example: `'Limit',10` returns 10 documents.

Data Types: `double`

Output Arguments

`documents` — Documents
structure | structure array | cell array of structures

Documents in a MongoDB collection or query on a collection, returned as a structure, structure array, or cell array of structures.

Each JSON-style document is represented as a structure. The `find` function returns a:

- Structure for one document
- Structure array for multiple documents containing the same fields
- Cell array of structures for multiple documents containing different fields

Tips

- The `find` function estimates memory requirements when retrieving many documents using the Java heap. To avoid out-of-memory issues, the function automatically limits the number of returned documents in a single execution.

  When an issue occurs, the function throws a warning message, for example, `Warning: Available memory is less than Total memory required. Limiting the RESULTSET from 15837001 to 59248. Use Skip and Limit to retrieve resultset in batches.`

  To retrieve many documents, retrieve them in batches. For an example, see “Import Large Data from MongoDB” on page 7-8.

See Also

`close` | `insert` | `isopen` | `mongo` | `remove` | `update`

Topics

“Import and Analyze Data from MongoDB” on page 7-2
“Import Filtered Data from MongoDB” on page 7-5
“Import Large Data from MongoDB” on page 7-8
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

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Introduced in R2017b

insert

Insert one or multiple documents into MongoDB collection

Syntax

```
n = insert(conn,collection,documents)
```

Description

`n = insert(conn,collection,documents)` returns the number of documents inserted into a collection using the MongoDB connection. Specify one or multiple documents to insert.

Examples

Insert One Document into Collection as Structure

Connect to MongoDB and export one document from MATLAB and insert it into a collection. Specify the document to insert as a structure. Here, the collection represents employee data.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
```

```
            Port: 27017
CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
 TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create one document as the `document` structure with these fields: `employee`, `department`, and `salary`.

```
document.employee = 28;
document.department = 'Sales';
document.salary = 200000;
```

Specify the `employee` collection. Insert the document into the collection by using the MongoDB connection. The `insert` function inserts one document into the collection.

```
collection = "employee";
n = insert(conn,collection,document)
```

```
n =

     1
```

Close the MongoDB connection.

```
close(conn)
```

Insert Multiple Documents into Collection as Structure Array

Connect to MongoDB and export multiple documents from MATLAB and insert them into a collection. Specify documents to insert as a structure array. Here, the collection represents employee data.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.

- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create two documents as structures with these fields: `employee`, `department`, and `salary`. Create the `documents` structure array from these documents.

```
employee1.employee = 26;
employee1.department = 'Sales';
employee1.salary = 100000;

employee2.employee = 27;
employee2.department = 'Training';
employee2.salary = 150000;

documents = [employee1 employee2];
```

Specify the `employee` collection. Insert documents into the collection using the MongoDB connection. The `insert` function inserts two documents into the collection.

```
collection = "employee";
n = insert(conn,collection,documents)
```

```
n =

     2
```

Close the MongoDB connection.

```
close(conn)
```

Insert Multiple Documents into Collection as Table

Connect to MongoDB and export documents from MATLAB and insert them into a collection. Specify documents to insert as a table. Here, the collection represents employee data.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create two documents using these workspace variables:

- `employee` — Double array
- `department` — Cell array of character vectors
- `salary` — Double array

Create the `documents` table from these workspace variables.

```
employee = [26;27];
department = {'Sales';'Training'};
salary = [100000;150000];
documents = table(department,employee,salary);
```

Specify the `employee` collection. Insert documents into the collection using the MongoDB connection. The `insert` function inserts two documents into the collection.

```
collection = "employee";
n = insert(conn,collection,documents)
```

```
n =

     2
```

Close the MongoDB connection.

```
close(conn)
```

Insert Multiple Documents into Collection as Cell Array of Structures

Connect to MongoDB and export documents from MATLAB and insert them into a collection. Specify documents to insert as a cell array of structures. Here, the collection represents employee data.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
```

```
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create two documents as the structures `employee1` and `employee2`. Create the `documents` cell array using these structures.

```
employee1.department = 'Sales';
employee1.employee = 26;
employee1.salary = 100000;
```

```
employee2.department = 'Training';
employee2.employee = 27;
employee2.salary = 150000;

documents = {employee1;employee2};
```

Specify the `employee` collection. Insert documents into the collection using the MongoDB connection. The `insert` function inserts two documents into the collection.

```
collection = "employee";
n = insert(conn,collection,documents)
```

```
n =

     2
```

Close the MongoDB connection.

```
close(conn)
```

Insert `Map` Object into Collection

Connect to MongoDB and export a `Map` object from MATLAB and insert it into a collection. Here, the collection represents employee data.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)

ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Construct a `Map` object `document` that contains an employee's payroll data for the first three months of the year.

```
months = {'January','February','March'};
payslips = [4500,5000,4500];
document = containers.Map(months,payslips);
```

Specify the `employee` collection. Insert the `Map` object into the collection using the MongoDB connection. The `insert` function inserts one document into the collection.

```
collection = "employee";
n = insert(conn,collection,document)

n =

     1
```

Close the MongoDB connection.

```
close(conn)
```

Input Arguments

`conn` — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

`collection` — Collection name

string scalar

Collection name, specified as a string scalar.

Example: `"taxidata"`

Data Types: `string`

`documents` — Documents to insert

string scalar | character vector | structure | ...

Documents to insert into a MongoDB collection, specified as one of these types:

- String scalar
- Character vector
- Structure
- Structure array
- Cell array of structures
- Table
- `Map` object
- Handle or value classes

When working with string scalars and character vectors, you specify key-value pairs as shown in these examples.

- String scalar — `"{'department':'Sales','employeename':'George Mason'}"`
- Character vector — `'{''department'':''Sales'',''employeename'':''George Mason''}'`

For handle and value classes, you can define your own class. After you instantiate a class, you can insert the resulting object into MongoDB. However, the resulting object properties must contain data types that can be converted to MATLAB data types. For example, if one of the object properties is a Java object, then you cannot insert the object into MongoDB. For details about these classes, see “Handle Classes” (MATLAB).

Output Arguments

`n` — Number of documents inserted

numeric scalar

Number of documents inserted into a collection in the database, returned as a numeric scalar.

See Also

`close` | `containers.Map` | `isopen` | `mongo` | `remove` | `update`

Topics

“Export MATLAB Data into MongoDB” on page 7-11
“Import and Export MATLAB Objects Using MongoDB” on page 7-15
“Import and Analyze Data from MongoDB” on page 7-2
“Import Filtered Data from MongoDB” on page 7-5
“Import Large Data from MongoDB” on page 7-8
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

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Introduced in R2017b

remove

Remove one or multiple documents from MongoDB collection

Syntax

```
n = remove(conn,collection,mongoquery)
```

Description

`n = remove(conn,collection,mongoquery)` returns the number of documents removed from a collection using the MongoDB connection. Use a MongoDB query to specify removing one or multiple documents.

Examples

Remove Documents Using MongoDB Query

Connect to MongoDB and remove documents from a collection. Specify a MongoDB query to determine which documents to remove. Here, the collection represents employee data.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

             Database: 'mongotest'
             UserName: ''
               Server: {'dbtb01'}
                 Port: 27017
```

```
    CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
     TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Create a MongoDB query to identify documents to remove. Here, specify the `employee` collection. Create the MongoDB query to identify documents in the Sales department.

```
collection = "employee";
mongoquery = '{"department":"Sales"}';
```

Remove documents using the MongoDB query. The `remove` function removes six documents from the collection.

```
n = remove(conn,collection,mongoquery)
```

```
n =

     6
```

Close the MongoDB connection.

```
close(conn)
```

Remove All Documents from Collection

Connect to MongoDB and remove all documents from a collection.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
                  Port: 27017
       CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
        TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical
```

```
    1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Remove all documents from the `employee` collection. Use an empty MongoDB query to specify removing all documents. The `remove` function removes three documents from the collection.

```
collection = "employee";
n = remove(conn,collection,"{}")

n =

     3
```

Close the MongoDB connection.

```
close(conn)
```

Input Arguments

`conn` — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

`collection` — Collection name

string scalar

Collection name, specified as a string scalar.

Example: `"taxidata"`

Data Types: `string`

`mongoquery` — MongoDB query

string scalar | character vector

MongoDB query, specified as a string scalar or character vector. Specify a JSON-style string to query the database.

Example: `'{"department":"Sales"}'` queries the database for documents where the `department` field is equal to `Sales`.

Example: `'{salary: {$gt: 90000}}'` queries the database for documents where the value of the `salary` field is greater than `90000`.

Data Types: `char` | `string`

Output Arguments

`n` — Number of documents removed

numeric scalar

Number of documents removed from a collection in the database, returned as a numeric scalar.

See Also

`close` | `insert` | `isopen` | `mongo` | `update`

Topics

"Export MATLAB Data into MongoDB" on page 7-11
"Import and Export MATLAB Objects Using MongoDB" on page 7-15
"Database Toolbox Interface for MongoDB Error Messages" on page 7-21

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Introduced in R2017b

update

Update one or multiple documents in MongoDB collection

Syntax

```
n = update(conn,collection,findquery,updatequery)
```

Description

`n = update(conn,collection,findquery,updatequery)` returns the number of documents updated in a collection using the MongoDB connection. Use MongoDB queries to find and update documents.

Examples

Update Documents in Collection

Connect to MongoDB and update documents in a collection. Find documents to update by using a MongoDB query. Specify the criteria for the update by using a MongoDB query. Here, the collection represents employee data.

Create a MongoDB connection to the database `mongotest`. Here, the database server `dbtb01` hosts this database using port number `27017`.

```
server = "dbtb01";
port = 27017;
dbname = "mongotest";
conn = mongo(server,port,dbname)
```

```
conn =

  mongo with properties:

              Database: 'mongotest'
              UserName: ''
                Server: {'dbtb01'}
```

```
                Port: 27017
      CollectionNames: {'airlinesmall', 'employee', 'largedata' ... and 3 more}
       TotalDocuments: 23485919
```

`conn` is the `mongo` object that contains the MongoDB connection. The object properties contain information about the connection and the database.

- The database name is `mongotest`.
- The user name is blank.
- The database server is `dbtb01`.
- The port number is `27017`.
- This database contains six document collections. The first three collection names are `airlinesmall`, `employee`, and `largedata`.
- This database contains 23,485,919 documents.

Verify the MongoDB connection.

```
isopen(conn)
```

```
ans =

  logical

   1
```

The database connection is successful because the `isopen` function returns `1`. Otherwise, the database connection is closed.

Specify the `employee` collection. Create a MongoDB query to find employees in the Sales department. Then, create a MongoDB query to increase the value in the `salary` field by 5000.

```
collection = "employee";
findquery = '{"department":"Sales"}';
updatequery = '{$inc:{"salary":5000}}';
```

Increase the salaries for all employees in the Sales department using the MongoDB connection. The `update` function updates seven documents in the collection.

```
n = update(conn,collection,findquery,updatequery)
```

```
n =

     7
```

Close the MongoDB connection.

```
close(conn)
```

Input Arguments

`conn` — MongoDB connection

`mongo` object

MongoDB connection, specified as a `mongo` object.

`collection` — Collection name

string scalar

Collection name, specified as a string scalar.

Example: `"taxidata"`

Data Types: `string`

`findquery` — MongoDB find query

string scalar | character vector

MongoDB find query, specified as a string scalar or character vector. Specify a JSON-style string to find documents in the database.

Example: `'{"department":"Sales"}'` finds all documents where the `department` field is equal to `Sales`.

Example: `'{"_id":{$oid:"593fec95b78dc311e01e9204"}}'` finds the document that has the identifier `593fec95b78dc311e01e9204`.

Data Types: `char` | `string`

`updatequery` — MongoDB update query

string scalar | character vector

MongoDB update query, specified as a string scalar or character vector. Use a JSON-style string to specify the criteria for the update.

Example: `'{$inc:{"salary":5000}}'` increases the values in the `salary` field by `5000`.

Data Types: `char` | `string`

Output Arguments

`n` — Number of documents updated

numeric scalar

Number of documents updated in a collection in the database, returned as a numeric scalar.

See Also

`close` | `insert` | `isopen` | `mongo` | `remove`

Topics

“Export MATLAB Data into MongoDB” on page 7-11
“Import and Export MATLAB Objects Using MongoDB” on page 7-15
“Database Toolbox Interface for MongoDB Error Messages” on page 7-21

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