

MATLAB[®] Web Server

For Use with MATLAB[®]

- Computation
- Visualization
- Programming

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MATLAB Web Server

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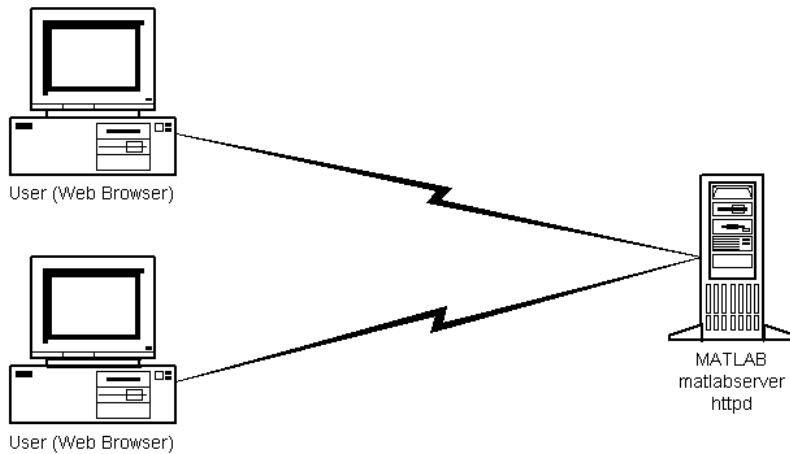
Considerations for graphics display

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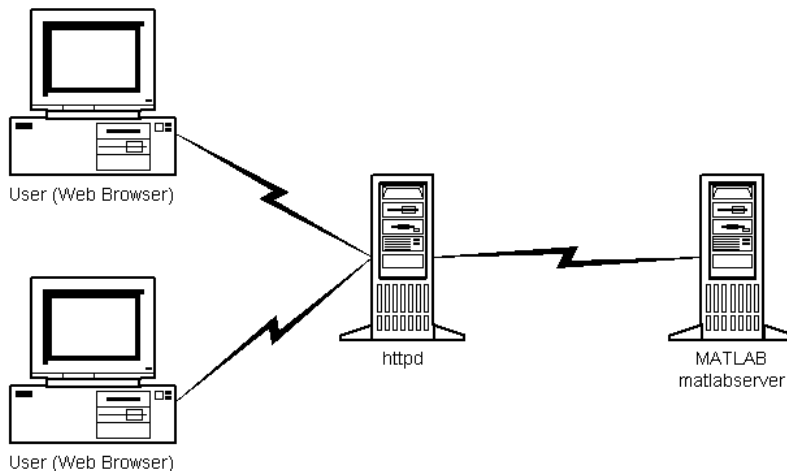
MATLAB Web Server Environment

The MATLAB[®] Web Server enables you to create MATLAB applications that use the capabilities of the World Wide Web to send data to MATLAB for computation and to display the results in a Web browser. The MATLAB Web Server depends upon TCP/IP networking for transmission of data between the client system and MATLAB. The required networking software and hardware must be installed on your system prior to using the MATLAB Web Server.

In the simplest configuration, a Web browser runs on your client workstation, while MATLAB, the MATLAB Web Server (`matlabserver`), and the Web server daemon (`httpd`) run on another machine.



In a more complex network, the Web server daemon can run on a machine apart from the others.



Building MATLAB Web Server Applications

MATLAB Web Server applications are a combination of M-files, Hypertext Markup Language (HTML), and graphics. Knowledge of MATLAB programming and basic HTML are the only requirements.

The application development process requires a small number of simple steps:

- 1** Create the HTML documents for collection of the input data from users and display of output. You can code the input documents using a text editor to input HTML directly, or you can use one of the commercially available HTML authoring systems, such as Front Page from Microsoft, PageMill from Adobe, or HoTMetaL from SoftQuad.
- 2** List the application name and associated configuration data in the configuration file `matweb.conf`. (See “`matweb.conf`” for a description of this file.)

- 3** Write a MATLAB M-file that:
 - a** Receives the data entered in the HTML input form.
 - b** Analyzes the data and generates any requested graphics.
 - c** Places the output data into a MATLAB structure.
 - d** Calls `htmlrep` to place the output data into an HTML output document template. (See `htmlrep` for a description of this process.) The maximum amount of HTML data you can receive from MATLAB is 256 KB.

Product Requirements

The MATLAB Web Server has the same supporting hardware and software requirements as MATLAB itself, except for memory required. MATLAB hardware and software requirements are documented in the MATLAB Installation Guide for your computer.

Memory requirements while running the MATLAB Web Server vary with the number of MATLABs configured. Each MATLAB running under the MATLAB Web Server consumes 256 KB of memory.

The MATLAB Web Server requires that TCP/IP networking software must be installed on your computer.

Web Requirements

Web Browsers

To submit input to and receive output from the MATLAB Web Server, you must install a Web browser suitable for your platform. Current versions of the MATLAB Web Server have been tested with Netscape Communicator Release 4.7 and Microsoft Internet Explorer 5.0. Earlier browser releases will probably also work but have not been tested.

The MathWorks does not redistribute these products. You can obtain them directly from the companies that developed them. You can find additional information at <http://www.netscape.com> or <http://www.microsoft.com>.

Web Server

You need to install Web server software (HTTPD or similar) on the system where MATLAB is running or on a machine that has network access to the machine where MATLAB is running. There are numerous sources for obtaining this software, including:

- Pre-installed Microsoft Peer Networking Services on your PC
- Netscape Enterprise Server, available by purchase from Netscape Communications, Inc.
- Free distribution over the Internet (Apache: <http://www.apache.org>)

The Web server software must be capable of running Common Gateway Interface (CGI) programs.

Installation

Availability

The MATLAB Web Server is available on UNIX (Solaris) workstations and IBM PC compatible computers running Microsoft Windows NT or Linux.

Installation Procedure

To install the MATLAB Web Server, follow the normal MATLAB installation procedure for your platform, as documented in the *MATLAB Installation Guide for PC* and the *MATLAB Installation Guide for UNIX*. The MATLAB Web Server appears as one of the installation choices you can select as you proceed through the installation screens.

General Post-Installation Procedures

After installing MATLAB and the MATLAB Web Server, you must perform a number of steps that regulate communication between MATLAB and your Web browser.

Note Throughout this document the notation `<matlab>` represents the MATLAB root directory, the directory where MATLAB is installed on your system. For notational consistency in UNIX command syntax, the notation `$MATLAB` is used to represent the MATLAB root directory.

Note in particular:

- 1 To get the demonstration programs discussed in this chapter to work, you need to create a `matweb.conf` file in the `<matlab>/toolbox/webserver/wsdemos` directory. The `Readme` file shows the format for `matweb.conf`. Replace the notation `<matlab>` with the name of the root directory where you installed MATLAB. Use the `matlabroot` command to determine this directory. Also, replace `matlabserver_host_name` with the TCP/IP hostname for your machine.
- 2 The installation procedure creates the file `matlabserver.conf` in the `<matlab>/webserver` directory. The file contains the notation

-m 1

This number represents the number of MATLABs that can run concurrently. After testing that everything is working properly, you can change this number to something more convenient. On Windows NT edit `matlabserver.conf` directly with a text editor.

Note To see any changes made to `matlabserver.conf`, you need to stop and restart the MATLAB Web Server. See the section “Understanding `matlabserver`” on page 3-5 for more information on `matlabserver.conf`.

On Solaris/Linux use the `webconf` script to initialize the `matlabserver.conf` file. Then edit this file to change options further, particularly those that `webconf` cannot set on the command line.

- 3 Follow the directions provided by your Web server (`httpd`) to create the needed aliases:
 - a The home or default directory
 - b `/cgi-bin`
 - c `/icons`

Point each of these aliases to `<matlab>/toolbox/webserver/wsdemos` to get the demonstration programs to work.

If your application creates graphic (`jpeg`) files, you need to provide a location where MATLAB can write these for `httpd` access, e.g, `/icons`. The `mldir` entry associated with each application in the `matweb.conf` file indicates the location to MATLAB.

If you do not have permission to set up or change these aliases, you must place copies of some files in locations where the `httpd` can find them.

- Copy `matweb` (`matweb.exe` on Windows NT), found in `<matlab>/webserver/bin/arch`, to the directory aliased by `/cgi-bin` or equivalent. The supported architectures are Windows NT (`win32`), Solaris (`so12`), and Linux (`glnx86`).

- Copy `matweb.conf` in `<matlab>/toolbox/webserver/wsdemos` to the directory aliased by `/cgi-bin` or equivalent.
- Copy all demo HTML files in `<matlab>/toolbox/webserver/wsdemos` to the directory where the `httpd` keeps all HTML files (often referred to as the *home* or *default* alias).

Note that when aliases are different from those provided in the demo HTML files, you will have to make the corresponding changes in those HTML files. For example, if you use the Apache Web Server (<http://www.apache.org>), the aliases listed above are called:

- a** `DocumentRoot`
- b** `ScriptAlias /cgi-bin/`
- c** `Alias /icons/`

You edit these in the `conf/http.conf` file in the main Apache directory. Note that any alias with a trailing `'/'`, such as `'/icons/'`, *must* have a trailing slash in its value, e.g.,

```
Alias /icons/ "/local/matlab/toolbox/webserver/wsdemos/".
```

Solaris/Linux Post-Installation Procedures

The MATLAB Web Server installation procedure places five scripts into the `<matlab>/webserver` directory:

- `webconf`: Builds `matlabserver` configuration file (`matlabserver.conf`). See Chapter 3, “Inside the MATLAB Web Server”, for a discussion of `matlabserver` and the `matlabserver.conf` file. Use this script to specify the number of simultaneous MATLABs to run, the nondefault TCP/IP port, and other variables.
- `webstart`: Stops and restarts `matlabserver` via calls to `webdown` and `webboot`. These three scripts must all reside in the same directory.
- `webdown`: Stops running `matlabserver`.
- `webboot`: Starts `matlabserver`.
- `webstat`: Displays `matlabserver` status information.

Enter the command

```
script_name -h
```

at the command prompt to see detailed information about a specific script.

After completing the MATLAB and MATLAB Web Server installation process, run the `webconf` script to generate the `matlabserver.conf` file. Then run `webstart` to start `matlabserver`. Run `webdown` at any time to stop `matlabserver` execution.

Automatic Startup at System Boot

- 1 To start `matlabserver` automatically at system boot, create the following links and file while logged in as root (superuser).

```
ln -s $MATLAB/webserver/webboot /etc/webboot$WEBSERVER_MARKER
ln -s $MATLAB/webserver/webdown /etc/webdown$WEBSERVER_MARKER
```

`$WEBSERVER_MARKER` is a marker string that uniquely identifies this release of the MATLAB Web Server. It is defined in the `matlabserver.conf` file. (See “`matlabserver.conf`” on page 3-5.) The default is `_TMW$RELEASE`, where `$RELEASE` is a string like `'R12'`, also set in `matlabserver.conf`.

Note Add the `-c` configuration file option to `webboot` and `webdown` if the `matlabserver.conf` file is not in `<matlab>/webserver` or in the directory where the script is located. For example: `webboot -c $CONFIGURATION_FILE`. `$CONFIGURATION_FILE` is the path to the file `matlabserver.conf`.

- 2 In the directory `$MATLAB/webserver` are two initialization scripts:

- `rc.web.sol2` (Solaris)
- `rc.web.glnx86` (Linux)

Solaris users should copy the script as shown below.

```
cp $MATLAB/webserver/rc.web.sol2 /etc/init.d/webserver
```

Linux users should copy the appropriate script as shown below.

```
cp $MATLAB/webserver/rc.web.glnx86 /etc/init.d/webserver (Debian)
cp $MATLAB/webserver/rc.web.glnx86 /etc/rc.d/init.d/webserver
(Red Hat)
```

- 3** Open the copied file in a text editor and follow the directions for modifying the file. Save and close the file when you are done.

- 4** *Solaris* users should create a link in the rc directory associated with run level 3.

```
cd /etc/rc3.d; ln -s ../init.d/webserver S20webserver
```

Linux users should look in `/etc/inittab` for the default run level. Create a link in the rc directory associated with that run level. For example, if it is 5

```
cd /etc/rc5.d; ln -s ../init.d/webserver S95webserver (Debian)
cd /etc/rc.d/rc5.d; ln -s init.d/webserver S95webserver (Red Hat)
```

- 5** You can test the changes you have made without rebooting your system. To start the MATLAB Web Server on *Solaris*, enter

```
cd /etc/init.d
./webserver start
```

On *Linux*, enter

```
cd /etc/init.d (Debian)
cd /etc/rc.d/init.d (Red Hat)
./webserver start
```

- 6** To check that the MATLAB Web Server is operational on any system, enter

```
cd $MATLAB/webserver
webstat -c $CONFIGURATION_FILE
```

`$CONFIGURATION_FILE` is the path to the file `matlabserver.conf`.

Windows NT Post-Installation Procedures

After installation, you must reboot your machine to start **MATLAB Server** as a Windows NT service. The service starts automatically at system boot.

Startup Sequence

If you install a new version of MATLAB and the MATLAB Web Server, start MATLAB before starting Web Server. MATLAB performs some system updates required for successful Web Server operation.

Deinstallation

To remove **MATLAB Server** from the Windows NT Registry, open a command prompt (MS-DOS) window. Enter the command sequence

```
cd <matlab>/webserver/bin/win32
matlabserver -remove
```

Graphics Display

We recommend that Solaris/Linux users use Virtual Network Computing (VNC) for their X display. VNC can be used even on systems where there is no hardware frame buffer. It is easy to use, can be easily started with the boot scripts, provides complete user control, and has good performance. For information about use of the VNC software with the MATLAB Web Server, see:

- “Downloading and Installing VNC” on page 1-12.
- “Starting and Stopping VNC” on page 1-13.
- “Using VNC with the MATLAB Web Server” on page 1-14.

The VNC software requires installation of Perl. Both VNC and Perl are available in binary form over the Web for free distribution.

Linux users should find Perl already installed on their systems.

Solaris users need to download the Perl distribution and decompress it with the `zcat` version of the `gunzip` utility. This utility is found in `$/MATLAB/webserver/bin/sol2/zcat`. Read “Downloading and Installing Perl” on page 1-13 for directions.

Downloading and Installing VNC

The VNC software is available at the Web site

`http://www.uk.research.att.com/vnc/download.html`

Select the latest distribution for either or both of the UNIX platforms

Linux 2.x for x86 (for `glnx86`)

Solaris 2.5 (SPARC) (for Solaris2; it should work on 2.6 and higher)

and download the software. To decompress run

```
zcat file | tar -xvf -
```

where *file* is either a `.tgz` file on `glnx86` or a `.Z` file on Solaris.

The file directory created contains a README file that discusses how to install the software. The directory contains four files

```
vncviewer
vncserver
vncpasswd
Xvnc
```

that should be copied to a standard directory on your UNIX path.

Downloading and Installing Perl

The Perl software is available at the Web site <http://www.activestate.com>.

Under **Products** select **ActivePerl**; then select **Download Now** next to the **ActivePerl** description on the **Products** page.

There are two formats for Solaris, one using Solaris packages and the other using the generic installer. Select **Solaris 2.6 - AS Package** to use the generic installer.

Download the distribution to a temporary directory, extract the files, change directory to the ActivePerl directory, and run the `install.sh` script.

```
$MATLAB/webserver/bin/sol2/zcat ActivePerlxxx.tar.gz | tar -xvf -
cd ActivePerlxxx
./install.sh
```

The installation script will ask for the installation directory.

Starting and Stopping VNC

Before starting VNC be sure the `vncserver` Perl script has the correct path to the Perl executable at the top of the script. Fix the path if it is incorrect. The default script makes reasonable assumptions about the geometry and color requirements of your virtual X display. If you need to change the assumptions, you can specify different geometry and color requirements on the command line or edit the `vncserver` script. See the README file with the VNC distribution for additional details or the online documentation at the Web site. Type

```
vncserver -help
```

for information about arguments to the script.

The first time you run the `vncserver`, you will be prompted for a password. This password controls access to the VNC viewer, which is not used with the Web Server.

You do not have to specify a display number when starting the VNC server, but it is best to specify one to prevent any potential conflict with the main X display, which is normally 0.

Starting VNC

To start the VNC server, enter

```
vncserver :number
```

where `number` is something other than 0. 1 is a good value. Set the `DISPLAY` variable to `:<number>` in your configuration file or use `'-display :<number>'` when starting the Web Server via the `webstart` or `webboot` script.

If your Web Server application requires MATLAB to render better color than the default, set the `depth` argument when you start the VNC server

```
vncserver :<number> -depth <depth>
```

where `<depth>` is either 16 or 24.

Stopping VNC

To stop the VNC server, enter

```
vncserver -kill :number
```

where `number` is the same as that used to start the server.

After stopping the VNC server, it takes about 30 seconds for the socket to time out and clear, so wait a while after stopping the server before restarting it.

Using VNC with the MATLAB Web Server

Use the same value for `display` with the MATLAB Web Server that you used when starting the VNC server.

For example, suppose you want to start the Web Server by passing the `display` on the command line. Here is some sample output from such a command.

```
webstart -display :1
[webstart]:Calling webdown to take down MATLAB Web Server...
  No server to take down . . .
[webstart]:Calling webboot to start MATLAB Web Server . . .
  Waiting for MATLAB Web Server to come up . . .
    Type your interrupt character (usually CTRL-C) to quit.
Time = 10 secs : still waiting for 1 of 2 MATLAB sessions . . .
Time = 20 secs : still waiting for 1 of 2 MATLAB sessions . . .
Time = 30 secs : still waiting for 1 of 2 MATLAB sessions . . .
ALL MATLAB sessions started, but . . .
Time = 10 secs : Web Server startup still not complete . . .
Time = 20 secs : Web Server startup still not complete . . .
MATLAB Web Server is up . . .
```

The display can also be indicated in the `matlabserver.conf` file.

Creating an Application

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Introduction

The process of creating a MATLAB Web Server application involves the creation of:

- An HTML input document for data submission to MATLAB. See “Creating Input Documents” on page 2-4.
- An HTML output document for display of MATLAB computations. See “Creating Output Documents” on page 2-10.
- A MATLAB M-file to process input data and compute results. See “Creating MATLAB Web Server M-Files” on page 2-7.
- A test file to validate code before distributing the application over the Web. See “Debugging Your Application” on page 2-13.

The process of creating a MATLAB Web Server application can be simplified through the use of a set of templates that has been provided. These are discussed in “Templates” on page 2-2.

Templates

Four templates found in the directory

`<matlab>/toolbox/websERVER/wsdemos` simplify the process of creating a MATLAB Web Server application:

- `input_template.html`
- `output_template.html`
- `mfile_template.m`
- `tmfile_template.m`

Each template provides actual code that you need to incorporate into your application plus instructions on how to modify the template where necessary. If you follow the directions in these templates, you should be able to create MATLAB Web Server applications with reasonable effort.

Additionally provided in `<matlab>/toolbox/websERVER/wsdemos` is `webmagic`, a magic squares demonstration program. A magic square produces the same sum along any row, column, or either of the two main matrix diagonals. There are four files associated with `webmagic`:

- `webmagic1.html`: the webmagic input document
- `webmagic2.html`: the webmagic output document
- `webmagic.m`: the webmagic MATLAB M-file
- `twebmagic.m`: the webmagic stand-alone test file

To learn how the four templates were modified to create the webmagic application, we will examine templates and note the specific changes applied.

If you want to look at some other applications created with these templates, see the section “Additional Application Examples” on page 2-15.

Creating Input Documents

Input Template

The file `input_template.html` provides the code needed to create a MATLAB Web Server input document. An abbreviated version looks like

```
<!-- STEP 1
Choose either the NT version or the Unix version of the form tag
(depending on which platform the matweb client program will be
run):
-->
<!-- NT version: -->
<form action="/cgi-bin/matweb.exe" method="POST">
<!-- Unix version: -->
<form action="/cgi-bin/matweb" method="POST">

<!-- STEP 2
Create a hidden field naming your M-file. Replace MY_M_FILE with
the name of main MATLAB function of your application.(An HTML
input field of type "hidden" is commonly used to pass variables
to a web server. It is not displayed by the browser.)
-->
<input type="hidden" name="mlmfile" value="my_m_file">

<!-- STEP 3
Add all your other HTML form tags here. Replace
MY_INPUT_VARIABLE_1 with the name of an input variable in your
application.
-->
<p>My input variable 1: <input type="text"
name="my_input_variable_1">
<!--
Create additional input variables here.
-->

<!-- STEP 4
Create a "submit" input tag for the user to click to send the input
to your program.
-->
<p><input type="submit" name="Submit" value="Submit"></p>
```

```

<!-- STEP 5
Add the name of your main application function to the file
matweb.conf. See the matweb.conf file in the wsdemos directory and
the documentation.)
-->

```

webmagic Input

Examine the significant part of the source for `webmagic1.html`.

```

<form action="/cgi-bin/matweb.exe" method="POST">
  <input type="hidden" name="mlmfile" value="webmagic">
  <p>Magic square size (minimum is 3, maximum is 20):
  <input type="text" size="2" maxlength="2" name="msize"></p>
  <p><input type="submit" name="Submit" value="Submit"></p>
</form>

```

The line

```
<form action="/cgi-bin/matweb.exe" method="POST">
```

calls `matweb`, the entry point to the MATLAB Web Server. `matweb.exe` is the Microsoft Windows NT name of the program used by the MATLAB Web Server to extract data from HTML forms. On Solaris/Linux this program is called just `matweb`. We refer to the program as `matweb` throughout this document except when the platform distinction is important. `matweb` is described more thoroughly in the next chapter.

The next line

```
<input type="hidden" name="mlmfile" value="webmagic">
```

provides the name of the MATLAB M-file (`mlmfile`) to run. In this application the M-file is named `webmagic`.

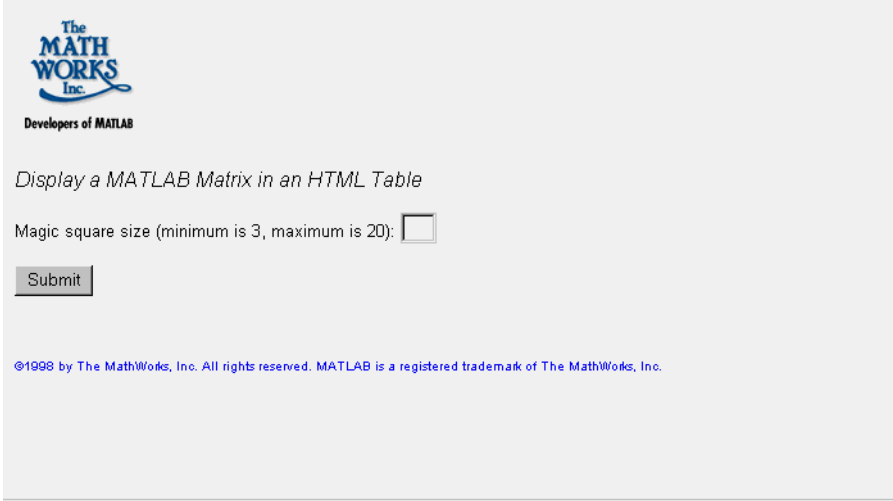
Lastly, the input

```
<input type="text" size="2" maxlength="2" name="msize"></p>
```

passes to `webmagic.m` a two-character field named `msize`, which contains the size of the magic square to compute.

To display the input document and run the magic squares demonstration locally on your computer, start your Web browser and set the URL to `http://<your_domain>/webmagic1.html`.

The magic squares input document, `webmagic1.html`, is displayed in your browser.



The screenshot shows a web page with the following content:

- The MATH WORKS Inc.** logo, with the text "Developers of MATLAB" below it.
- The title: *Display a MATLAB Matrix in an HTML Table*
- A text input field with the label: "Magic square size (minimum is 3, maximum is 20):" followed by an empty text box.
- A "Submit" button.
- Copyright notice: ©1998 by The MathWorks, Inc. All rights reserved. MATLAB is a registered trademark of The MathWorks, Inc.

Enter the size of the magic square matrix you want to compute and press **Submit**.

Creating MATLAB Web Server M-Files

M-File Template

You use the M-file template to code your MATLAB application as you normally do. The template provides the additional code you need to accept input from your HTML input document and to return results to your HTML output document. An abbreviated version looks like

```
function retstr = mfile_template(instruct, outfile)
% STEP 1
% Initialize the return string.
retstr = char('');

% STEP 2
% Set working directory.
% The variables INSTRUCT.MLDIR and INSTRUCT.MLID are provided
% automatically to all MATLAB Web Server applications that use
% the matweb program.
cd(instruct.mldir);

% STEP 3
% Get the HTML form input variables
my_input_variable_1 = instruct.my_input_variable_1;

% STEP 4
% Perform your MATLAB computations, graphics file creations,
% etc., here:

% STEP 5
% Put variables that you want to put into your HTML output document
% in an output structure. You create an HTML output document from
% OUTPUT_TEMPLATE.HTML.
outstruct.my_output_variable_1 = More MATLAB computations
creating ...
    scalars, matrices, cell arrays, graphics files, etc.;

% STEP 6
% Call the function HTMLREP with the output structure you just
% created and the filename you created from OUTPUT_TEMPLATE.HTML.
% Replace <OUTPUT_TEMPLATE.HTML> with the name of the HTML output
% file you created using OUTPUT_TEMPLATE.HTML.
```

```
% This call fills the string RETSTR to return and optionally
% writes the output as a file if a valid filename is given as the
% second argument to the present function.
templatefile = which('<OUTPUT_TEMPLATE.HTML>');
if (nargin == 1)
    retstr = htmlrep(outstruct, templatefile);
elseif (nargin == 2)
    retstr = htmlrep(outstruct, templatefile, outfile);
end
```

webmagic M-File

The data entered on the webmagic1.html input document is automatically passed to MATLAB, which then runs the webmagic function. Notations in **boldface** refer to steps in the M-file template.

```
% Initialize the return string. (Step 1)
retstr = char('');
```

(Step 2. Not needed. No generated graphics.)

```
% Get the msize (string) variable. Convert to a number. (Step 3)
% Check the range.
```

```
if(~length(instruct.msize))
    msize = 3; % Default empty field.
else
    msize = str2double(instruct.msize);
    if (msize > 20), msize = 20; end % Max size.
    if (msize < 3), msize = 3; end % Min square.
end
```

```
% Save size as a char string in structure OUTSTRUCT. (Step 4, 5)
outstruct.msize = msize;
```

```
% Create magic square in output structure OUTSTRUCT.
outstruct.msquare = magic(msize);
```

```
% Get column, row, and diagonal sum. Put in OUTSTRUCT.
d = sum(outstruct.msquare,1);
outstruct.msum = d(1,1);
```

```
% Output the results and optionally write as a file if the
```

```
% filename was given as the second argument to WEBMAGIC. (Step 6)
templatefile = which('webmagic2.html');
if (nargin == 1)
    retstr = htmlrep(outstruct, templatefile);
elseif (nargin == 2)
    retstr = htmlrep(outstruct, templatefile, outfile);
end
```

Creating Output Documents

Output Template

The file `output_template.html` provides the code needed to create a MATLAB Web Server output document. An abbreviated version looks like

```
<!--
Modify this file to create your own HTML output document
and save it as <MY_OUTPUT>.html, where <MY_OUTPUT> is replaced
by a name that has meaning within the context of your application.
-->

<!-- STEP 1
Display a MATLAB scalar or character string. Replace
<MY_OUTPUT_VARIABLE_1> in the following line with the name of the
MATLAB variable you want to display. Change the other text to
something meaningful within the context of your application.
-->
My output variable 1 has been computed to be
$<my_output_variable_1>$

<!-- STEP 2
Put all your other HTML tags here.
-->
```

webmagic Output

The `webmagic` output document contains three variables.

`$msquare$` -- the completed magic square

`$msize$` -- the size of the magic square

`$msum$` -- the magic square sum along its rows, columns, or diagonals

Using `htmlrep` the `webmagic` function replaces these variables with actual values, using the input obtained from `webmagic1.html`.

The source for the webmagic2.html template document looks like

```

<!--
HTML output template used by webmagic.m in call to the
function HTMLREP. (HTMLREP replaces variable names delimited
by dollar signs, e.g., $msquare$, with their values. It also
generates HTML tables and select lists dynamically from matrices,
cell arrays, and vectors.)
-->

<html>
<head>
<title>Magic Square in an HTML Table</title>
</head>
<div align="center">
<strong>Magic Square in an HTML Table</strong></p>

<!--
Use the MATLAB "AUTOGENERATE" HTML attribute to generate a table
dynamically from the variable "msquare", which is a matrix (in
program webmagic.m).
-->

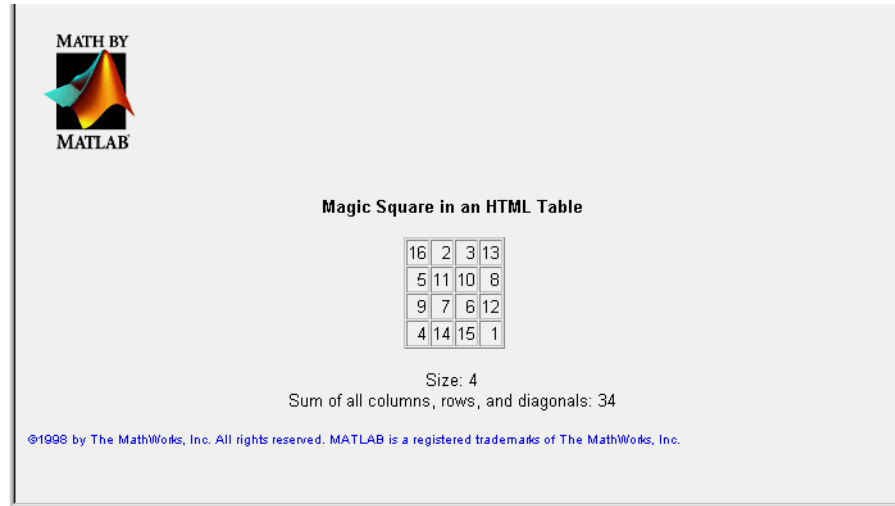
<table border="1" cellspacing="1" autogenerate="$msquare$"
  <tr>
    <td align="right">
  </td>
  </tr>
</table>

<!--
Replace $msize$ and $msum$ with the contents of MATLAB variables
named "msize" and "msum" respectively as computed in webmagic.m.
-->

<p>
Size: $msize$<br>
Sum of all columns, rows, and diagonals: $msum$
</div>

```

When displayed in a browser, `webmagic2.html` looks like



Debugging Your Application

Debugging Procedure

You can use the MATLAB debugging facility plus your Web browser to debug your application before making it available to all users.

An effective method of debugging is to write your application M-file to accept two arguments, as in

```
retstr = webmagic(structure, testfile)
```

You can use the second argument to create an HTML file that displays test output.

As a first debugging step, create a driver program that sets up the input variables and calls the main function. You can use the MATLAB debugging facilities to check the logic of your test program. The file `twebmagic.m` located in `<matlab>/toolbox/webserver/wsdemos` is an example of such a driver program. (Note the use of the `wssetfield` function to create the test input variables. This is optional. Elements of the structure `s` could be created directly, e.g., `s.msize = '5'`.)

```
function twebmagic()
%TWEBMAGIC Example standalone test of webmagic function.
%TWEBMAGIC Does setup and calls webmagic. Creates the output file,
%twebmagic.html.

% Set up input variables.
s = {};
s = wssetfield(s, 'mlmfile', 'webmagic');
s = wssetfield(s, 'msize', '5');
s = wssetfield(s, 'mldir', '.');

% Create an output test file.
str = webmagic(s, 'twebmagic.html');
```

Because the driver program calls `webmagic` with two arguments, `webmagic` writes its output to the file `twebmagic.html`. The call to `htmlrep` within the `webmagic` function handles this.

```
retstr = htmlrep(outstruct, 'webmagic2.html', outfile)
```

outfile in this case is `twebmagic.html`, the second argument passed to `webmagic`.

The second step in debugging is to use your Web browser to examine your test file (outfile) and make appropriate changes until the output is displayed as you intend.

Debugging Template

To assist you in debugging, we have provided the template `tmfile_template.m`, shown below in abbreviated form.

```
function tmfile_template()

% STEP 1
% Set up input variables as they would come in from
% the HTML input form created from INPUT_TEMPLATE.HTML.
outstruct.my_input_variable_1 = some appropriate test value;

% STEP 2
% Call your application function that was created from
% <MFILE_TEMPLATE.M>. Replace <MFILE_TEMPLATE> with the
% name of your application M-file. Provide a test output
% file name for the optional argument by replacing
% <TEST_OUTPUT.HTML> with your test output HTML file name.
retstr = <MFILE_TEMPLATE>(outstruct, '<TEST_OUTPUT.HTML>');

% STEP 3
% Examine the file you supplied for <TEST_OUTPUT.HTML> in
% your web browser.
```

Additional Application Examples

The easiest way to learn how to create MATLAB applications that send and receive data over the Web is to analyze the sample programs included with your MATLAB Web Server distribution. To access these sample programs, open the file `<matlab>/toolbox/webserver/wsdemos/index.html` in your browser. By analyzing the code used to create these examples, you can expand upon them to create more complex MATLAB Web Server applications.

Data Display

The `players` demonstration function illustrates a basic use of the MATLAB Web Server to display data over the Web. The file `players.txt` contains a data base with information about The MathWorks softball team.

PLAYER	POSITION	AVERAGE	AT BATS
Ron Berg	First Base	.337	30
John Theytaz	Second Base	.294	22
Charles Carmody	Third Base	.261	34
Debby Oldman	Shortstop	.287	29
Jack Pirrotta	Right Field	.256	27
Josh Tillson	Center Field	.301	31
Eugene Goldbrick	Left Field	.281	31
Donna Navillus	Pitcher	.222	32
Anna Alman	Catcher	.290	30

`players` uses a few MATLAB commands to read the tab-delimited file, convert the data to an HTML file, and display the output in a Web browser. No input form is needed for this application, only a URL. The URL can be entered directly in your browser or as a live link in another page.

The URL for the `players` example is

```
http://<your_domain>/cgi-bin/matweb.exe?mlmfile=players&
```

on Windows NT. (On Solaris/Linux use `matweb` instead of `matweb.exe`.)

The output looks like

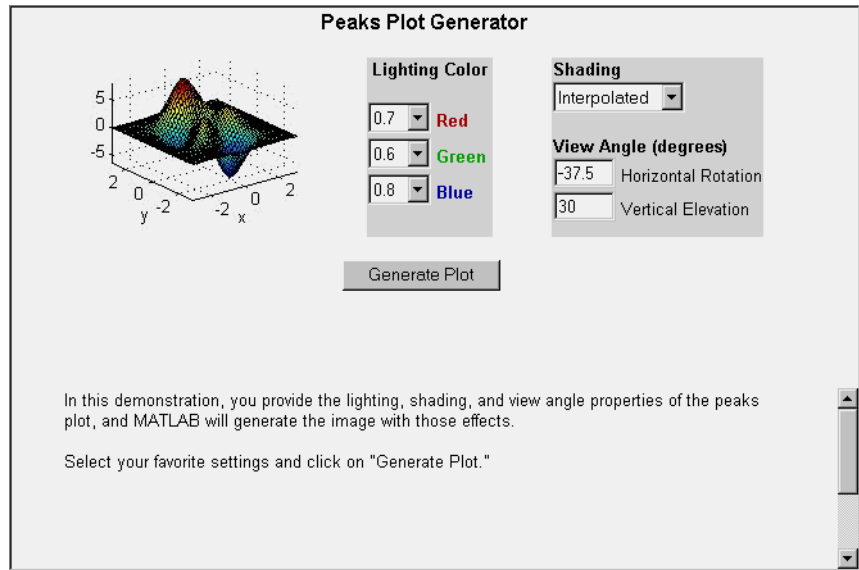
Ron Berg	First Base	.337	30
John Theytaz	Second Base	.294	22
Anna Alman	Catcher	.290	30
Debby Oldman	Shortstop	.287	29
Eugene Goldbrick	Left Field	.281	31
Charles Carmody	Third Base	.261	34
Jack Pirrotta	Right Field	.256	27
Donna Navillus	Pitcher	.242	32
Josh Tillson	Center Field	.221	31

If you would like to experiment on your own with a similar simple application, use `players` as a model to create an M-file that reads your own text file, e.g., `myfile.txt`, and places data into a MATLAB structure. To display the result in your Web browser, use the above URL, changing the value of the `mlmfile` argument to the name of your new M-file. Also, copy the entry for `players` in `matweb.conf` and change the name of the application within the brackets `[]` to the one you have chosen.

MATLAB Graphics

The `webpeaks` function, included as a demonstration program, creates a peaks plot and returns the output to your Web browser. In examining portions of the `webpeaks` code, you will see how to include MATLAB graphics as part of a MATLAB Web Server application.

To start the `webpeaks` demonstration, set the URL in your browser to `http://<your_domain>/webpeaks1.html`, the `webpeaks` input document.



This input document allows you to set the characteristics of the peaks plot you want to generate. This is a more complex input document than the one we used with webmagic, as it makes use of HTML frames. The code in the source file

```
<form action="/cgi bin/matweb.exe" method="POST"
target="outputwindow">
<input type="hidden" name="mlmfile" value="webpeaks">
```

calls the webpeaks function and targets the output to a frame on the lower portion of the input document itself.

In addition to the code necessary to compute and display the peaks function, the file webpeaks.m contains additional code specific to the transmission of graphics data across the Web. In webpeaks.m the code

```
mlid = getfield(h,'mlid')
```

extracts mlid from the structure h.

mlid is a unique identifier that matlabserver provides. Using the value of mlid to construct filenames ensures that filenames are unique. It can also be used

to maintain contexts among the different connections in an application. You can see this in the code

```
s.GraphFileName = sprintf('%speaks.jpeg',mlid)
```

which creates a name for a jpeg file. If `mlid` has the value `m100277`, for example, the jpeg file will be named `m100277peaks.jpeg`.

The function `htmlrep` replaces MATLAB variable names it finds in the HTML output template file `webpeaks2.html` with the values in the input structure `s`.

```
rs = htmlrep(s, 'webpeaks2.html')
```

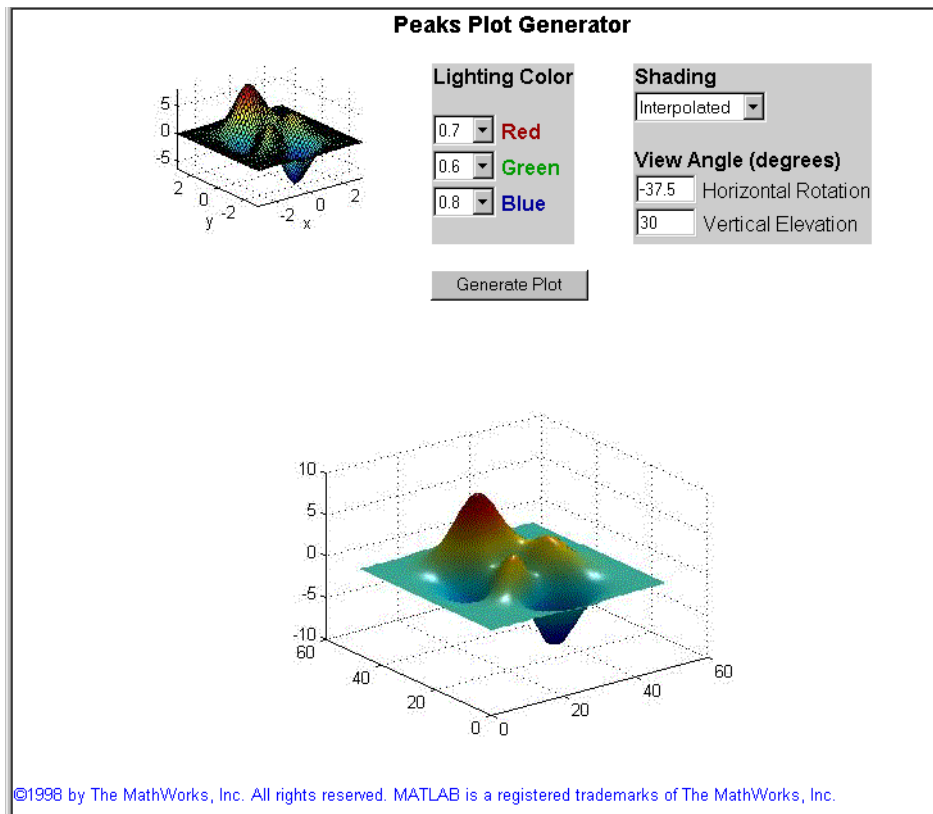
`$GraphFileName$`, the variable that represents the graphic output, is found in the line

```

```

in `webpeaks2.html`.

The final output document shows both the input and output frames.



Note When the input form contains a “clickable” image created by an `<input>` tag of the form `<type = "image" name = "mymap">`, the variable names for the x and y coordinates are normally passed to the program as `mymap.x` and `mymap.y`. The MATLAB Web Server converts these to `mymap_x` and `mymap_y`. For example, the input `<input type = image src = "mymap.jpeg" name = "mymap">` results in storing the x and y coordinates `mymap_x` and `mymap_y` in the structure passed to your program.

Stock Price Simulation

Now that you are familiar with the use and operation of the MATLAB Web Server, look at `webstock`, a program that uses MATLAB to simulate possible stock price scenarios based on user assumptions about estimated return and price volatility.

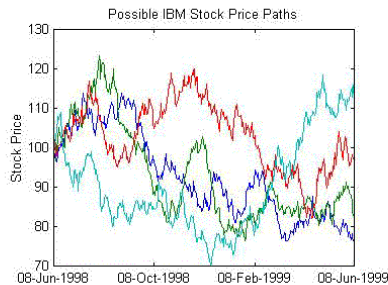
Simulation of Future Stock Prices

This is a Monte-Carlo simulation of the price of a stock over the next year. Input today's price, the expected rate of return, and the volatility of the stock. You can plot a number of possible price scenarios at once.

The prices are generated by sampling a lognormal stock price process. See, for example, N. Chriss "Black-Scholes and Beyond", Irwin, 1997. The lognormal stock price model is used in finance to value stock options.

Stock symbol:
Current Stock Price:
Annualized Expected Return (percent):
Annualized Volatility (percent):
Number of Simulated Paths:

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Set your browser to `http://<your_domain>/webstock1.html` to begin the simulation. When you are finished, examine the source of the input (`webstock1.html`) and output (`webstock2.html`) documents, the MATLAB M-file (`webstockrnd.m`), and the stand-alone test M-file `twebstockrnd.m`.

Inside the MATLAB Web Server

MATLAB Web Server Components
(p. 3-2)

Programs to create MATLAB applications and access them on the Web

Understanding matlabserver (p. 3-5)

Details about `matlabserver`, which manages communication between the Web application and MATLAB

MATLAB Web Server Components

The MATLAB Web Server consists of a set of programs that enable MATLAB programmers to create MATLAB applications and access them on the Web:

- `matlabserver`: Manages the communication between the Web application and MATLAB.
`matlabserver` is a multithreaded TCP/IP server. It runs the MATLAB program (M-file) specified in a hidden field named `mlmfile` contained in the HTML document. `matlabserver` invokes `matweb.m`, which in turn runs the M-file.
`matlabserver` can be configured to listen on any legal TCP/IP port by editing the `matlabserver.conf` file on Windows NT or running `webconf` on Solaris/Linux. The number of simultaneous MATLABs is specified here.
- `matweb`: A TCP/IP client of `matlabserver`. This program uses the Common Gateway Interface (CGI) to extract data from HTML documents and transfer it to `matlabserver`.
- `matweb.m`: Calls the M-file that you want the Web application to run.

Two configuration files are used in conjunction with the MATLAB Web Server programs:

- `matweb.conf`: A configuration file that `matweb` needs for connecting to `matlabserver`. Applications must be listed in `matweb.conf`.
- `hosts.conf`: An optional file providing additional security. If `hosts.conf` is present, only listed machines can connect to the MATLAB Web Server. Machines are listed by name in a single column, e.g.,

```
parrot.mathworks.com  
bluebird.mathworks.com
```

Machines must be listed by name, not by IP number. The operating system resolves the name into a valid IP address.

Figure 3-1, MATLAB on the Web, is diagram showing how MATLAB operates over the Web.

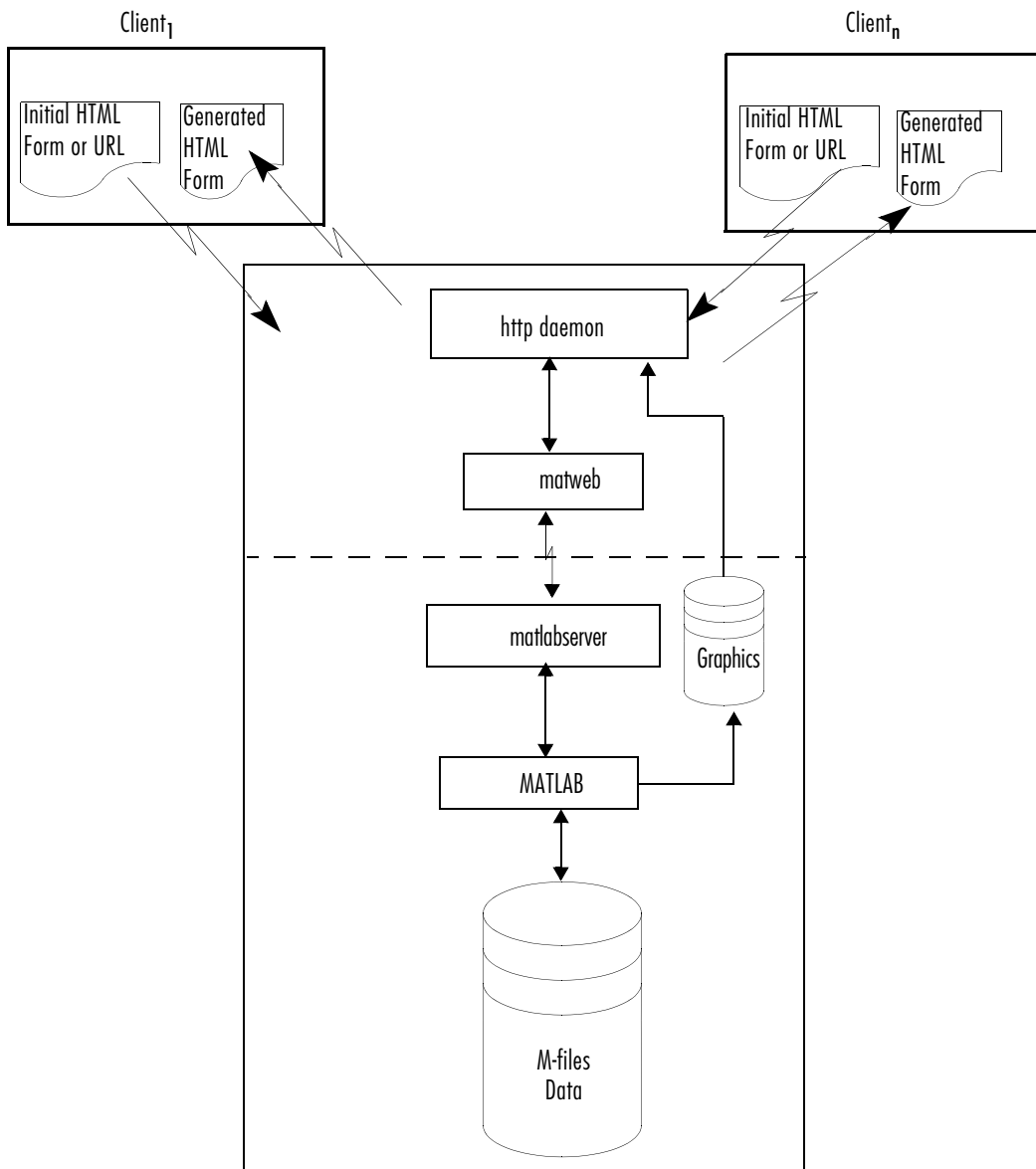


Figure 3-1: MATLAB on the Web

File Locations

Any M-files used in conjunction with a Web application, including `matweb.m`, must appear on the MATLAB path. The `matweb` and `matweb.conf` files must appear under a `/cgi bin` alias. Any generated graphics must be located where the Web Server can find them and programs can write them.

Understanding matlabserver

`matlabserver` is designed to run continuously in the background as a Windows NT service or as a background process on other systems. (Administrator privileges are normally required to install `matlabserver`.) For testing you can turn on terminal logging by entering the command `matlabserver -t` at a Windows NT command prompt (`webstart -t` on Solaris and Linux) when starting `matlabserver`. (See “General Troubleshooting” on page B-2.)

- To learn about how the `matlabserver.conf` file controls `matlabserver`, see “`matlabserver.conf`” on page 3-5.
- To learn about the `matweb` program and additional files and programs that run in conjunction with `matlabserver`, see “Using `matlabserver`” on page 3-7.
- To learn how the MATLAB Web Server returns output, see “Returning Results via the Web” on page 3-10.

`matlabserver.conf`

When `matlabserver` starts up, it looks in the file `matlabserver.conf` for its initial setting data. On Windows NT the installation procedure creates this file in the `<matlab>/webserver` directory while installing the MATLAB Web Server. On other systems you must first run the `webconf` script to establish values for some of the arguments in the file before starting the MATLAB Web Server.

Configuration settings must appear on the first line of the `matlabserver.conf` file. Basic options that can go on the first line include:

- Port number (port that `matlabserver` listens on)
- Threads (maximum number of simultaneous MATLABs)
- Timeout (how long in seconds to wait for `matlabserver` to start)
- Additional MATLAB path (path prepended to the MATLAB path at startup)

You can also specify additional settings related to troubleshooting. See Appendix B, “Troubleshooting Web Server” for details.

Additional lines appear in the Solaris/Linux `matlabserver.conf` file, starting on line 2, to specify various shell variables that fully specify the environment.

Note that the values for the variables can contain references to other shell variables using the normal shell \$ notation.

Table 3-1: Additional Environment Variables for Solaris/Linux

Variable	Purpose
SERVER	Distinguishes multiple servers in one configuration file. Usually blank.
SERVER_HOST	Hostname where matlabserver will run.
START_USERNAME	Username of user who will start the server. (Do not start as root. It causes a security problem.)
RELEASE	String normally obtained from \$MATLAB/.VERSION file. Used in constructing matlabserver log files.
ARCH	Architecture of matlabserver to run.
MATLAB	Location of MATLAB to be started by matlabserver.
DISPLAY	X Window display. Use -nodisplay if no MATLAB graphical display is required.
LM_LICENSE_FILE	MATLAB license file.
WEBSERVER_MARKER	String used to construct various log files.
SLOG_FILE	matlabserver log file used for debugging. To turn on add -f \$SLOG_FILE on first line.
ELOG_FILE	matlabserver error log file. Turned on automatically. Use webstat to view.
PID_FILE	File containing the process ID of the matlabserver process.
CHECK_XHOST	Time in seconds to check for a valid X Window display.

Changing Initial Data

Edit `matlabserver.conf` on Windows NT. On Solaris/Linux run the `webconf` script to initialize the `matlabserver.conf` file. Edit this file if you want to change options further, particularly those that `webconf` cannot set on the command line. To see any changes you have made to `matlabserver.conf`, you need to stop and restart the MATLAB Web Server.

Table 3-1: matlabserver Basic Options

Option	Meaning
<code>-p [n]</code>	Port <code>matlabserver</code> listens on. Default is 8888.
<code>-m [n]</code>	MATLABs to run. Default is 1.
<code>-o timeout</code>	Number of seconds to wait for <code>matlabserver</code> to start (range from 1 to 32000). Default is 300.
<code>-a path</code>	Path prepended to the MATLAB path at startup No default.

Type `matlabserver -h` on Windows NT (`webconf -h` on Solaris/Linux) for a list of additional editable `matlabserver.conf` options.

If `matlabserver` cannot locate a `matlabserver.conf` file, it uses the defaults.

Using matlabserver

When we viewed the source of the `webmagic1.html` file, we observed the line of HTML code

```
<FORM ACTION="/cgi bin/matweb.exe" METHOD="POST">
```

and we noted that this line establishes communication with MATLAB. `matweb` is a program that resides on the HTTP server and communicates with `matlabserver`. `matweb` requires information found in `matweb.conf` to locate `matlabserver` (which could be running on a different machine).

matweb Program

`matweb` is a client of `matlabserver` that uses Common Gateway Interface (CGI) to get data from HTML forms. It transfers the information to `matlabserver`, which then runs applications written in M-files to produce responses.

When the MATLAB Web Server is installed, `matweb` is placed in `<matlab>/webserver/bin/arch` for all architectures. This placement allows you to run `matweb` on a machine having the HTTPD but not having MATLAB installed and being of a different architecture from the server.

For HTTP server access you must also place a copy of `matweb` in the directory denoted by the `/cgi-bin` alias. The installation process places a copy in `<matlab>/toolbox/webserver/wsdemos` to run the sample applications.

matweb.conf

To connect with `matlabserver`, `matweb` requires information stored in the configuration file `matweb.conf`. Create this file inside the directory denoted by `/cgi-bin`, along with the `matweb` program. Use the copy in `<matlab>/toolbox/webserver/wsdemos` as a guide.

An instance of `matweb.conf` looks like

```
[webmagic]
mlserver=parrot

[webpeaks]
mlserver=parrot
mdir=/matlab/toolbox/webserver/wsdemos
```

Multiple application configurations must appear in the same file. Each variable appears on a separate line followed by an equal sign `=`, which is then followed by a value, e.g., `mlserver=parrot`. Applications are delineated by the main application entry point name (M-file) in square brackets `[]`. For example, `[webpeaks]` is on one line followed by all its variables and corresponding values. Note that `webmagic` does not require an `mdir` entry because it does not generate any graphics or save any files. Use the `%` or `#` character at the beginning of any line to comment it out.

All the fields that can be contained in `matweb.conf` are described in Table 3-2.

Table 3-2: `matweb.conf` Fields

Variable	Description	Sample Value
[application] (required)	Name of the MATLAB application to run	webmagic
mldir (optional)	Working directory for reading or writing files. If specified, this directory is automatically added to the MATLAB path.	<matlab>/toolbox/webserver/wsdemos
mllog (optional)	Produces an application-specific log file that records all exchanges between the application and MATLAB. Turn off logging when the program is running because logging has a negative impact on performance.	<matlab>/toolbox/webserver/wsdemos/webmagic.log
mlserver (required)	Name of host running matlabserver	parrot
mlport (optional)	Port that matlabserver listens on. This value must correspond to the port number set in the <code>matlabserver.conf</code> file or on the command line (the <code>p</code> argument).	8888 (default)
mltimeout (optional)	Seconds to wait for matlabserver before timing out	180 (default)
my_var	User-created configuration variable	value

After you create a new MATLAB Web Server application and enter its configuration data into `matweb.conf`, you need to restart `matlabserver` before you can use the application.

matweb M-File

Looking again at the source from the `webmagic1.html` file (see “webmagic Input” on page 2-5), observe that the line

```
<input type="hidden" name="mlmfile" value="webmagic">
```

sets argument `mlmfile` to the value `webmagic`. The `mlmfile` argument contains the name of the MATLAB M-file to run.

`matlabserver` uses the value of `mlmfile` obtained from the `matweb` M-file, `matweb.m`, (`webmagic` in this example) to run the MATLAB application. `webmagic` takes the input data from `webmagic1.html`, computes the magic square of the requested dimensions, and outputs the results using `webmagic2.html` as a template.

Returning Results via the Web

The MATLAB Web Server distribution kit contains the file `webmagic2.html`, which serves as an example of an HTML output document template. The `webmagic` function uses the `htmlrep` command to place the computed values into the `webmagic2.html` output template using the code

```
str = htmlrep(s, 'webmagic2.html');
```

In this example `s` is a MATLAB structure containing the results of the `webmagic` magic squares computation. `htmlrep` extracts data from `s` and replaces variable fields in `webmagic2.html` with the results of MATLAB computation. The completed `webmagic2.html` form is transmitted to the user’s browser.

Function Reference

Functions - Alphabetical List (p. 4-2) Functions organized alphabetically

Functions - Alphabetical List

This chapter provides detailed descriptions of the functions in the MATLAB Web Server.

Purpose	Substitute values for variable names in HTML document
Syntax	<pre>outstring = htmlrep(instruct,infile) outstring = htmlrep(instruct,infile,outfile) outstring = htmlrep(instruct,infile,outfile,attributes)</pre>
Description	<p>htmlrep(instruct,infile) replaces all MATLAB variables in infile, an HTML document, with corresponding values of variables of the same name in instruct. Variables can be character strings, matrices, or cell arrays containing strings and scalars. String and scalar variables are replaced by straight substitution. Output is returned in outstring. Variable names in infile must be enclosed in dollar signs, e.g., \$varname\$.</p> <p>outstring = htmlrep(instruct,infile,outfile) additionally writes output to the HTML document outfile (for stand-alone testing).</p> <p>instruct is a MATLAB structure containing variable names (field names) and corresponding values.</p> <p>infile is an HTML template file with MATLAB variable names enclosed in dollar signs.</p> <p>outfile is the name of an output file for optional standalone testing.</p> <p>outstring = htmlrep(instruct,infile,outfile,attributes) provides additional directives to htmlrep. The third argument in this form of the command must be present for the attributes argument to be recognized. Use an empty string ' ' for the third argument if you do not want to direct output to a file. The attributes argument is a MATLAB string (enclosed in ' ') with the listed attributes separated by spaces.</p> <p>Two attributes are allowed.</p> <p>noheader Suppresses the output of the HTML header 'Content-type: text/html\n\n' to outfile and outstring.</p> <p>extendmemory Enables dynamic memory extension beyond 256 KB.</p>

Note The `extendmemory` attribute is designed only for use with `htmlrep` independently of the MATLAB Web Server. Using it with the MATLAB Web Server will cause unpredictable results with output larger than 256 KB.

HTML tables and select lists can be generated dynamically from matrices or cell arrays containing strings and scalars:

- 1 Tables can be generated using the special MATLAB AUTOGENERATE HTML table attribute with the matrix or cell array name as the value. For example, the following code automatically generates all the HTML needed to display the entire matrix, `msquare`, in an HTML table.

```
<TABLE BORDER="1" CELLSPACING="1" AUTOGENERATE="$msquare$">
  <TR>
    <TD ALIGN="RIGHT">
    </TD>
  </TR>
</TABLE>
```

At least one of each of the tags listed above is required.

`htmlrep` uses the HTML code from the `<TABLE>` tag to the `</TABLE>` tag as a template for generating the entire table. If different column attributes are required, additional pairs of cell tags (`<TD>` and `</TD>`) can be included up to the number of columns in the matrix or cell array. For example, adding these tags

```
<TD ALIGN="CENTER">
</TD>
```

after the `</TD>` tag above causes the second column to be center-justified.

If there are more columns in the matrix or cell array than `<TD>` `</TD>` pairs, the last pair is used for all subsequent columns.

- 2 SELECT lists are generated using the special MATLAB AUTOGENERATE HTML SELECT attribute with the vector, matrix or cell array name as the value. For example, the following code automatically generates all the HTML needed to display the entire vector, `mylist`, in an HTML SELECT list. (SELECT lists must appear inside HTML `<FORM>` and `</FORM>` tags.)


```
<SELECT NAME="NAMELIST" SIZE=10 AUTOGENERATE=$mylist$ MULTIPLE>  
<OPTION SIZE=6>  
</SELECT>
```

htmlrep uses the **HTML** code from the `<SELECT>` tag to the `</SELECT>` tag as a template for generating the entire `SELECT` list. One of each of the tags shown above is required.

If `mylist` is a matrix or cell array, htmlrep uses only the first column vector to construct the select list.

matweb

Purpose MATLAB Web Server main entry point

Syntax `matweb(instruct)`

Description `matweb` is an M-file that in turn calls a MATLAB application M-file stored in the `mlmfile` field of MATLAB structure `instruct`. It also passes `instruct` to the application. The `matweb` function (M-file) is invoked by `matlabserver`. `instruct` contains the fields:

- All the data from the HTML input document
- `mlmfile`, which stores the name of the M-file to call
- `mlmdir`, the working directory specified in `matweb.conf`
- `mlid`, the unique identifier for creating filenames and maintaining contexts

If a MATLAB warning or error is encountered, the text is captured and returned to the user's browser. You can disable error and warning notification if you want.

See Also `eval`, `lasterr`, `lastwarn`, `warning`

Purpose Purge stale files from directory

Syntax `deletecount = wscleanup(filespec,timewindow,direc)`
`deletecount = wscleanup(filespec,timewindow)`

Description `deletecount = wscleanup(filespec,timewindow,direc)` deletes all files matching `filespec` in the directory `direc` that are older than the number of hours specified in `timewindow`. `deletecount` is the number of files actually deleted.

`deletecount = wscleanup(filespec,timewindow)` deletes all files matching `filespec` in the current default directory that are older than the number of hours specified in `timewindow`. `deletecount` is the number of files actually deleted.

wsprintjpeg

Purpose Create JPEG file

Syntax `status = wsprintjpeg(fig, jpegfilename)`

Description `status = wsprintjpeg(fig, jpegfilename)` creates a JPEG file called `jpegfilename`. `wsprintjpeg` attempts to create the JPEG file using the MATLAB `print` command with the `-djpeg` argument. If this fails, it creates a temporary PCX file and then calls `imread` and `imwrite` to create the JPEG output.

See Also `imread`, `imwrite`, `print`

Purpose Add new field or append to existing field

Syntax `s = wssetfield(s,name1,value1,...)`

Description `s = wssetfield(s,name1,value1,...)` sets the contents of the field `name1` to `value1` and returns the result in the changed structure `s`. A single value is stored as a character array. Items with multiple values have the values stored in a cell array of strings. Multiple calls serve to add values to an existing field. Either use the MATLAB `getfield` function to retrieve the values or reference the structure fields directly.

See Also `getfield`

Directory Structure

MATLAB is distributed in compressed format on CD. The installation procedure moves the files to your hard disk, decompresses them, and installs them into your MATLAB root directory. The installation provides a version of the CGI client program `matweb` for all platforms, regardless of which platform `matlabserver` is licensed for. This allows your `matweb` client to run on a different machine and platform from your copy of `matlabserver`. The supported platforms are:

- PC running Windows NT (`win32`)
- Sun workstation running Solaris (`so12`)
- PC running Linux (`g1nx86`)

In the directory structure shown below, replace the pathname component *arch* with the appropriate identifier for your platform.

After installation of the MATLAB Web Server, your MATLAB directory should include these additional files and subdirectories.

Table A-1: <matlab>/webserver

File	Purpose
<code>matlabsever.conf</code>	<code>matlabserver</code> options
<code>webboot</code>	Start <code>matlabserver</code> script
<code>webconf</code>	<code>matlabserver</code> configuration file script
<code>webdown</code>	Stop <code>matlabserver</code> script
<code>webstart</code>	<code>matlabserver</code> restart script
<code>webstat</code>	Report <code>matlabserver</code> status

Note If you create a `hosts.conf` file to control which machines can access the MATLAB Web Server, you must place that file in this directory.

Table A-2: <matlab>/webserver/bin/arch

File	Purpose
matlabserver	The MATLAB Web Server binary
matlabserver.exe	The MATLAB Web Server binary (Windows NT)
matweb	MATLAB TCP/IP client of matlabserver (Solaris and Linux)
matweb.exe	MATLAB TCP/IP client of matlabserver (Windows NT)

You must also place a copy of the appropriate matweb executable and matweb.conf into the /cgi-bin aliased subdirectory of the HTTP server root directory

Table A-3: <matlab>/toolbox/webserver/webserver

File	Purpose
htmlrep.mexsol (Solaris)	Replace variable names with values in HTML document
htmlrep.mexglx (Linux)	
htmlrep.dll (Windows NT)	
matweb.m	Web Server main entry point
wscleanup.m	Purge stale files from directory
wsprintjpeg	Create JPEG file
wssetfield.m	Add new field or append to existing field

Table A-4: <matlab>/toolbox/webserver/wsdemos

File	Purpose
dummy.html	Temporary HTML document in bottom frame of webpeaks1.html
index.html	List of demos
input_template.html	HTML input template
matweb.conf	Sample matweb.conf file
mfile_template.m	M-file creation template
output_template.html	HTML output template
peaksp1ot.html	HTML document (input form) in top frame of webpeaks1.html
players.html	Softball players HTML output form
players.m	Softball statistics file
players.txt	Softball text data file
tplayers.m	Stand-alone test driver for players
tmfile_template.m	Test file template
thtmlrep.m	Test of htmlrep function
thtmlrep1.html	HTML input form
webmagic.m	Convert magic square into HTML table
webmagic1.html	Magic square input form
webmagic2.html	Magic square output template
twebmagic.m	Example stand-alone test of webmagic function
webpeaks.m	Web peaks plot

Table A-4: <matlab>/toolbox/webserver/wsdemos (Continued)

File	Purpose
webpeaks1.html	HTML frame
webpeaks2.html	peaks plot output form
webstock.html	Stock price simulation input form
webstock1.html	Stock price simulation main frame
webstock2.html	Stock price simulation output template
webstockrnd.m	Stock future price path simulation
webstocktemp.html	HTML output place holder
twebstockrnd.m	Stand-alone test driver for webstockrnd
wstextread.m	Place a delimited file into a cell array of strings

Troubleshooting Web Server

This section provides three categories of troubleshooting information:

- General Troubleshooting
- Additional Troubleshooting for Windows NT
- Additional Troubleshooting for Solaris and Linux

General Troubleshooting

This information is relevant to all operating systems that support the MATLAB Web Server.

Event and Error Logging

The MATLAB Web Server provides a logging facility that may be useful in diagnosing operational problems. This facility supplements capabilities such as the Windows NT Event Viewer provided by the operating system. Logs may record all events or error events only.

Logging can be controlled using various logging options. Logging options may be set in the `matlabserver.conf` file or specified on the command line. Any option you specify on the command line overrides the value found in `matlabserver.conf`.

Use the `matlabserver` command on Windows NT and the `webconf` and `webstart` scripts on Solaris and Linux to set these options.

Table B-1: matlabserver Logging Options

Option	Purpose
<code>-f [log_filename]</code>	Event log file. Required when logging to a file. File content determined by <code>-v</code> setting. (File logging is inefficient. Use when debugging only.)
<code>-l [errorlog_filename]</code>	(Solaris and Linux only). Error log file. Default is <code>matlabserver_error.log</code> in current directory. On Windows NT use the Event Viewer to see a list of error events.

Table B-1: matlabserver Logging Options (Continued)

-t	Terminal logging. The logging level is set to 2 (transaction and buffer logging). (If you use this option with the <code>matlabserver</code> command on Windows NT, it must precede all other options on the command line.)
-v [<i>n</i>]	Verbosity. Controls file logging. Default is 0 (no logging). Additional values are 1 (transaction logging) and 2 (transaction and buffer logging).

Application-Specific Log File Not Produced

If present, the `m1log` variable in `matweb.conf` (see “`matweb.conf`” on page 3-8) creates an application-specific log file. This file is not a MATLAB file; it is controlled by the operating system. If this file is not produced, check that the slashes in the pathname of your file are in the correct orientation for the operating system you are using.

Network bind Error (Port in Use)

If `matlabserver` fails to start because of a bind error, as noted in `matlabserver_error.log` or in the **Event Viewer** on Windows NT, the port you are attempting to run `matlabserver` on is busy. To fix this problem, you need to change the port number that `matlabserver` listens on. See the section “`matlabserver.conf`” on page 3-5 for a discussion on how to change the port number. You may need to ask your system administrator to provide you with a valid unused port number.

M-File Programming Considerations

Make certain that each line of your M-file application is terminated with a `;` character. Otherwise, the HTML output will be corrupted.

Connect() failure Error

There are two probable reasons why you may receive a `Error: connect() failure message:`

1 `matlabserver` is not running.

On Solaris or Linux run the `webstat` script. On Windows NT click the **Start** button, open the **Control Panel**, and choose **Services**. The status of MATLAB Server should be Started.

2 Port mismatch between `matlabserver.conf` and `matweb.conf`.

The default TCP/IP port that `matlabserver` listens on is set at 8888. You may change this setting in the `matlabserver.conf` file with the `-p` option. The port setting for each application configuration in the `matweb.conf` file must agree with the port setting in `matlabserver.conf`. (See “Table 3-2: `matweb.conf` Fields”.) If you have changed the port setting in `matlabserver.conf`, you must similarly change the port setting in `matweb.conf` using the `mlport` option. If `mlport` is not explicitly set, the default of 8888 is assumed.

Locating `matweb.conf`

In some network configurations, it is not possible to give users access to the `/cgi-bin` directory of the HTTP server. In such cases a `matweb.conf` file should be created with only one entry, containing the actual location of a configuration file that users can edit. This entry must appear inside angle brackets `< >`. An example of this type of `matweb.conf` file is

```
</apps/projects/strategy/matweb.conf>
```

where `/apps/projects/strategy/matweb.conf` is a valid accessible file.

Additional Troubleshooting for Windows NT

Using the Windows NT Event Viewer

The Windows NT Event Viewer captures data that can be useful for debugging `matlabserver` operations even if you have not requested `matlabserver` logging through the command options. To access the Event Viewer, choose **Start ->Programs ->Administrative Tools ->Event Viewer**. When the Event

Viewer appears, click on **Log** on the menu bar and choose **Application** from the pull-down menu.

	Source	Category	Event	User	Computer
System	matlabserver	None	0	N/A	PARROT
Security	matlabserver	None	0	N/A	PARROT
Application	matlabserver	None	0	N/A	PARROT
Open...	matlabserver	None	0	N/A	PARROT
Save As...	matlabserver	None	0	N/A	PARROT
Clear All Events	matlabserver	None	0	N/A	PARROT
Log Settings...	matlabserver	None	0	N/A	PARROT
Select Computer...	matlabserver	None	0	N/A	PARROT
Exit Alt+F4	Matlabserver	None	0	N/A	PARROT
1/27/98 5:46:55 PM	DrWatson	None	4097	N/A	PARROT
1/22/98 4:09:12 PM	Autochk	None	1001	N/A	PARROT

Double-click on a matlabserver entry to receive additional details that may be useful in determining the cause of a matlabserver problem.

Event Detail

Date: 4/10/98 Event ID: 0
Time: 10:47:44 AM Source: matlabserver
User: N/A Type: Information
Computer: PARROT Category: None

Description:
The description for Event ID (0) in Source (matlabserver) could not be found. It contains the following insertion string(s): matlabserver error: 0, matlabserver startup completed successfully..

Data: Bytes Words

Close Previous Next Help

Startup Sequence

If you install a new version of MATLAB and the MATLAB Web Server, you need to start MATLAB before starting Web Server. MATLAB performs some system updates required for successful Web Server operation.

Additional Troubleshooting for Solaris and Linux

Error Logging

For error logging information, look in `matlabserver_error.log` in `<matlab>/webservice` or in the file specified with the `-l` option in the `matlabserver.conf` file.

Creating New Applications

After you create a new MATLAB Web Server application and enter its configuration data into `matweb.conf`, you will need to restart `matlabserver` before you can use the application.

Selected Bibliography

Numerous books have been published about HTML programming and the World Wide Web. Two that we have found both useful and readable are:

Gundavaram, Shishir, *CGI Programming on the World Wide Web*, Sebastopol, CA, O'Reilly & Associates, Inc., 1996.

Musciano, Chuck and Bill Kennedy, *HTML The Definitive Guide*, Sebastopol, CA, O'Reilly & Associates, Inc., 1996.

On the Web, the World Wide Web Consortium (W3C) publishes comprehensive information about current and future directions of the Web and the HTML language. You will find their home page at <http://www.w3.org>. Look at <http://www.w3.org/MarkUp> for a comprehensive discussion of HTML.

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