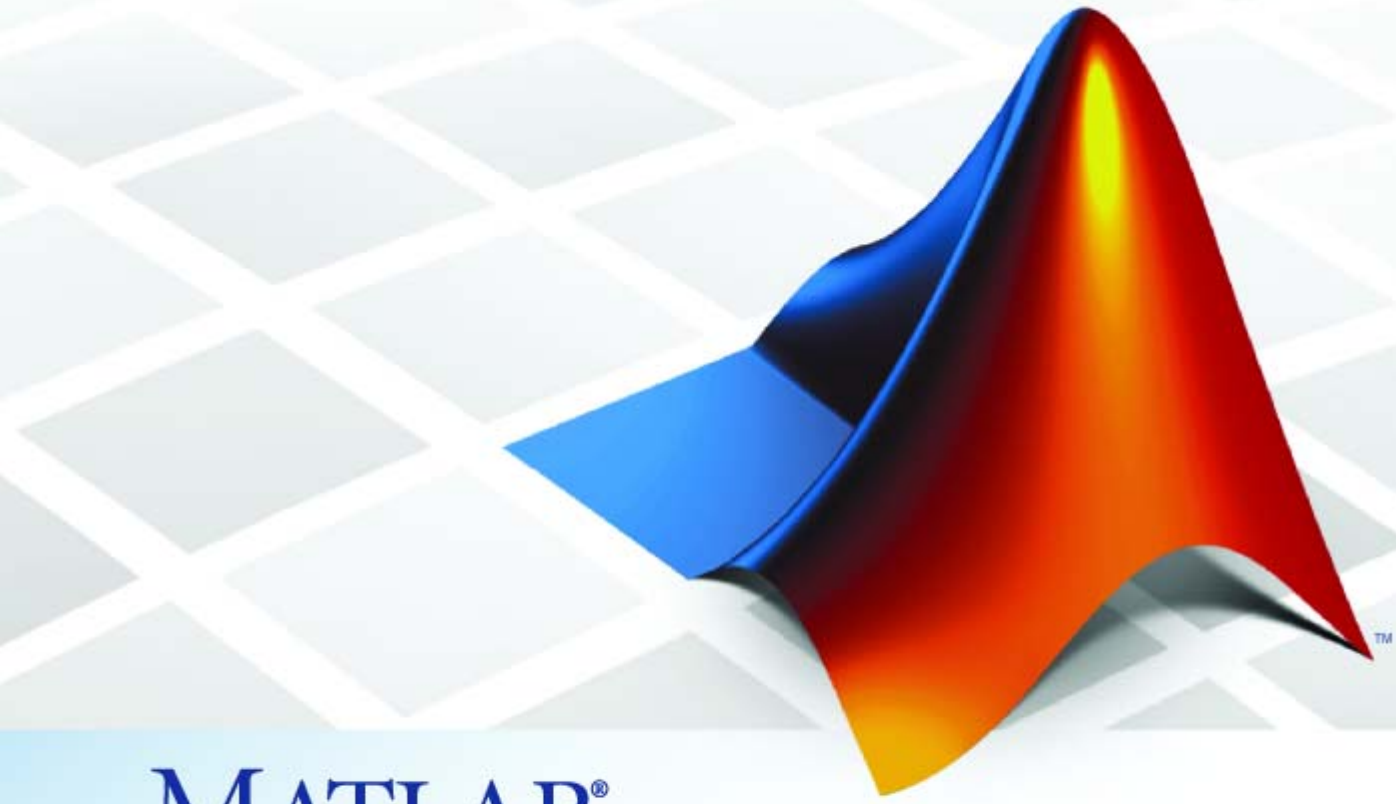
Model-Based Calibration Toolbox™ 3
Reference



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Model-Based Calibration Toolbox™ Reference

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Function Reference

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`CreateModel`	Create new model
`CreateProject`	Create project object
`DataFileTypes`	Data file types
`LoadProject`	Load mbcmodel.project
`modelinput`	Create modelinput object

Data Manipulation

Data Properties

`Filters`	Structure array holding user-defined filters
`IsBeingEdited`	Boolean signaling if data or model is being edited
`IsEditable`	Boolean signaling whether data is editable
`Name`	Name of object
`NumberOfRecords`	Total number of records in data object
`NumberOfTests`	Total number of tests being used in model
`Owner`	Object from which data was received
`RecordsPerTest`	Number of records in each test
`SignalNames`	Names of signals held by data
`SignalUnits`	Names of units in data
`TestFilters`	Structure array holding user-defined test filters
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Data Methods

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`AddTestFilter`	Add user-defined test filter to data set
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`Value`	Double data from data object

Projects

Project Properties

`Data`	Array of data objects in project or test plan
`Filename`	Full path to project file
`Modified`	Boolean signaling whether project has been modified
`Name`	Name of object
`TestPlans`	Array of test plan objects in project

Project Methods

`CopyData`	Create data object from copy of existing object
`CreateData`	Create data object
`CreateTestplan`	Create new test plan
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Test Plans

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Testplan Methods (p. 1-6)	Work with test plan objects

Testplan Properties

`BestDesign`	Best design in test plan
`Data`	Array of data objects in project or test plan
`DefaultModels`	Default models for test plan
`Designs`	Designs in test plan
`Inputs`	Inputs for test plan, model, design or constraint
`InputSignalNames`	Names of signals in data that are being modeled
`InputsPerLevel`	Number of inputs at each level in model
`Levels`	Number of levels in hierarchical model
`Name`	Name of object
`Responses`	Array of available responses for test plan

Testplan Methods

`AddDesign`	Add design to test plan
`AttachData`	Attach data from project to test plan
`BoundaryModel`	Get boundary model from test plan
`CreateDesign`	Create design object for test plan or model

`CreateResponse`	Create new response model for test plan
`DetachData`	Detach data from test plan
`FindDesign`	Find design by name
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Candidate Set Methods (p. 1-10)	Work with design candidate set objects
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Design Constraint Methods (p. 1-10)	Work with design constraint objects

Design Properties

`Constraints`	Constraints in design
`Generator`	Design generation options
`Inputs`	Inputs for test plan, model, design or constraint
`Model (for designs)`	Model for design
`Name`	Name of object
`NumberOfInputs`	Number of model or design object inputs
`NumberOfPoints`	Number of design points
`Points`	Matrix of design points
`PointTypes`	Fixed and free point status
`Style`	Style of design type
`Type (for designs and generators)`	Design type

Design Methods

`AddConstraint`	Add design contraint
`Augment`	Add design points
`ConstrainedGenerate`	Generate constrained space-filling design of specified size
`CreateCandidateSet`	Create candidate set for optimal designs
`CreateConstraint`	Create design contraint
`Discrepancy`	Discrepancy value
`FixPoints`	Fix design points
`Generate`	Generate new design points
`getAlternativeTypes`	Alternative model or design types
`Maximin`	Maximum of minimum of distance between design points
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`Minimax`	Minimum of maximum distance between design points
`OptimalCriteria`	Optimal design criteria (V, D, A, G)
`RemovePoints`	Remove all nonfixed design points
`Scatter2D`	Plot design points

Generator Properties

`NumberOfInputs`	Number of model or design object inputs
`Type (for designs and generators)`	Design type

Generator Methods

`getAlternativeTypes`	Alternative model or design types
`Properties (for design generators)`	View and edit design generator properties

Candidate Set Properties

`NumberOfInputs`	Number of model or design object inputs
`Type (for candidate sets)`	Candidate set type

Candidate Set Methods

`getAlternativeTypes`	Alternative model or design types
`Properties (for candidate sets)`	View and edit candidate set properties

Design Constraint Properties

`Inputs`	Inputs for test plan, model, design or constraint
`Name`	Name of object
`NumberOfInputs`	Number of model or design object inputs
`Type (for design constraints)`	Design constraint type

Design Constraint Methods

`Evaluate`	Evaluate model or design constraint
`getAlternativeTypes`	Alternative model or design types

`MatchInputs`	Match design constraint inputs
`Properties (for design constraints)`	View and edit design constraint properties

Models

Hierarchical Models

Hierarchical Response Properties

`InputSignalNames`	Names of signals in data that are being modeled
`Level`	Level in test plan of response
`LocalResponses`	Array of local responses for response
`Name`	Name of object
`NumberOfTests`	Total number of tests being used in model
`ResponseSignalName`	Name of signal or response feature being modeled

Hierarchical Response Methods

`AlternativeModelStatistics`	Summary statistics for alternative models
`CreateAlternativeModels`	Create alternative models from model template
`DoubleInputData`	Data being used as input to model

`DoubleResponseData`	Data being used as output to model for fitting
`Export`	Make command-line or Simulink® export model
`OutlierIndices`	Indices of `DoubleInputData` marked as outliers
`PEV`	Predicted error variance of model at specified inputs
`PredictedValue`	Predicted value of model at specified inputs
`Remove`	Remove project, test plan, or model
`SummaryStatistics`	Summary statistics for response

Local Models

Local Response Properties

`InputSignalNames`	Names of signals in data that are being modeled
`Level`	Level in test plan of response
`Name`	Name of object
`NumberOfTests`	Total number of tests being used in model
`ResponseFeatures(Local Response)`	Array of response features for local response
`ResponseSignalName`	Name of signal or response feature being modeled

Local Response Methods

`AlternativeModelStatistics`	Summary statistics for alternative models
`CreateAlternativeModels`	Create alternative models from model template
`CreateResponseFeature`	Create new response feature for local model
`DiagnosticStatistics`	Diagnostic statistics for response
`DoubleInputData`	Data being used as input to model
`DoubleResponseData`	Data being used as output to model for fitting
`Export`	Make command-line or Simulink export model
`MakeHierarchicalResponse`	Build two-stage model from response feature models
`ModelForTest`	Model for specified test
`OutlierIndices`	Indices of `DoubleInputData` marked as outliers
`OutlierIndicesForTest`	Indices marked as outliers for test
`PEV`	Predicted error variance of model at specified inputs
`PEVForTest`	Local model predicted error variance for test
`PredictedValue`	Predicted value of model at specified inputs
`PredictedValueForTest`	Predicted local model response for test
`Remove`	Remove project, test plan, or model
`RemoveOutliers`	Remove outliers in input data by index or rule, and refit models

`RemoveOutliersForTest`	Remove outliers on test by index or rule and refit models
`RestoreData`	Restore removed outliers
`RestoreDataForTest`	Restore removed outliers for test
`SummaryStatistics`	Summary statistics for response
`SummaryStatisticsForTest`	Statistics for specified test
`UpdateResponseFeatures`	Refit response feature models

Local Model Properties

`LocalModel Properties`	Edit local model properties
`ResponseFeatures(Local Model)`	Set of response features for local model

Response Models

Response Properties

`AlternativeResponses`	Array of alternative responses for this response
`InputSignalNames`	Names of signals in data that are being modeled
`Level`	Level in test plan of response
`Model Object`	Model object within response object
`Name`	Name of object
`NumberOfTests`	Total number of tests being used in model
`ResponseSignalName`	Name of signal or response feature being modeled

Response Methods

`AlternativeModelStatistics`	Summary statistics for alternative models
`ChooseAsBest`	Choose best model from alternative responses
`CreateAlternativeModels`	Create alternative models from model template
`DiagnosticStatistics`	Diagnostic statistics for response
`DoubleInputData`	Data being used as input to model
`DoubleResponseData`	Data being used as output to model for fitting
`Export`	Make command-line or Simulink export model
`OutlierIndices`	Indices of `DoubleInputData` marked as outliers
`PEV`	Predicted error variance of model at specified inputs
`PredictedValue`	Predicted value of model at specified inputs
`Remove`	Remove project, test plan, or model
`RemoveOutliers`	Remove outliers in input data by index or rule, and refit models
`RestoreData`	Restore removed outliers
`SummaryStatistics`	Summary statistics for response

Model Objects

Response objects contain an `mbcmodel.model` object with the following properties and methods.

Model Properties

`FitAlgorithm`	Fit algorithm for model
`InputData`	Input data for model
`Inputs`	Inputs for test plan, model, design or constraint
`IsBeingEdited`	Boolean signaling if data or model is being edited
`NumberOfInputs`	Number of model or design object inputs
`OutputData`	Output (or response) data for model
`Parameters`	Model parameters
`Properties (for models)`	View and edit model properties
`Response`	Response for model object
`Status`	Model status: fitted, not fitted or best
`Type (for models)`	Valid model types
`Units`	Model output units

Linear Model Methods

`AliasMatrix`	Alias matrix for linear model parameters
`BoxCoxSSE`	SSE and confidence interval for Box-Cox transformations
`Correlation`	Correlation matrix for linear model parameters
`Covariance`	Covariance matrix for linear model parameters
`MultipleVIF`	Multiple VIF matrix for linear model parameters

`ParameterStatistics`	Calculate parameter statistics for linear model
`PartialVIF`	Partial VIF matrix for linear model parameters
`SingleVIF`	Single VIF matrix for linear model parameters
`StepwiseRegression`	Change stepwise selection status for specified terms

Model Methods

`CreateDesign`	Create design object for test plan or model
`Evaluate`	Evaluate model or design constraint
`Export`	Make command-line or Simulink export model
`Fit`	Fit model to new or existing data, and provide summary statistics
`getAlternativeTypes`	Alternative model or design types
`InputSetupDialog`	Open Input Setup dialog box to edit inputs
`Jacobian`	Calculate Jacobian matrix for model at existing or new X points
`ModelSetup`	Open Model Setup dialog box where you can alter model type
`PEV`	Predicted error variance of model at specified inputs
`PredictedValue`	Predicted value of model at specified inputs
`StatisticsDialog`	Open summary statistics dialog box

`SummaryStatistics`	Summary statistics for response
`UpdateResponse`	Replace model in response

Fit Algorithm Methods

An `mbcmodel.fitalgorithm` object is contained within the `Properties` property of an `mbcmodel.model` object.

`CreateAlgorithm`	Create algorithm
`getAlternativeNames`	List alternative algorithm names
`IsAlternative`	Test alternative fit algorithm
`SetupDialog`	Open fit algorithm setup dialog box

Model Parameters

These properties of the `mbcmodel.modelparameters` object are all read-only. An `mbcmodel.modelparameters` object is contained within the `Parameters` property of an `mbcmodel.model` object.

Model Parameters Properties

`Names`	Model parameter names
`NumberOfParameters`	Number of included model parameters
`Values`	Values of model parameters

Linear Model Properties

A mbcmodel.linearmodelparameters object is a mbcmodel.modelparameters object plus the following properties.

`SizeOfParameterSet`	Number of model parameters
`StepwiseSelection`	Model parameters currently included and excluded
`StepwiseStatus`	Stepwise status of parameters in model

RBF Model Properties

A mbcmodel.rbfmodelparameters object is a mbcmodel.linearmodelparameters object plus the following properties.

`Centers`	Centers of RBF model
`Widths`	Width data from RBF model

Model Properties

Linear Model Properties Methods

`GetAllTerms`	List all model terms
`GetIncludedTerms`	List included model terms
`SetTermStatus`	Set status of model terms

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Commands — Alphabetical List

AddConstraint

Purpose

Add design contraint

Syntax

```
D = AddConstraint(D,c)
```

Description

`AddConstraint` is a method of `mbcdoe.design`.

`D = AddConstraint(D,c)` adds constraint `c` to the design. You must call `AddConstraint` to apply the constraint and remove points outside the constraint.

See Also

`CreateConstraint`

Purpose

Add design to test plan

Syntax

```
D = AddDesign(T,D)
D = AddDesign(T,Level,D)
D = AddDesign(T,Level,D,Parent)
```

Description

`AddDesign` is a method of `mbcmodel.testplan`.

```
D = AddDesign(T,D)
```

```
D = AddDesign(T,Level,D)
```

```
D = AddDesign(T,Level,D,Parent)
```

`D` is the array of designs to be added to the test plan, `T`.

`Level` is the test plan level. By default the level is the outer level (i.e., Level 1 for One-stage, Level 2 (global) for Two-stage).

`Parent` is the parent design in the design tree. By default designs are added to the top level of the design tree. See `Designs` for more information on the design tree.

In order to ensure that the design names are unique in the test plan, the design name will be changed when adding a design to a test plan if a design of the same name already exists. The array of designs with modified names is an output.

Examples

To add three designs to the test plan global (2) level:

```
D = AddDesign(TP, [sfDesign, parkedCamsDesign, mainDesign])
```

See Also

`UpdateDesign`; `RemoveDesign`; `FindDesign`

AddFilter

Purpose

Add user-defined filter to data set

Syntax

```
D = AddFilter(D, expr)
```

Description

This is a method of `mbcmodel.data`.

A filter is a constraint on the data set used to exclude some records. You define the filter using logical operators or a logical function on the existing variables.

`D` is the `mbcmodel.data` object you want to filter.

`expr` is an input string holding the expression that defines the filter.

Examples

```
AddFilter(D, 'AFR < AFR_CALC + 10');
```

The effect of this filter is to keep all records where AFR < AFR_CALC +10.

```
AddFilter(D, 'MyFilterFunction(AFR, RPM, TQ, SPK)');
```

The effect of this filter is to apply the function `MyFilterFunction` using the variables AFR, RPM, TQ, SPK.

All filter functions receive an `nx1` vector for each variable and must return an `nx1` logical array out. In that array, true (or `1`) indicates a record to keep, and false (or `0`) indicates a record to discard.

See Also

`ModifyFilter`, `RemoveFilter`, `Filters`, `AddTestFilter`, `ModifyTestFilter`

Purpose

Add user-defined test filter to data set

Syntax

```
D = AddTestFilter(D, expr)
```

Description

This is a method of `mbcmodel.data`.

A test filter is a constraint on the data set used to exclude some entire tests. You define the test filter using logical operators or functions on the existing variables.

`D` is your data object.

`expr` is the input string holding the definition of the new test filter.

Examples

```
AddTestFilter(d1, 'any(n>1000)');
```

The effect of this filter is to include all tests in which all records have speed (`n`) greater than 1000.

Similar to filters, test filter functions are iteratively evaluated on each test, receiving an `nx1` vector for each variable input in a test, and must return an `1x1` logical array out. In that array, true (or `1`) indicates a record to keep, and false (or `0`) indicates a test to discard.

```
AddTestFilter(data, 'length(LOGNO) > 6');
```

The effect of this filter is to include all tests with more than 6 records.

See Also

`ModifyTestFilter`, `RemoveTestFilter`, `TestFilters`, `AddFilter`

AddVariable

Purpose

Add user-defined variable to data set

Syntax

```
D = AddVariable(D, expr, units)
```

Description

This is a method of `mbcmodel.data`.

You can define new variables in terms of existing variables. Note that variable names are case sensitive.

`D` is your data object.

`expr` is the input string holding the definition of the new variable.

`units` is an optional input string holding the units of the variable.

Examples

```
AddVariable(D, 'MY_NEW_VARIABLE = TQ*AFR/2');
AddVariable(D, 'funcVar = MyVariableFunction(TQ, AFR, RPM)',
'lb');
AddVariable(D, 'TQ=tq');
```

The last example could be useful if the signal names in the data do not match the model input factor names in the test plan template file.

See Also

`ModifyVariable`, `RemoveVariable`, `UserVariables`

Purpose

Alias matrix for linear model parameters

Syntax

```
A = M.AliasMatrix
```

Description

This is a method of `mbcmodel.linearmodel`.

`A = M.AliasMatrix` calculates the alias matrix for the linear model parameters (where `M` is a linear model).

Examples

```
A = AliasMatrix(knot_model)
```

See Also

`ParameterStatistics`

AlternativeModelStatistics

Purpose

Summary statistics for alternative models

Syntax

```
S = AlternativeModelStatistics(R)
S = AlternativeModelStatistics(R, Name)
```

Description

This is a method of all model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse` and `mbcmodel.response`.

This returns an array (`S`) of summary statistics of all the alternative model fits, to be used to select the best model. These are the summary statistics seen in the list view at the bottom of the Model Browser GUI in any model view.

You must use CreateAlternativeModels before you can compare the alternative responses using AlternativeModelStatistics. Then use ChooseAsBest.

`R` is the model object whose alternative response models you want to compare. `R` could be a local (`L`), response feature (`R`) or hierarchical response (`HR`) model.

`S` is a structure containing `Statistics` and `Names` fields.

- `S.Statistics` is a matrix of size (number alternative responses x number of statistics).
- `S.Names` is a cell array containing the names of all the statistics.

The available statistics vary according to what kind of parent model (two-stage, local, response feature or response) produced the alternative models, and include PRESS RMSE, RMSE, and Two-Stage RMSE.

All the available statistics are calculated unless you specify which you want. You can specify only the statistics you require using the following form:

```
S = AlternativeModelStatistics(R, Name)
```

This returns a double matrix containing only the statistics specified in `Name`.

Note that you use `SummaryStatistics` to examine the fit of the current model, and `AlternativeModelStatistics` to examine the fit of several alternative child models.

Examples

```
S = AlternativeModelStatistics(R);
```

See Also

`CreateAlternativeModels`, `SummaryStatistics`, `ChooseAsBest`

AlternativeResponses

Purpose

Array of alternative responses for this response

Syntax

```
altR = R.AlternativeResponses
```

Description

This is a property of the response model object, `mbcmodel.response` (`R`).

It returns a list of alternative responses used for one-stage or response feature models.

Examples

```
R = testplan.Responses;
TQ = R(1);
AR = TQ.AlternativeResponses;
```

See Also

`LocalResponses`, `ResponseFeatures(Local Response)`

Purpose

Append data to data set

Syntax

```
D = Append(D, otherData)
```

Description

This is a method of `mbcmodel.data`.

You can use this to add new data to your existing data set, `D`.

`otherData` is the input argument holding the extra data to add below the existing data. This argument can either be an `mbcmodel.data` object or a double array. The behavior is different depending on the type.

If `otherData` is an `mbcmodel.data` object then `Append` will look for common `SignalNames` between the two sets of data. If no common `SignalNames` are found then a error will be thrown. Any common signals will be `Append`ed to the existing data and other signals will be filled with `NaN`.

If `otherData` is a double array then it must have exactly the same number of columns as there are `SignalNames` in the data, and a simple `vertcat` (vertical concatenation) is applied between the existing data and `otherData`.

Examples

```
Append(D, CreateData('aDataFile.xls'));
Append(D, rand(10,100));
```

See Also

`CreateData`

AttachData

Purpose

Attach data from project to test plan

Syntax

```
newD = AttachData(T, D, Property1, Value, Property2, Value...)
```

Description

This is a method of `mbcmodel.testplan`. Use it to attach the data you want to model to the test plan.

`T` is the test plan object, `D` is the data object.

The following table shows the valid properties and their corresponding possible values. These are the settings shown in the last page of the Data Wizard (if there is a design) in the Model Browser. For more information on the meaning of these settings, refer to the Data Wizard section (under Data) in the *Model Browser User's Guide*.

Note If the testplan has responses set up the models are fitted when you attach data.

Property	Value	Default
`unmatcheddata`	{'all', 'none'}	`'all'`
`moredata`	{'all', 'closest'}	`'all'`
`moredesign`	{'none', 'closest'}	`'none'`
`tolerances`	`[1xNumInputs double]`	ModelRange/20

When you attach data to a test plan the `Name` property of the test plan inputs is used to select data channels. If the Name is empty then the Symbol is used as the Name. If the Name does not exist in the data set, an error is generated.

When a test plan has data attached, it is only possible to change the symbols, ranges or nonlinear transforms of the test plan inputs.

You can use AttachData to use data from one project in another project, as follows:

```
p1 = mbcmodel.LoadProject( filename );
p2 = mbcmodel.LoadProject( filename2 );
p1.Testplan.AttachData( p2.Data );
```

Examples

```
newD = AttachData(T1, D1, `more data', `all');
```

```
tol = [0.075, 100, 1, 2];
unmatch = 'all';
moredata = 'all';
moredes = 'none';
AttachData(testplan, data ,...
    'tolerances',    tol,...
    'unmatcheddata', unmatch,...
    'moredata',      moredata,...
    'moredesign',    moredes);
```

See Also

Data, CreateData, DetachData

Augment

Purpose

Add design points

Syntax

```
D = Augment(D,Numpoints)
D = Augment(D,'Prop1',value1,...)
```

Description

`Augment` is a method of `mbcdoe.design`. Use it to add points to a design using a specified design generator. After augmenting a design, the design `Style` is set to `Custom` unless an optimal design is used for augmentation, as in the Design Editor.

`D = Augment(D,Numpoints)` augments the design with the number of points specified by `Numpoints` using the current generator settings.

`D = Augment(D,'Prop1',value1,...)` augments the design with the generator specified by the generator property value pairs.

You can use the `Augment` method to add points to an existing type using a different design type.

```
OptDesign = Augment(OptDesign,...
    'Type','V-optimal',...
    'MaxIterations',200,...
    'NoImprovement', 50,...
    'NumberOfPoints',20);
```

To set all designs points to fixed and then augment an existing design optimally, use the `FixPoints` method to fix all the points as follows:

```
OptDesign = FixPoints(OptDesign);
OptDesign = Augment(OptDesign,...
    'Type','V-optimal',...
    'MaxIterations',200,...
    'NoImprovement', 50,...
    'NumberOfPoints',20);
```

When augmenting with an optimal design generator existing points which are not fixed may be changed. To add points optimally and keep only fixed points, use `RemovePoints` before augmenting, e.g.,

```
OptDesign = RemovePoints(OptDesign,'free');
OptDesign = Augment(OptDesign,...
    'Type','V-optimal',...
    'MaxIterations',200,...
    'NoImprovement', 50,...
    'NumberOfPoints',20);
```

To get a candidate set object for use with an optimal design:

```
C = CreateCandidateSet(OptDesign,'Type', 'Grid',...
       'NumberOfLevels',[21 21 21]);
```

You see an error if you try to call `Augment` when the design `Style` is User-defined or Experimental data.

Examples

To create a candidate set and then optimally augment a design with 10 points:

```
CandidateSet = augmentedDesign.CreateCandidateSet( 'Type', 'Grid' )
CandidateSet.NumberOfLevels = [21 21 21 21];
augmentedDesign = Augment( augmentedDesign,...
    'Type', 'V-optimal',...
    'NumberOfPoints', 10,...
    'CandidateSet', CandidateSet,...
    'MaxIterations', 200,...
    'NoImprovement', 50 );
```

See Also

`Generate`; `CreateCandidateSet`

BeginEdit

Purpose

Begin editing session on data object

Syntax

```
D = BeginEdit(D)
```

Description

This is a method of `mbcmodel.data`.

You must call this method before you can make any changes to a data object.

There are no input arguments. You must call `BeginEdit` before attempting to modify your data object (`D` in the example below) in any way. An error will be thrown if this condition is not satisfied. Data which cannot be edited (see `IsEditable`) will throw an error if `BeginEdit` is called.

Examples

```
BeginEdit(D);
```

See Also

`CommitEdit`, `RollbackEdit`, `IsEditable`, `IsBeingEdited`

Purpose

Best design in test plan

Syntax

```
T.BestDesign{Level} = d;
```

Description

`BestDesign` is a property of `mbcdmodel.testplan`.

`T.BestDesign{Level} = d;` sets `d` as the best design, where `Level` is the test plan level. There can be one best design for each level, but the best global (2) level design is used for matching to data when you call `AttachData`.

BestDesign is a cell array with a cell per level. `TP.BestDesign{1}` is the best design for the first level and `TP.BestDesign{2}` is best design for the second level.

Examples

To set the design `globalDesign` as the best design at the global (2) level:

```
T.BestDesign{2} = globalDesign
```

See Also

`CreateDesign`

BoundaryModel

Purpose

Get boundary model from test plan

Syntax

```
DC = BoundaryModel (T)
DC = BoundaryModel (T, Type)
```

Description

`BoundaryModel` is a method of `mbcmodel.testplan`.

`DC = BoundaryModel (T)` returns the best boundary model for the test plan, `T`. `DC` is a `mbcdoe.designconstraint` object.

`DC = BoundaryModel (T, Type)` is the best boundary model for the specified type associated with the test plan.

`Type` can be any of the following values:

- `'all'` : Best boundary model for all inputs (default)
- `'local'` : Best local boundary model
- `'global'` : Best global boundary model

Examples

To load boundary constraints from another project file and add to design:

```
otherProject = mbcmodel.LoadProject( [matlabroot,'\toolbox\...
mbc\mbctraining\Gasoline_project.mat']);
boundaryConstraints = otherProject.Testplans(1).BoundaryModel('global'
Design.Constraints = boundaryConstraints;
```

Purpose

SSE and confidence interval for Box-Cox transformations

Syntax

```
[sse, ci, lambda] = BoxCoxSSE(Model, lambda)
[sse, ci, lambda] = BoxCoxSSE(Model)
BoxCoxSSE(Model, ...)
```

Description

This is a method of `mbcmodel.linearmodel`.

`[sse, ci, lambda] = BoxCoxSSE(Model, lambda)` computes the sum of squares error (`sse`) and confidence interval (`ci`) for values of the model under different Box-Cox transforms (as given by the parameter `lambda`). The data used is that which was used to fit the model. `sse` is a vector the same size as `lambda` and `ci` is a scalar. There is no statistical difference between the Box-Cox transforms where `sse` less than `ci`.

`[sse, ci, lambda] = BoxCoxSSE(Model)` If `lambda` is not specified, then default values for are used and these are returned in third output argument.

`BoxCoxSSE(Model, ...)` If no output arguments are requested then a plot of SSE versus lambda is displayed. The confidence intervals are also displayed on this plot.

Examples

To try several different values, of the Box-Cox parameter and plot the results:

```
lambda = -3:0.5:3;
[sse, ci] = BoxCoxSSE( M, lambda);
semilogy( lambda, sse, 'bo-', lambda([1,end]), [ci, ci], 'r--' );
xlabel( 'Box-Cox parameter, \lambda' );
ylabel( 'SSE' );
```

Note that `BoxCoxSSE` does not set a Box-Cox transform in the model. To do this use:

```
M.Properties.BoxCox = 0;
[S,M] = M.Fit;
```

See Also

`ParameterStatistics`

Centers

Purpose

Centers of RBF model

Syntax

```
centers = params.Centers
```

Description

This is a property of `mbcmodel.rbfmodelparameters`, for Radial Basis Function (RBF) models only. This returns an array of size number_of_centers by number_of_variables.

Examples

```
centers = params.Centers;
```

See Also

`Widths`

Purpose

Choose best model from alternative responses

Syntax

```
ChooseAsBest(R, Index)
```

Description

This is a method of the response model object, `mbcmodel.response`. This is the same function as selecting the best model in the Model Selection window of the Model Browser GUI. For a local model `MakeHierarchicalResponse` performs a similar function.

`R` is the object containing the response model.

`Index` is the number of the response model you want to choose as best. Use `AlternativeResponses` to find the index for each response model, and use AlternativeModelStatistics to choose the best fit.

Examples

```
ChooseAsBest(R, AlternativeModel)
RMSE = AlternativeModelStatistics(R, 'RMSE');
[mr, Best] = min(RMSE);
ChooseAsBest(R, Best);
```

See Also

`AlternativeResponses`, `AlternativeModelStatistics`, `DiagnosticStatistics`, `MakeHierarchicalResponse`

CommitEdit

Purpose

Update temporary changes in data

Syntax

```
D = CommitEdit(D)
```

Description

This is a method of `mbcmodel.data`.

Use this to apply changes you have made to the data, such as creating new variables and applying filters to remove unwanted records.

There are no input arguments. Once you have finished editing your data object `D` you must commit your changes back to the project. Data can only be committed if both `IsEditable` and `IsBeingEdited` are true. `CommitEdit` will throw an error if these conditions are not met.

Examples

```
D = P.Data;
BeginEdit(D);
AddVariable(D, 'TQ = tq', 'lbft');
AddFilter(D, 'TQ < 200');
DefineTestGroups(D, {'RPM' 'AFR'}, [50 10], 'MyLogNo');
CommitEdit(D);
```

For an example situation which results in `CommitEdit` failing:

```
D  = p.Data;
D1 = p.Data;
BeginEdit(D1);
tp = p.'Testplan;
Attach(tp, D);
```

Where `p` is an `mbcmodel.project` object, and `D` and `D1` are `mbcmodel.data` objects.

At this point `IsEditable`(D1) becomes false because it is now `Attach`ed to the test plan and hence can only be modified from the test plan. If you now enter:

```
OK = D1.IsEditable
```

the answer is `false`.

If you now enter:

```
CommitEdit(D1);
```

An error is thrown because the data is no longer editable. The error message informs you that the data may have been attached to a test plan and can only be edited from there.

See Also

`BeginEdit`, `RollbackEdit`, `IsEditable`, `IsBeingEdited`

ConstrainedGenerate

Purpose

Generate constrained space-filling design of specified size

Syntax

```
design = ConstrainedGenerate( design, NumPoints,
   'UnconstrainedSize', Size, 'MaxIter', NumIterations )
design = ConstrainedGenerate( design, NumPoints, OPTIONS )
```

Description

`ConstrainedGenerate` is a method of `mbcdoe.design`. Use it to generate a space-filling design of specified size within the constrained region. This method only works for space-filling designs. It may not be possible to achieve a specified number of points, depending on the generator settings and constraints.

`design = ConstrainedGenerate( design, NumPoints, 'UnconstrainedSize', Size, 'MaxIter', NumIterations )` tries to generate a design with the number of constrained points specified by `NumPoints`. You can supply parameter value pairs for the options or you can use a structure:`design = ConstrainedGenerate( design, NumPoints, OPTIONS )`.

- MaxIter — Maximum iterations. Default: 10
- UnconstrainedSize — Total number of points in unconstrained design. Default: NumPoints

The algorithm `ConstrainedGenerate` produces a sequence of calls to `Generate`, and updates the `UnconstrainedSize` using the following formula:

```
UnconstrainedSize = ceil(UnconstrainedSize * NumPoints/D.NumberOfPoints
```

Examples

With `ConstrainedGenerate`, make a 200 point design, using an existing space-filling design `sfDesign`, and inspect the constrained and total number of points:

```
sfDesign = ConstrainedGenerate( sfDesign, 200, 'UnconstrainedSize', 80

% How did we do?
finalNumberOfPoints = sfDesign.NumberOfPoints
```

```
% How many points did we need in total?
totalNumberOfPoints = sfDesign.Generator.NumberOfPoints

finalNumberOfPoints =
   200
totalNumberOfPoints =
   839
```

See Also

CreateConstraint; Generate

Constraints

Purpose

Constraints in design

Syntax

```
Constraints = D.Constraints
```

Description

`Constraints` is a property of `mbcdoe.design`.

`Constraints = D.Constraints` Designs have a Constraints property, initially this is empty:

```
constraints = design.Constraints

constraints =
0x0 array of mbcdoe.designconstraint
```

Use CreateConstraint to form constraints.

See Also

`CreateConstraint`; `AddConstraint`

Purpose

Create data object from copy of existing object

Syntax

```
newD = CopyData(P, D)
newD = CopyData(P, Index)
```

Description

This is a method of `mbcmodel.project`.

Use this to duplicate data, for example if you want to make changes for further modeling but want to retain the existing data set. You can refer to the data object either by name or index.

`P` is the project object.

`D` is the data object you want to copy.

`Index` is the index of the data object you want to copy.

Examples

```
D2 = CopyData(P1, D1);
```

See Also

`Data`, `CreateData`, `RemoveData`

Correlation

Purpose

Correlation matrix for linear model parameters

Syntax

```
STATS = Correlation(LINEARMODEL)
```

Description

This is a method of `mbcmodel.linearmodel`.

`STATS = Correlation(LINEARMODEL)` calculates the correlation matrix for the linear model parameters.

Examples

```
Stats = Correlation(knot_model)
```

See Also

`ParameterStatistics`

Purpose

Covariance matrix for linear model parameters

Syntax

```
STATS = Covariance(LINEARMODEL)
```

Description

This is a method of `mbcmodel.linearmodel`.

`STATS = Covariance(LINEARMODEL)` calculates the covariance matrix for the linear model parameters.

Examples

```
Stats = Covariance(knot_model)
```

See Also

`ParameterStatistics`

CreateAlgorithm

Purpose

Create algorithm

Syntax

```
newalg = alg.CreateAlgorithm( AlgorithmName)
```

Description

This is a method of `mbcmodel.fitalgorithm`.

`newalg = alg.CreateAlgorithm( AlgorithmName)` creates an algorithm of the specified type. `alg` is a `mbcmodel.fitalgorithm` object. `AlgorithmName` must be in the list of alternative algorithms given by `alg.getAlternativeNames`.

To change the fit algorithm for a model:

```
>> mdl = mbcmodel.CreateModel('Polynomial', 2);
>> minpress = mdl.FitAlgorithm.CreateAlgorithm('Minimize PRESS');
>> mdl.FitAlgorithm = minpress;
```

The `AlgorithmName` determines what properties you can set. You can display the properties for an algorithm as follows:

```
>> mdl.FitAlgorithm.properties

Algorithm: Minimize PRESS
Alternatives: 'Least Squares','Forward Selection','Backward
Selection','Prune'
     MaxIter: Maximum Iterations (int: [1,1000])
```

The following sections list the properties available for each algorithm type.

Linear Model Algorithm Properties

Linear Models Algorithms

Used by polynomials, hybrid splines and as the StepAlgorithm for RBF algorithms.

Algorithm: Least Squares

Alternatives: `'Minimize PRESS','Forward Selection','Backward Selection','Prune'`

Algorithm: Minimize PRESS

Alternatives: `'Least Squares','Forward Selection','Backward Selection','Prune'`

- MaxIter: Maximum Iterations (int: [1,1000])

Algorithm: Forward Selection

Alternatives: `'Least Squares','Minimize PRESS','Backward Selection','Prune'`

- ConfidenceLevel: Confidence level (%) (numeric: [70,100])
- MaxIter: Maximum Iterations (int: [1,1000])
- RemoveAll: Remove all terms first (Boolean)

Algorithm: Backward Selection

Alternatives: `'Least Squares','Minimize PRESS','Forward Selection','Prune'`

- ConfidenceLevel: Alpha (%) (numeric: [70,100])
- MaxIter: Maximum Iterations (int: [1,1000])
- IncludeAll: Include all terms first (Boolean)

Algorithm: Prune

Alternatives: `'Least Squares','Minimize PRESS','Forward Selection','Backward Selection'`

- Criteria (PRESS RMSE|RMSE|GCV|Weighted PRESS|-2logL|AIC|AICc|BIC|R^2|R^2 adj|PRESS R^2|DW|Cp|cond(J))
- MinTerms: Minimum number of terms (int: [0,Inf])
- Tolerance (numeric: [0,1000])

- IncludeAll: Include all terms before prune (Boolean)
- Display (Boolean)

RBF Algorithm Properties

For information about any of the RBF and Hybrid RBF algorithm properties, see “Radial Basis Functions”, and especially “Fitting Routines” in the Model Browser User’s Guide.

Algorithm: RBF Fit

- WidthAlgorithm: Width selection algorithm (mbcmodel.fitalgorithm)
- StepAlgorithm: Stepwise (mbcmodel.fitalgorithm)

Width Selection Algorithms

Alternatives: `'WidPerDim','Tree Regression'`

Algorithm: TrialWidths

- NestedFitAlgorithm: Lambda selection algorithm (mbcmodel.fitalgorithm)
- Trials: Number of trial widths in each zoom (int: [2,100])
- Zooms: Number of zooms (int: [1,100])
- MinWidth: Initial lower bound on width (numeric: [2.22045e-016,1000])
- MaxWidth: Initial upper bound on width (numeric: [2.22045e-016,100])
- PlotFlag: Display plots (Boolean)
- PlotProgress: Display fit progress (Boolean)

Algorithm: WidPerDim

Alternatives: `'TrialWidths','Tree Regression'`

- NestedFitAlgorithm: Lambda selection algorithm (mbcmodel.fitalgorithm)
- DisplayFlag: Display (Boolean)
- MaxFunEvals: Maximum number of test widths (int: [1,1e+006])
- PlotProgress: Display fit progress (Boolean)

Algorithm: Tree Regression

Alternatives: `'TrialWidths','WidPerDim'`

- MaxNumRectangles: Maximum number of panels (int: [1,Inf])
- MinPerRectangle: Minimum data points per panel (int: [2,Inf])
- RectangleSize: Shrink panel to data (Boolean)
- AlphaSelectAlg: Alpha selection algorithm (mbcmodel.fitalgorithm)

Lambda Selection Algorithms

Algorithm: IterateRidge

Alternatives: `'IterateRols','StepItRols'`

- CenterSelectionAlg: Center selection algorithm (mbcmodel.fitalgorithm)
- MaxNumIter: Maximum number of updates (int: [1,100])
- Tolerance: Minimum change in log10(GCV) (numeric: [2.22045e-016,1])
- NumberOfLambdaValues: Number of initial test values for lambda (int: [0,100])
- CheapMode: Do not reselect centers for new width (Boolean)
- PlotFlag: Display (Boolean)

Algorithm: IterateRols

Alternatives: `'IterateRidge','StepItRols'`

- CenterSelectionAlg: Center selection algorithm (mbcmodel.fitalgorithm)
- MaxNumIter: Maximum number of iterations (int: [1,100])
- Tolerance: Minimum change in log10(GCV) (numeric: [2.22045e-016,1])
- NumberOfLambdaValues: Number of initial test values for lambda (int: [0,100])
- CheapMode: Do not reselect centers for new width (Boolean)
- PlotFlag: Display (Boolean)

Algorithm: StepItRols

Alternatives: `'IterateRidge','IterateRols'`

- MaxCenters: Maximum number of centers (evalstr)
- PercentCandidates: Percentage of data to be candidate centers (evalstr)
- StartLambdaUpdate: Number of centers to add before updating (int: [1,Inf])
- Tolerance: Minimum change in log10(GCV) (numeric: [2.22045e-016,1])
- MaxRep: Maximum number of times log10(GCV) change is minimal (int: [1,100])

Center Selection Algorithms

Algorithm: Rols

Alternatives: `'RedErr','WiggleCenters','CenterExchange'`

- MaxCenters: Maximum number of centers (evalstr)
- PercentCandidates: Percentage of data to be candidate centers (evalstr)

- Tolerance: Regularized error tolerance (numeric: [2.22045e-016,1])

Algorithm: RedErr

Alternatives: `'Rols','WiggleCenters','CenterExchange'`

- MaxCenters: Number of centers (evalstr)

Algorithm: WiggleCenters

Alternatives: `'Rols','RedErr','CenterExchange'`

- MaxCenters: Number of centers (evalstr)
- PercentCandidates: Percentage of data to be candidate centers (evalstr)

Algorithm: CenterExchange

Alternatives: `'Rols','RedErr','WiggleCenters'`

- MaxCenters: Number of centers (evalstr)
- NumLoops: Number of augment/reduce cycles (int: [1,Inf])
- NumAugment: Number of centers to augment by (int: [1,Inf])

Tree Regression Algorithms

Algorithm: Trial Alpha

Alternatives: `'Specify Alpha'`

- AlphaLowerBound: Initial lower bound on alpha (numeric: [2.22045e-016,Inf])
- AlphaUpperBound: Initial upper bound on alpha (numeric: [2.22045e-016,Inf])
- Zooms: Number of zooms (int: [1,Inf])
- Trials: Trial alphas per zoom (int: [2,Inf])

- Spacing: Spacing (Linear|Logarimthic)
- CenterSelectAlg: Center selection algorithm (mbcmodel.fitalgorithm)

Algorithm: Specify Alpha

Alternatives: `'Trial Alpha'`

- Alpha: Width scale parameter, alpha (numeric: [2.22045e-016,Inf])
- NestedFitAlgorithm: Center selection algorithm (mbcmodel.fitalgorithm)

Algorithm: Tree-based Center Selection

Alternatives: `'Generic Center Selection'`

- ModelSelectionCriteria: Model selection criteria (BIC|GCV)
- MaxNumberCenters: Maximum number of centers (evalstr)

Algorithm: Generic Center Selection

Alternatives: `'Tree-based Center Selection'`

- CenterSelectAlg: Center selection algorithm (mbcmodel.fitalgorithm)

Hybrid RBF Algorithms

Algorithm: RBF Fit

- WidthAlgorithm: Width selection algorithm (mbcmodel.fitalgorithm)
- StepAlgorithm: Stepwise (mbcmodel.fitalgorithm)

Width Selection Algorithms

Algorithm: TrialWidths

- NestedFitAlgorithm: Lambda and term selection algorithm (mbcmodel.fitalgorithm)
- Trials: Number of trial widths in each zoom (int: [2,100])

- Zooms: Number of zooms (int: [1,100])
- MinWidth: Initial lower bound on width (numeric: [2.22045e-016,1000])
- MaxWidth: Initial upper bound on width (numeric: [2.22045e-016,100])
- PlotFlag: Display plots (Boolean)
- PlotProgress: Display fit progress (Boolean)

Nested Fit Algorithms

Algorithm: Twostep

Alternatives: `'Interlace'`

- MaxCenters: Maximum number of centers (evalstr)
- PercentCandidates: Percentage of data to be candidate centers (evalstr)
- StartLambdaUpdate: Number of terms to add before updating (int: [1,Inf])
- Tolerance: Minimum change in log10(GCV) (numeric: [2.22045e-016,1])
- MaxRep: Maximum number of times log10(GCV) change is minimal (int: [1,100])
- PlotFlag: Display (Boolean)

Algorithm: Interlace

Alternatives: `'Twostep'`

- MaxParameters: Maximum number of terms (evalstr)
- MaxCenters: Maximum number of centers (evalstr)
- PercentCandidates: Percentage of data to be candidate centers (evalstr)

- StartLambdaUpdate: Number of terms to add before updating (int: [1,Inf])
- Tolerance: Minimum change in log10(GCV) (numeric: [2.22045e-016,1])
- MaxRep: Maximum number of times log10(GCV) change is minimal (int: [1,100])

Examples

First get a fitalgorithm object, F, from a model:

```
M = mbcmodel.CreateModel('Polynomial', 4);
F = M.FitAlgorithm

F =
Algorithm: Least Squares
Alternatives: 'Minimize PRESS','Forward Selection','Backward
Selection','Prune'
1x1 struct array with no fields.
```

Then, to create a new algorithm type:

```
Alg = CreateAlgorithm(F, 'Minimize PRESS')

Alg =
Algorithm: Minimize PRESS
Alternatives: 'Least Squares','Forward Selection','Backward
Selection','Prune'
    MaxIter: 50
```

See Also

`getAlternativeNames`, `SetupDialog`

Purpose

Create alternative models from model template

Syntax

```
R = CreateAlternativeModels(R, modeltemplate, criteria)
R = CreateAlternativeModels(R, modellist, criteria
R = CreateAlternativeModels(R,
LocalModels,LocalCriteria,GlobalModels,GlobalCriteria)
```

Description

This is a method of all model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse` and `mbcmodel.response`.

This is the same as the Build Models function in the Model Browser GUI. A selection of child node models are built. The results depend on where you call this method from. Note that the hierarchical model is automatically constructed when `CreateAlternativeModels` is called for a local model.

- This option makes alternative response feature models for each response feature.

  ```
  R = CreateAlternativeModels(R, models, criteria)
  ```

  - `Models` is the list of models. You can use a model template file (`.mbm`) created in the Model Browser, or a cell array of `mbcmodel.model` objects.
  - `Criteria` is the selection criteria for best model (from the statistics available from `AlternativeModelStatistics`).

- This option makes alternative local models as well as alternative response feature models.

  ```
  R = CreateAlternativeModels(R,
  LocalModels,LocalCriteria,GlobalModels,GlobalCriteria)
  ```

  - `LocalModels` is the list of local models - you must pass in an empty matrix).
  - `LocalCriteria` is `'Two-Stage RMSE'`.

- `GlobalModels` is the list of global models (from the model template).
- `GlobalCriteria` is the selection criteria for best model.

You construct a model template file (such as `'mymodels.mbm'`) in the Model Browser. From any response (global or one-stage model) with alternative responses (child nodes), select **Model > Make Template**. You can save the child node model types of your currently selected modeling node as a model template. Alternatively from any response click **Build Models** in the toolbar and create a series of alternative response models in the dialog.

Examples

```
mymodels = 'mymodels.mbm';
mlist = {};
load('-mat', mymodels);
critera = 'PRESS RMSE';
CreateAlternativeModels(R, [], 'Two-Stage RMSE', mlist,
criteria);
```

Note that the model template contains the variable `mlist`.

```
CreateAlternativeModels( RESPONSE, 'alternative_models.mbm', 'Weighted PRESS' )
```

creates alternative response feature models based upon the model template file `alternative_models.mbt`, and chooses the best model based upon each model's Weighted PRESS statistic.

See Also

`AlternativeModelStatistics`

Purpose

Create candidate set for optimal designs

Syntax

```
D = CreateCandidateSet(D)
D = CreateCandidateSet(D,prop1,value1,...)
```

Description

`CreateCandidateSet` is a method of `mbcdoe.design`. Candidate sets are very similar to design generators. They are not used directly in specifying a design but are used to specify the set of all possible points to be considered as part of an optimal design. You obtain the candidate set from an optimal design generator or by using `mbcdoe.design.CreateCandidateSet`.

`D = CreateCandidateSet(D)` creates a candidate set (`mbcdoe.candidateset` object) for the design.

`D = CreateCandidateSet(D,prop1,value1,...)` creates a candidate set with the specified properties for the design. To see the properties you can set, see the table of candidate set properties, Candidate Set Properties (for Optimal Designs) on page 2-158.

Examples

```
CandidateSet = augmentedDesign.CreateCandidateSet( 'Type',...
 'Grid' );
CandidateSet.NumberOfLevels = [21 21 21 21];
```

See Also

`Properties (for candidate sets)`; `Augment`

CreateConstraint

Purpose

Create design contraint

Syntax

```
c = CreateConstraint(D)
c = CreateConstraint(D,prop1,val1,...)
```

Description

`CreateConstraint` is a method of `mbcdoe.design`.

Designs have a Constraints property, initially this is empty:

```
constraints = design.Constraints

constraints =
0x0 array of mbcdoe.designconstraint
```

Use CreateConstraint to form constraints.

`c = CreateConstraint(D)` creates a default constraint for the design.

`c = CreateConstraint(D,prop1,val1,...)` creates a constraint with the specified properties. See Constraint Properties on page 2-161.

By default a 1D table constraint is created for designs with two or more inputs.

For a design with one input a linear constraint is created by default.

You can specify the constraint type during creation by using the `Type` property, e.g.,

```
c = D.CreateConstraint('Type','Linear')
```

Other available properties depend on the design type. See the table Constraint Properties on page 2-161.

This method does not add the constraint to the design. You must explicitly add the constraint to the design using the Constraints property of the design e.g.,

```
D= AddConstraint(D,c)
```

or

```
D.Constraints(end+1) = c;
```

You must call `AddConstraint` to apply the constraint and remove design points outside the constraint.

Examples

To create a `Linear` constraint, add it to a design, and regenerate the design points:

```
cLinear = design.CreateConstraint( 'Type', 'Linear' );
cLinear.A = [-2.5e-4, 1];
cLinear.b = 0.25;
cLinear
design.Constraints = cLinear;
design = Generate(design);
```

To create and apply a `1D Table` constraint:

```
cTable1d = design.CreateConstraint( 'Type', '1D Table' );
cTable1d.Table = [0.9 0.5];
cTable1d.Breakpoints = [500 6000];
cTable1d
design.Constraints = cTable1d;
design = Generate(design);
```

To combine constraints, use an array of the constraints you want to apply:

```
design.Constraints = [cLinear, cTable1d];
constraints = design.Constraints
design = Generate(design);

constraints =
1x2 array of mbcdoe.designconstraint
Linear design constraint: -0.00025*N + 1*L <= 0.25
1D Table design constraint: L(N) <= Lmax
```

To load boundary constraints from another project file and add to design:

```
otherProject = mbcmodel.LoadProject( [matlabroot,'\toolbox\...
mbc\mbctraining\Gasoline_project.mat']);
boundaryConstraints = otherProject.Testplans(1).BoundaryModel...
('global');
Design.Constraints = boundaryConstraints;
```

See Also

Properties (for design constraints); AddConstraint

Purpose

Create data object

Syntax

```
D = CreateData(P, filename, filetype)
D = mbcmodel.CreateData(filename, filetype)
```

Description

The first syntax is a method of `mbcmodel.project`. Use this to create a new data object in an existing project. `P` is the project object.

`filename` and `filetype` are optional arguments that are used to load data from a file into the new data object at creation time.

`filename` is a string specifying the full path to the file.

`filetype` is a string specifying the file type. See `DataFileTypes` for the specification of allowed file types (and `mbccheckindataloadingfcn` to specify your own data loading function). If `filetype` is not provided, then MBC will attempt to infer the file type from the file extension, i.e. if the file extension is .xls then MBC will try the Excel File Loader.

If `filename` is not provided then no data will be loaded into the new data object. Data can be loaded subsequently using `ImportFromFile`, provided that editing of the data object has been enabled via a call to `BeginEdit`. Call `CommitEdit` to apply edits.

If you create the data object specifying a `filename`, then the Name property is set to the filename. However, if you use ImportFromFile after creation to load data from a file, the name of the data object does not change.

The second syntax is a function. Use this to create a new data object independent of any project. You can use AttachData to use the data object in another test plan, e.g.,

```
d = mbcmodel.CreateData( filename );
testplan.AttachData( d );
```

Examples

```
data = CreateData(P, 'D:\MBCWork\data1.xls');
D = mbcmodel.CreateData;
D = mbcmodel.CreateData('D:\MBCWork\data.xls');
```

Where P is an `mbcmodel.project` object.

See Also

`DataFileTypes`, `BeginEdit`, `CopyData`, `RemoveData`, `Data`, `ImportFromFile`, `CommitEdit`, `AttachData`

Purpose

Create design object for test plan or model

Syntax

```
D = CreateDesign(Testplan)
D = CreateDesign(Testplan,Level)
D = CreateDesign(Testplan,Level,prop1,value1,...)
D = CreateDesign(Model)
D = CreateDesign(Model,prop1,value1,...)
D = CreateDesign(Inputs)
D = CreateDesign(Inputs,prop1,value1,...)
D = CreateDesign(Design)
```

Description

`CreateDesign` is a method of `mbcmodel.testplan`, `mbcmodel.model`, and `mbcmodel.modelinput`. Property value pairs can be specified at creation time. The property value pairs are properties of `mbcdoe.design`.

Properties of `mbcdoe.design`

mbcdoe.design Property	Description
`Constraints`	Constraints in design.
`Generator`	Design generation options.
`Inputs`	Inputs for design.
`Model`	Model for design.
`Points`	Matrix of design points.
`PointTypes`	Fixed and free point status.
`Style`	Style of design type.
`NumberOfInputs`	Read-only — Number of model inputs.

Properties of `mbcdoe.design` (Continued)

mbcdoe.design Property	Description
`NumberOfPoints`	Read-only — Number of design points.
`Type`	Design type. The design property `Type` can *only* be specified with `CreateDesign` and is subsequently read-only for design objects.

`D = CreateDesign(Testplan)` creates a design for the test plan, where `Testplan` is an `mbcmodel.testplan` object.

`D = CreateDesign(Testplan,Level)` creates a design for the specified level of the test plan. By default the level is the outer level (i.e., Level 1 for one-stage, Level 2 (global) for two-stage).

If you do not specify any properties, the method creates a default design type. The default design types are a Sobol Sequence for two or more inputs, and a Full Factorial for a single input.

`D = CreateDesign(Testplan,Level,prop1,value1,...)` creates a design with the specified properties.

`D = CreateDesign(Model)` creates a design based on the inputs of the `mbcmodel.model` object, `Model`.

`D = CreateDesign(Model,prop1,value1,...)` creates a design with the specified properties based on the inputs of the model.

`D = CreateDesign(Inputs)` creates a design based on the inputs of the `mbcmodel.modelinput` object, `Inputs`.

`D = CreateDesign(Inputs,prop1,value1,...)` creates a design with the specified properties based on the inputs.

`D = CreateDesign(Design)` creates a copy of an existing design.

Examples

To create a space-filling design for a test plan `TP`:

```
sfDesign = CreateDesign(TP, ...
    'Type', 'Latin Hypercube Sampling',...
    'Name', 'Space Filling');
```

Create an optimal design based on the inputs of a model:

```
optimalDesign = CreateDesign( model,...
    'Type', 'V-optimal',...
    'Name', 'Optimal Design' );
```

Create a classical full factorial design based on the inputs defined by a `mbcmodel.modelinput` object:

```
design = CreateDesign( inputs, 'Type', 'Full Factorial' );
```

Create a new design based on an existing design (`ActualDesign`) in order to augment it:

```
augmentedDesign = ActualDesign.CreateDesign('Name',...
 'Augmented Design');
```

Create a local level design for the two-stage test plan `TP`:

```
localDesign = TP.CreateDesign(1,'Type',...
'Latin Hypercube Sampling');
```

Create a global level design for the two-stage test plan `TP`:

```
globalDesign = TP.CreateDesign(2, 'Type',...
 'Latin Hypercube Sampling');
```

See Also

`Generate`; `modelinput`

CreateModel

Purpose

Create new model

Syntax

```
M = mbcmodel.CreateModel(Type, INPUTS)
NewModel = CreateModel(model,Type)
```

Description

`M = mbcmodel.CreateModel(Type, INPUTS)` This syntax is a function that creates an `mbcmodel.model` object of the specified `Type`.

`mbcmodel.linearmodel` and `mbcmodel.localmodel` are subclasses of `mbcmodel.model`. Model types that begin with the word "local" specify an `mbcmodel.localmodel` object.

`NewModel = CreateModel(model,Type)` This syntax is a function that creates a new model (of the specified Type) with the same inputs as an existing `model`. `model` is an `mbcmodel.model` object. You can use getAlternativeTypes to generate a list of valid model types. See `Type (for models)` for a list of valid model types. Spaces and case in `Type` are ignored.

`INPUTS` can be a `mbcmodel.modelinput` object, or any valid input to the `mbcmodel.modelinput` constructor. See `modelinput`.

Examples

To create a hybrid spline with four input factors, enter:

```
M = mbcmodel.CreateModel('Hybrid Spline', 4)
```

To create an RBF with four input factors, enter:

```
Inputs = mbcmodel.modelinput('Symbol',{'N','L','EXH','INT'}',...
   'Name',{'ENGSPEED','LOAD','EXHCAM','INTCAM'}',...
   'Range',{[800 5000],[0.1 1],[-5 50],[-5 50]}');

RBFModel = mbcmodel.CreateModel( 'RBF', Inputs);
```

To create a polynomial with the same input factors as the previously created RBF, enter:

```
PolyModel = CreateModel(RBFModel,'Polynomial')
```

See Also

`getAlternativeTypes`, `modelinput`, `CreateProject`, `CreateData`, `Type (for models)`

CreateProject

Purpose

Create project object

Syntax

```
P = mbcmodel.CreateProject
```

Description

This is a function that creates an `mbcmodel.project` object.

`P` is the project object.

`P = mbcmodel.CreateProject` creates an `mbcmodel.project` called Untitled. `P = mbcmodel.CreateProject( NAME )` creates an `mbcmodel.project` called NAME.

Examples

```
P = mbcmodel.CreateProject;
```

Create a project called MBT_Project:

```
P = mbcmodel.CreateProject( 'MBT_Project' );
```

Purpose

Create new response model for test plan

Syntax

```
R = CreateResponse(T, Varname)
R = CreateResponse(T, Varname, Model)
R = CreateResponse(T, Varname, LocalModel, GlobalModel)
R = CreateResponse(T, Varname, LocalModel, GlobalModel,
   DatumType)
```

Description

This is a method of `mbcmodel.testplan`.

`R = CreateResponse(T, Varname)` creates a model of the variable `Varname` using the test plan's one- or two-stage default models. `T` is the test plan object, `R` is the new response object.

`R = CreateResponse(T, Varname, Model)` creates a one-stage model of `Varname`, where `T` must be a one-stage test plan object.

`R = CreateResponse(T, Varname, LocalModel, GlobalModel)` or `R = CreateResponse(T, Varname, LocalModel, GlobalModel, DatumType)` creates a two-stage model of `Varname`. `T` must be a two-stage test plan object. `DatumType` can only be specified if the local model type permits a datum model. Only the model types "Polynomial Spline" and "Polynomial with Datum" permit datum models.

`Varname` is the variable name for the new response.

`Model` is the One-stage model object (if you leave this field empty, the default is used).

`LocalModel` is the Local Model object (if you leave this field empty, the default is used).

`GlobalModel` is the Response Feature model object (if you leave this field empty, the default is used).

`DatumType` can be `'None'` `'Maximum'` `'Minimum'` or `'Linked'`.

Examples

To create a response using the default models, enter:

```
R = CreateResponse(T, 'torque');
TQ_response = CreateResponse(testplan, 'TQ');
```

To create a response and specify the local and global model types, enter:

```
mdls = T.DefaultModels
LocalModel = CreateModel(mdl{1}, 'Local Polynomial Spline');
GlobalModel = CreateModel(mdl{2}, 'RBF');
R = CreateResponse(T, 'TQ', LocalModel, GlobalModel, 'Maximum')
```

See Also

`Responses`

Purpose

Create new response feature for local model

Syntax

```
RF = CreateResponseFeature(RF,RFType)
RF = CreateResponseFeature(RF,RFType,EvaluationPoint)
```

Description

This is a method of `mbcmodel.localresponse`.

`RF = CreateResponseFeature(RF,RFType)`

`RF = CreateResponseFeature(RF,RFType,EvaluationPoint)`

`RFType` is a description string belonging to the set of alternative response features for the current local model.

`EvaluationPoint` is a row vector with an element for each model input and is used for response features that require an input value to evaluate the response feature (e.g., function evaluation, derivatives). It is an error to specify an evaluation point for a response feature type that does not require an evaluation point.

You should use this method to add response features without refitting all local and global models.

Examples

```
RF = CreateResponseFeature(RF,'Beta_1')
```

See Also

`ResponseFeatures(Local Model)`

CreateTestplan

Purpose

Create new test plan

Syntax

```
T = CreateTestplan(P, TestPlanTemplate)
T = CreateTestplan(P, TestPlanTemplate, newtestplanname)
T = CreateTestplan(P, InputsPerLevel)
T = CreateTestplan(P, InputsPerLevel, newtestplanname)
T = CreateTestplan(P, Inputs)
T = CreateTestplan(P, Inputs, newtestplanname)
```

Description

This is a method of the `mbcmodel.project` object.

You can use this method with a test plan template or input information.

You set templates up in the Model Browser GUI. This setup includes number of stages, inputs, base models, and designs. If the test plan is used as part of a previous project it is also possible to save response models in the test plan. It is not possible to change the number of stages after creation of the test plan.

After you create a new test plan, you can add data to model, and new responses. Note that the model input signal names specified in the template *must* match the signal names in the data.

Use CreateTestplan in the following ways:

```
T = CreateTestplan(P, TestPlanTemplate)
```

```
T = CreateTestplan(P, TestPlanTemplate, newtestplanname)
```

`P` is the project object.

`TestPlanTemplate` is the full name and path to the test plan template file created in the Model Browser.

`newtestplanname` is the optional name for the new test plan object.

```
T = CreateTestplan(P, InputsPerLevel)
```

```
T = CreateTestplan(P, InputsPerLevel, newtestplanname)
```

`InputsPerLevel` is a row vector with number of inputs for each stage.

```
T = CreateTestplan(P, Inputs)
```

```
T = CreateTestplan(P, Inputs, newtestplanname)
```

`Inputs` is a cell array with input information for each level. The input information can be specified as a cell array of `mbcmodel.modelinput` objects (one for each level), or as a cell array of cell arrays (one for each level).

Examples

To create a test plan using a test plan template, enter:

```
T = CreateTestplan(P1, 'd:\MBCwork\TQtemplate1', 'newtestplan')

testplan = CreateTestplan(P, 'example_testplan')
```

To create a test plan using inputs per level, enter:

```
T = P.CreateTestplan([1,2])
```

To specify the input information in a cell array of `mbcmodel.modelinput` objects, enter:

```
% Define Inputs for test plan
LocalInputs = mbcmodel.modelinput('Symbol','S',...
    'Name','SPARK',...
    'Range',[0 50]);
GlobalInputs = mbcmodel.modelinput('Symbol',{'N','L','ICP',...
'ECP'},'Name',{'SPEED','LOAD','INT_ADV','EXH_RET'},...
    'Range',{[500 6000],[0.0679    0.9502],[-5 50],[-5 50]});
% create test plan
testplan = CreateTestplan( project, {LocalInputs,...
GlobalInputs} );
```

Or

```
T = P.CreateTestplan({LocalInputs,GlobalInputs})
```

To specify the input information in a cell array, enter:

```
localInputs = {'S',0,50,'','SPARK'};
globalInputs = {'N',   800, 5000, '', 'ENGSPEED'
```

```
                    'L',   0.1,    1, '', 'LOAD'
                    'EXH',  -5,   50, '', 'EXHCAM'
                    'INT',  -5,   50, '', 'INTCAM'};

  T = CreateTestplan(P,{localInputs,globalInputs});
```

See Also

AttachData, CreateResponse, Responses, Data, Levels, InputSignalNames, InputsPerLevel, Inputs, modelinput

Purpose

Array of data objects in project or test plan

Syntax

```
allD = project.Data
allD = testplan.Data
```

Description

This is a property of `mbcmodel.project` and `mbcmodel.testplan`.

It returns an array of `mbcmodel.data` objects. There may be many data objects in a project, but a test plan can only have one or none.

Examples

```
allD = P.Data;
```

For a project object `P`, this example returns an `nx1` array of all the data objects.

```
allD = T.Data;
```

For the test plan object T, this example returns a `1x1` array if the test plan has a data object attached, and `0x1` otherwise.

See Also

`CreateData`, `RemoveData`, `CopyData`

DataFileTypes

Purpose

Data file types

Syntax

```
f = mbcmodel.DataFileTypes
```

Description

This is a function to return a list of data file types for `mbcmodel`.

Examples

```
f = mbcmodel.DataFileTypes

f =

  Columns 1 through 4
    'Excel file'    'FT/DB data files'    'Delimited Text File'
  [1x25 char]
  Column 5
    'MATLAB Data File'
```

See Also

`ImportFromFile`, `CreateData`

Purpose

Default models for test plan

Syntax

```
testplan.DefaultModels
```

Description

This is a read-only property of `mbcmodel.testplan`. It returns a cell array of `mbcmodel.model` objects (one array for each stage).

Examples

To get the default model objects for use in creating a response, enter:

```
mdls = T.DefaultModels
LocalModel = CreateModel(mdl{1}, 'Local Polynomial Spline');
GlobalModel = CreateModel(mdl{2}, 'RBF');
R = CreateResponse(T, 'TQ', LocalModel, GlobalModel, 'Maximum')
```

See Also

`CreateResponse`; `modelinput`

DefineNumberOfRecordsPerTest

Purpose

Define exact number of records per test

Syntax

```
D = DefineNumberOfRecordsPerTest(D, number, testnumAlias)
```

Description

This is a method of `mbcmodel.data`.

You can use this to set one test per record for one-stage modeling.

`number` is the input specifying the number of records to include in each test. Most usually this will be used to specify one test per record.

`testnumAlias` is an optional string input to define the `SignalName` that should be used as the testnumber within MBC. Defaults to the index of the test.

Note `testnumaAias` uses the first record in the test as the testnumber, and testnumbers *are* unique so any duplicates will be modified.

Examples

```
DefineNumberOfRecordsPerTest(D, 1);
DefineNumberOfRecordsPerTest(D, 10, 'MYLOGNO');
```

See Also

`DefineTestGroups`

Purpose

Define rule-based test groupings

Syntax

```
D = DefineTestGroups(D, variables, tolerances, testnumAlias,
reorder)
```

Description

This is a method of `mbcmodel.data`.

You can impose rules to collect records of the current data set (`D`) into groups; these groups are referred to as **tests**. Test groupings are used to define hierarchical structure in the data for two-stage modeling.

Select a variable or variables to group by and set `tolerances`. The tolerance is used to define groups: on reading through the data, when the value of any specified variable changes by more than the tolerance, a new group is defined.

`variables` is the input cell array of strings holding the `SignalNames` on which to define the test groupings.

`tolerances` is the input double array of the same length as variables holding the required tolerances for the test grouping definition.

`testnumAlias` is an optional string input to define the `SignalName` that should be used as the testnumber within MBC. Defaults to the index of the test.

Note `testnumAlias` uses the first record in the test as the testnumber, and testnumbers *are* unique so any duplicates will be modified.

`reorder` is an optional Boolean indicating that the data should be reordered within the data set. Defaults to `false`.

See the section on Test Groupings (under Data) in the Model Browser User's Guide for more information on these inputs.

Examples

```
DefineTestGroups(D, {'AFR' 'RPM'}, [0.1 30], 'MYLOGNO', false);
```

See Also

`DefineNumberOfRecordsPerTest`, `NumberOfTests`

Purpose

Designs in test plan

Syntax

```
D = T.Designs
```

Description

`Designs` is a property of `mbcmodel.testplan`.

`D = T.Designs` returns a cell array of designs in the test plan, `T`, one element for each level.

When using designs at the command line, designs are treated as an array. In the Design Editor you can build a design tree, where child designs inherit characteristics such as constraints from the parent design. At the command line you can copy and modify designs. By default, designs are added to the top level of the design tree. To build tree structures at the command line, you can use the `Parent` argument of the `AddDesign` method to specify the parent design in the design tree. The tree structure cannot be used at the command line any further, but you can use the design tree in the Design Editor after you load the project into the Model Browser.

Examples

To get local designs only:

```
LocalDesigns = T.Designs{1}
```

To get global designs only:

```
GlobalDesigns = T.Designs{2}
```

To get the fifth global design:

```
D = T.Design {2}(5)
```

After modifying the design, you must call `UpdateDesign`, or reassign to the test plan as follows:

T.Design {2}(5) = D

See Also

`UpdateDesign`

DetachData

Purpose

Detach data from test plan

Syntax

```
T = DetachData(T)
```

Description

This is a method of `mbcmodel.testplan`.

`T` is the test plan object. A test plan can only use a single data set, so you do not need to specify the data object.

Examples

```
DetachData(T1);
```

See Also

`AttachData`

Purpose

Diagnostic statistics for response

Syntax

```
S = DiagnosticStatistics(R, TestNumbers, Stats)
```

Description

This is a method of the local and response model objects, `mbcmodel.localresponse` and `mbcmodel.response`.

The options available are model-specific and are the same options shown in the drop-down menus of the scatter plots (the top plots) in the local and global (response feature) model views of the toolbox GUI.

`S` is a structural array containing `Statistics` and `Names` fields.

`R` is the response model object.

`Testnumbers` specifies the index into tests for local or hierarchical models.

`Stats` is an optional input that defines which diagnostic statistics you want from the available list. If you don't specify `Stats`, you get all available statistics.

A row is set to `NaN` if that point is removed.

Examples

```
studentRes = DiagnosticStatistics(local, tn, 'Studentized
residuals');
```

See Also

`SummaryStatistics`, `AlternativeModelStatistics`

Discrepancy

Purpose

Discrepancy value

Syntax

```
s = Discrepancy(D)
```

Description

`Discrepancy` is a method of `mbcdoe.design`.

`s = Discrepancy(D)` returns the discrepancy, which is a measure of the deviation from the average point density. `Discrepancy` is defined over the unconstrained design and is only available for space-filling designs.

See Also

`Maximin`; `Minimax`

Purpose

Data being used as input to model

Syntax

```
X = DoubleInputData(R, TestNumber)
```

Description

This is a method of all model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse` and `mbcmodel.response`. It returns an array (`X`) containing the input data used for fitting the model.

`R` is the response model object.

`TestNumber` is an optional input to specify the tests you want.

Examples

```
X = DoubleInputData(R);
x = DoubleInputData(local, tn);
```

See Also

`DoubleResponseData`

DoubleResponseData

Purpose

Data being used as output to model for fitting

Syntax

```
Y = DoubleResponseData(R, TestNumber)
```

Description

This is a method of all model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse` and `mbcmodel.response`. It returns an array (`Y`) containing the response data used for fitting the model.

`R` is the response model object.

`TestNumber` is an optional input to specify the tests you want.

Examples

```
Y = DoubleResponseData(R);
y = DoubleResponseData(local, tn);
```

See Also

`DoubleInputData`

Purpose

Evaluate model or design constraint

Syntax

```
Y = Evaluate(M, X)
Y = Evaluate(C, X)
```

Description

This is a method of `mbcmodel.model` and `mbcdoe.designconstraint`.

`Y = Evaluate(M, X)` evaluates the model M at X.

`Y = Evaluate(C, X)` evaluates the design constraint C at X (negative results are within the constraint).

`X` is a (*numpoints*-by-*nfactors*) array.

`Y` is a (*numpoints*-by-1) array.

See Also

`PredictedValue`, `PEV`

Export

Purpose

Make command-line or Simulink export model

Syntax

```
ExportedModel = Export(MODEL)
ExportedModel = Export(MODEL, Format)
```

Description

This is a method of these model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse`, `mbcmodel.response` and `mbcmodel.model`.

`ExportedModel = Export(MODEL)` exports the model to MATLAB® software.

`ExportedModel = Export(MODEL, Format)` exports the model in the specified format, which can be `'MATLAB'` or `'Simulink'`.

`Format` must be `'MATLAB'` or `'Simulink'`; an error will be thrown if this is incorrect.

You can evaluate models exported to the MATLAB workspace in the same way as when you export them from the Model Browser. You can save these models as a `*.mat` file and load them into CAGE.

`Model` is the object containing the response models from the node you are exporting from.

Examples

```
M = Export(R2, 'MATLAB');
mbt_model = Export(maxTQ, 'MATLAB');
```

Purpose

Export data to MBC data structure

Syntax

```
mbcStruct = ExportToMBCDataStructure (D)
```

Description

This is a method of `mbcmodel.data`.

It converts the specified data object (`D`) to the MBC Data Structure format.

An MBC Data Structure is a structure array that contains the following fields:

- `varNames` is a cell array of strings that hold the names of the variables in the data (`1xn` or `nx1`).
- `varUnits` is a cell array of strings that hold the units associated with the variables in varNames (`1xn` or `nx1`). This array can be empty, in which case no units are defined.
- `data` is an array that holds the values of the variables (`m x n`).
- `comment` is an optional string holding comment information about the data.

For more information see the Data Loading Function section (under Data) in the Model Browser User's Guide ("Data Loading Application Programming Interface"). See also `mbccheckindataloadingfcn` to specify your own data loading function.

Examples

```
X = ExportToMBCDataStructure(D1);
```

See Also

`ImportFromMBCDataStructure`

Filename

Purpose Full path to project file

Syntax `Name = P.Filename`

Description This is a property of `mbcmodel.project`.

Examples

```
Name = P.Filename;
```

Purpose

Structure array holding user-defined filters

Syntax

```
filt = D.Filters
```

Description

This is a property of `mbcmodel.data`.

It returns a structure array holding information about the currently defined filters. The array will be the same length as the number of currently defined filters, with the following fields for each filter:

- `Expression` — The string expression as defined in `AddFilter` or `ModifyFilter`
- `AppliedOK` — Boolean indicating that the filter was successfully applied
- `RemovedRecords` — Boolean vector indicating which records the filter removed. Note that many filters could remove the same record
- `Message` — String holding information on the success or otherwise of the filter

Examples

```
filt = D.Filters;
```

See Also

`AddFilter`, `ModifyFilter`, `RemoveFilter`

FindDesign

Purpose

Find design by name

Syntax

```
D = FindDesign(T,Name)
D = FindDesign(T,Level,Name)
```

Description

FindDesign is a method of `mbcmodel.testplan`.

`D = FindDesign(T,Name)` finds a design with a matching name from the test plan `T`.

`Name` is a string or a cell array of strings specifying a design name.

`Level` is the test plan level. By default the level is the outer level (i.e., Level 1 for one-stage, Level 2 (global) for two-stage).

`D = FindDesign(T,Level,Name)` finds a design with a matching name from the specified level of the test plan.

Purpose

Fit algorithm for model

Syntax

```
F = M.FitAlgorithm
```

Description

This is a property of `mbcmodel.model`.

An mbcmodel.model.FitAlgorithm object is contained within the FitAlgorithm property of an mbcmodel.model object. This object has a Name property, and the following methods: CreateAlgorithm, getAlternativeNames, IsAlternative, SetupDialog, properties.

Examples

To get a fitalgorithm object, F, from a model:

```
M = mbcmodel.CreateModel('Polynomial', 4);
F = M.FitAlgorithm

F =
Algorithm: Least Squares
Alternatives: 'Minimize PRESS','Forward Selection','Backward
Selection','Prune'
1x1 struct array with no fields.
```

See Also

`CreateAlgorithm`, `getAlternativeNames`, `IsAlternative`, `SetupDialog`.

Fit

Purpose

Fit model to new or existing data, and provide summary statistics

Syntax

```
[statistics, model] = Fit(model, X, Y)
[statistics, model] = Fit(model)
```

Description

This is a method of `mbcmodel.model`.

`[statistics, model] = Fit(model, X, Y)` This fits the model to the specified data. After you have called `Fit` specifying the data to use, then you can refit the model by calling `[statistics, model] = Fit(model)`

The statistics returned are defined by the summary statistics for the response object the model came from. To see these call `SummaryStatistics`. These are the statistics that appear in the Summary Statistics pane of the Model Browser GUI. The statistics returned depend on the model type.

For a linear model, the statistics are:

'Observations','Parameters','Box-Cox','PRESS RMSE','RMSE'.

For a neural network model:

'Observations','Parameters', 'Box-Cox','RMSE', 'R^2'.

Examples

```
statistics = Fit(knot)
statistics =
   27.0000    7.0000    1.0000    3.0184    2.6584
```

See Also

`SummaryStatistics`, `UpdateResponse`

Purpose

Fix design points

Syntax

```
D = FixPoints(D)
D = FixPoints(D,indices)
```

Description

`FixPoints` is a method of `mbcdoe.design`.

`D = FixPoints(D)` fixes all points in the design.

`D = FixPoints(D,indices)` fixes all points specified by `indices`.

See Also

`PointTypes`; `RemovePoints`

Generate

Purpose

Generate new design points

Syntax

```
D = Generate(D)
D = Generate(D,NumPoints)
D = Generate(D,'Prop1',value1,...)
```

Description

`Generate` is a method of `mbcdoe.design`. The `Generate` method always generates a new design and replaces the existing points (fixed or free).

`D = Generate(D)` regenerates the design with the current generator settings (the current design properties and current number of points). It is possible that a different design will result (e.g., for Latin Hypercube Sampling designs).

`D = Generate(D,NumPoints)` generates the number of points specified by `NumPoints` using the current generator settings. You cannot specify the number of points for all design types (e.g., Central Composite, Box Behnken) and therefore the `NumPoints` second input is not supported for all design types.

`D = Generate(D,'Prop1',value1,...)` generates a new design with the generator specified by the generator property value pairs.

You can use the property value pairs to specify design generator properties (such as the design Type) as part of the Generate command, e.g.,

```
C = OptDesign.CreateCandidateSet(OptDesign,...
       'Type', 'Grid',...
       'NumberOfLevels',[21 21 21]);

OptDesign = Generate(OptDesign,...
    'Type','V-optimal',...
    'CandidateSet',C,...
    'MaxIterations',200,...
    'NoImprovement', 50,...
    'NumberOfPoints',200);
```

This is equivalent to the following code setting the properties individually and then assigning the updated generator object to the design:

```
P = OptDesign.Generator;
P.Type = `V-optimal';
P.CandidateSet.NumberOfLevels(:)=21;
P.MaxIterations = 200;
P.NumberOfPoints = 200;
P.NoImprovement = 50;
OptDesign.Generator = P;
```

You see an error if you try to call `Generate` when the design `Style` is User-defined or Experimental data.

For space-filling designs, see also `ConstrainedGenerate`.

Examples

To generate a design with 10 points:

```
d = Generate( d, 10 );
```

Note The design `Type` must have a writeable property `'NumberOfPoints'` to use this syntax `D = Generate(D,NumPoints)`. See `Type (for designs and generators)`.

To create and generate a 15 point latin hypercube sampling design:

```
globalDesign = TP.CreateDesign(2, 'Type',...
 'Latin Hypercube Sampling');
globalDesign = Generate(globalDesign, 15)
```

To regenerate the design and get a different 15 point latin hypercube sampling design:

```
globalDesign = Generate(globalDesign);
```

To create and generate a halton design with 50 points:

```
haltonDesign = CreateDesign( inputs, 'Type',...
 'Halton Sequence', 'Name', 'Halton' );
haltonDesign = Generate( haltonDesign, 'NumberOfPoints', 50 );
```

To create and generate a halton design with specified scrambling and other properties:

```
haltonDesignWithScrambling = haltonDesign.CreateDesign...
( 'Name', 'Scrambled Halton' );
haltonDesignWithScrambling = Generate...
(haltonDesignWithScrambling,
 'Scramble', 'RR2', 'PrimeLeap', true );
```

To create a full factorial design and specify the number of levels when generating the design:

```
design = CreateDesign( inputs, 'Type', 'Full Factorial' );
design = Generate( design, 'NumberOfLevels', [50 50] );
```

See Also

`Augment`; `CreateDesign`; `ConstrainedGenerate`

Purpose

Design generation options

Syntax

```
D.Generator
D.Generator = NewGenerator
```

Description

`Generator` is a property of `mbcdoe.design`.

`D.Generator` returns an `mbcdoe.generator` object.

`D.Generator = NewGenerator` generates a new design based on the new design generator. Design generators provide the properties for all the design types.

The properties you can set depend on the design `Type`. To view the properties for generating designs, see `Properties (for design generators)`.

Use `getAlternativeTypes` to get a list of alternative generators.

See Also

`Generate`; `Properties (for design generators)`; `Type (for designs and generators)`; `getAlternativeTypes`.

GetAllTerms

Purpose

List all model terms

Syntax

```
Terms = M.Properties.GetAllTerms
```

Description

This is a method of `mbcmodel.linearmodelproperties`.

`Terms = M.Properties.GetAllTerms` returns a list of all terms in this model. `M` is an `mbcmodel.linearmodel` object.

`Terms` is a (*numterms*-by-*nfactors*) array. The $(m,n)^{\text{th}}$ element is the power of the n^{th} factor in the m^{th} term.

Examples

The following example creates a model, and finds which terms are quadratic in the first input factor (X1):

```
mdl = mbcmodel.CreateModel('Polynomial', 2)

mdl =

   1 + 2*X1 + 8*X2 + 3*X1^2 + 6*X1*X2 + 9*X2^2 + 4*X1^3
     + 5*X1^2*X2 + 7*X1*X2^2 + 10*X2^3
   InputData: [0x2 double]
   OutputData: [0x1 double]
   Status: Not fitted
   Linked to Response: <not linked>

>>terms = mdl.Properties.GetAllTerms;
>>x1quadraticterms = find(terms(:,1)==2)

x1quadraticterms =

     4
     8
```

See Also

`GetIncludedTerms`

Purpose

List alternative algorithm names

Syntax

```
F.getAlternativeNames
AltList = getAlternativeNames(F)
```

Description

This is a method of `mbcmodel.fitalgorithm`.

`F.getAlternativeNames` or `AltList = getAlternativeNames(F)` return a cell array of alternative algorithm names. `F` is a `mbcmodel.fitalgorithm` object.

Examples

```
mdl = mbcmodel.CreateModel('Polynomial', 2);
F = mdl.FitAlgorithm;
altAlgs = F.getAlternativeNames

altAlgs =

    'Least Squares'    'Minimize PRESS'    'Forward Selection'
'Backward Selection'    'Prune'
```

See Also

`CreateAlgorithm`, `IsAlternative`

getAlternativeTypes

Purpose

Alternative model or design types

Syntax

```
list = getAlternativeTypes(Model)
list = getAlternativeTypes(Design)
list = getAlternativeTypes(Design,Style)
list = getAlternativeTypes(DesignGenerator)
list = getAlternativeTypes(DesignGenerator,Style)
list = getAlternativeTypes(CandidateSet)
list = getAlternativeTypes(DesignConstraint)
```

Description

This is a method of `mbcmodel.model`, and all the design objects: `mbcdoe.design`, `mbcdoe.generator`, `mbcdoe.candidateset`, and `mbcdoe.designconstraint`.

Models

`list = getAlternativeTypes(Model)` returns a cell array of alternative model types with the same number of inputs as `Model`.

Designs

`list = getAlternativeTypes(Design)` returns a list of design types which could be used as alternative designs for current design.

`list = getAlternativeTypes(Design,Style)` returns a list of design types of the specified style. The design style must be one of `'Space-Filling'`, `'Classical'` or `'Optimal'`.

Design Generators

`list = getAlternativeTypes(DesignGenerator)` returns a list of design generator types which could be used as alternative designs for current design generator.

`list = getAlternativeTypes(DesignGenerator,Style)` returns a list of design generator types of the specified style. The design generator style must be one of `'Candidate Set'`,`'Space-Filling'`, `'Classical'` or `'Optimal'`.

Design Candidate Sets

`list = getAlternativeTypes(CandidateSet)` is a list of candidate set types which could be used as alternative candidate sets for the current candidate set. The candidate set can be obtained from an optimal design generator or using `mbcdoe.design.CreateCandidateSet`.

Design Constraints

`list = getAlternativeTypes(DesignConstraint)` returns a list of design constraint types.

Examples

```
mdl = mbcmodel.CreateModel('RBF', 2);
altmodels = getAlternativeTypes(mdl)
```

This produces the output:

```
altmodels =

 Columns 1 through 6

  'Polynomial' 'Hybrid Spline' 'RBF' 'Polynomial-RBF' 'Hybrid Splin
 'Multiple Linear'

 Columns 7 through 8

  'Neural Network' 'Transient'
```

See Also

`Type (for models)`, `CreateModel`

GetIncludedTerms

Purpose

List included model terms

Syntax

```
Terms = M.Properties.GetIncludedTerms
```

Description

This is a method of `mbcmodel.linearmodelproperties`.

`Terms = M.Properties.GetIncludedTerms` returns a list of those terms that will be used to fit the model. `M` is an `mbcmodel.linearmodel` object.

`Terms` is a (*numincludedterms*-by-*nfactors*) array. The $(m,n)^{th}$ element is the power of the n^{th} factor in the m^{th} included term.

Examples

```
>>mdl = mbcmodel.CreateModel('Polynomial', 2);


>>includedterms = mdl.Properties.GetIncludedTerms;
>>x1quadraticterms = find(includedterms(:,1)==2)

x1quadraticterms =

     4
     8
```

See Also

`GetAllTerms`, `SetTermStatus`

Purpose

List labels for model terms

Syntax

```
Labels = M.Properties.GetTermLabel
Labels = M.Properties.GetTermLabel( Terms )
Labels = M.Properties.GetTermLabel( Terms, 'Format',
   OutputFormat )
```

Description

This is a method of `mbcmodel.linearmodelproperties`, which returns a user-friendly label for one or more specified terms.

`Labels = M.Properties.GetTermLabel`

`Labels = M.Properties.GetTermLabel( Terms )`

`Labels = M.Properties.GetTermLabel( Terms, 'Format', OutputFormat )`

`M` is an `mbcmodel.linearmodel` object.

The specified terms form a row where each value gives the power of that parameter. `OutputFormat`

can be `'List'` or `'Formula'`.

Examples

```
mdl = mbcmodel.CreateModel('Polynomial', 2);
mdl.Properties.GetTermLabel([1 2; 1 0] )
```

produces `{'X1*X2^2';'X1'}` and

```
mdl.Properties.GetTermLabel([1 2; 1 0], 'Format', 'Formula' )
```

produces `'X1*X2^2 + X1'`.

See Also

`GetAllTerms`, `GetIncludedTerms`

GetTermStatus

Purpose

List status of some or all model terms

Syntax

```
Status = M.Properties.GetTermStatus
Status = M.Properties.GetTermStatus(Terms)
```

Description

This is a method of `mbcmodel.linearmodelproperties`.

`Status = M.Properties.GetTermStatus` returns the status of all of the terms in this model. `Status` is a cell array of status strings. `M` is an `mbcmodel.linearmodel` object.

`Status = M.Properties.GetTermStatus(Terms)` returns the status of the specified terms in this model.

The stepwise status for each term can be 'Always', 'Never' or 'Step'. The status determines whether you can use the StepwiseRegression function to throw away terms in order to try to improve the predictive power of the model.

Examples

```
mdl = mbcmodel.CreateModel('Polynomial', 2);
```

Get status of $X2^3$ term:

```
status = mdl.Properties.GetTermStatus([0 3])

status =

    'Step'
```

Get status of all terms linear in X1:

```
status = mdl.Properties.GetTermStatus([1 0; 1 1; 1 2])

status =

    'Step'
    'Step'
    'Step'
```

See Also SetTermStatus, StepwiseStatus

ImportFromFile

Purpose

Load data from file

Syntax

```
D = ImportFromFile(D, filename, filetype)
```

Description

This is a method of the `mbcmodel.data` object.

First you must use `CreateData`, than `BeginEdit` before you can call ImportFromFile to bring data into your new data object, `D`.

Note that you can specify `filename` and `filetype` when you call `CreateData` as a shortcut for loading data from a file. You still need to call `BeginEdit` before you can make changes to the data.

`filename` is a string holding the full path to the file to load.

`filetype` is an optional file type to load. See `DataFileTypes` for the specification of the allowed file types (and `mbccheckindataloadingfcn` to specify your own data loading function).

Filetype defaults to '`auto`' which will attempt to guess the filetype based on the extension of the file being loaded. i.e. if the file extension is .xls then MBC will try the Excel File Loader.

Examples

```
ImportFromFile(D, 'D:\MBCData\Raw Data\testdata.xls');
```

See Also

`CreateData`, `DataFileTypes`, `BeginEdit`, `ImportFromMBCDataStructure`, `RemoveData`, `Append`

Purpose

Load data from MBC data structure

Syntax

```
D = ImportFromMBCDataStructure(D, mbcStruct)
```

Description

This is a method of `mbcmodel.data`.

First you must use `CreateData`, than `BeginEdit` before you can bring data into your new data object.

An MBC Data Structure is a structure array that contains the following fields:

- `varNames` is a cell array of strings that hold the names of the variables in the data (`1xn` or `nx1`).
- `varUnits` is a cell array of strings that hold the units associated with the variables in varNames (`1xn` or `nx1`). This array can be empty, in which case no units are defined.
- `data` is an array that holds the values of the variables (`m x n`).
- `comment` is an optional string holding comment information about the data.

For more information see the Data Loading Function section (under Data) in the *Model Browser User's Guide* ("Data Loading Application Programming Interface"), and see also `mbccheckindataloadingfcn` to specify your own data loading function.

Examples

```
ImportFromMBCDataStructure(D, mbcStruct);
```

See Also

`ImportFromFile`, `CreateData`, `BeginEdit`, `RemoveData`, `Append`, `ExportToMBCDataStructure`

InputData

Purpose

Input data for model

Syntax

```
D = M.InputData
```

Description

This is a property of `mbcmodel.model`. It returns an array of the input variable data currently in the model.

Examples

```
D = knot.InputData;
```

See Also

`OutputData`

Purpose

Inputs for test plan, model, design or constraint

Syntax

```
testplan.Inputs
model.Inputs
design.Inputs
```

Description

This is a property of `mbcmodel.testplan`, `mbcmodel.model`, `mbcdoe.design` and `mbcdoe.designconstraint`.

For `mbcmodel.testplan`, this property returns a cell array of `mbcmodel.modelinput` objects (one array for each stage). You cannot change the number of stages after creation of the test plan.

For `mbcmodel.model`, this property returns an `mbcmodel.modelinput` object. It is not editable when attached to a response. You cannot change number of inputs after creation.

In both cases, verification of valid variable names and symbols occurs before assigning inputs to model at the command line. Names and Symbols must be unique.

For `mbcdoe.design`, `D.Inputs = NewInputs` updates the inputs.

The number of design inputs cannot be changed. Many designs have `Limits` properties in addition to model input ranges. These properties allow you to restrict the range of the design without changing the model or losing points via a constraint.

See Also

`CreateTestplan`, `modelinput`

InputSetupDialog

Purpose

Open Input Setup dialog box to edit inputs

Syntax

```
[NEWMODEL, OK] = InputSetupDialog(OLDMODEL)
[NEWTESTPLAN, OK] = InputSetupDialog(OLDTESTPLAN)
```

Description

This is a method of `mbcmodel.model` and `mbcmodel.testplan`.

`[NEWMODEL, OK] = InputSetupDialog(OLDMODEL)` opens the Input Setup dialog box, where you can edit the model inputs (names, symbols, and ranges).

`[NEWTESTPLAN, OK] = InputSetupDialog(OLDTESTPLAN)` opens the Input Setup dialog box, where you can edit the test plan inputs (names, symbols, and ranges).

If you click **Cancel** to dismiss the dialog box, `OK = false` and `NEWMODEL = OLDMODEL`. If you click **OK** to close the dialog box, then `OK = true` and `NEWMODEL` is your new chosen model setup. The new model is refitted when you click OK.

Purpose

Names of signals in data that are being modeled

Syntax

```
inputs = A.InputSignalNames
```

Description

This is a property of `mbcmodel.testplan` and the modeling objects `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse` and `mbcmodel.response`.

`A` can be a test plan (`T`) or model (`L`, `R`, `HR`) object.

Examples

```
inputs =  T.'InputSignalNames;

InputFactors = thisRF.InputSignalNames';
```

See Also

`SignalNames`

InputsPerLevel

Purpose

Number of inputs at each level in model

Syntax

```
L = T.InputsPerLevel
```

Description

This is a property of `mbcmodel.testplan`.

This is a vector of length `Levels`. Each element defines the number of inputs at that level. See "Understanding Model Structure" for an explanation of the levels in a test plan.

Examples

```
L = T.InputsPerLevel
L =
  2  4
```

This answer means the test plan `T` has 2 local inputs and 4 global inputs.

See Also

`Levels`, `Level`

Purpose

Test alternative fit algorithm

Syntax

```
OK = IsAlternative(F1, F2)
```

Description

This is a method of `mbcmodel.fitalgorithm`.

`OK = IsAlternative(F1, F2)` tests whether F is an alternative `mbcmodel.fitalgorithm` for F1.

See Also

`CreateAlgorithm`, `getAlternativeNames`

IsBeingEdited

Purpose

Boolean signaling if data or model is being edited

Syntax

```
OK = D.IsBeingEdited
```

Description

This is a property of `mbcmodel.data` and `mbcmodel.model`.

This Boolean property indicates that the data or model is currently being edited.

For data, it also indicates that previously there was a successful call to `BeginEdit` and hence that whatever changes have been applied can be undone by calling `RollbackEdit`. It does not indicate that a call to `CommitEdit` will necessarily succeed. See `CommitEdit` for an example of this case.

Examples

```
OK = D.IsBeingEdited;

OK = knot.IsBeingEdited;
```

See Also

`BeginEdit`, `IsEditable`, `CommitEdit`, `RollbackEdit`

Purpose

Boolean signaling whether data is editable

Syntax

```
OK = D.IsEditable
```

Description

This is a property of `mbcmodel.data`.

This Boolean property indicates if a particular piece of data is editable. The following rules apply:

- If the data was created using `mbcmodel.CreateData` and was not `Attach`ed to a test plan it is editable.
- If the data was created or retrieved from the project and was not `Attach`ed to a test plan it is editable.
- If the data was `Attach`ed to a test plan and was subsequently retrieved from that test plan it is editable.

Examples

```
D  = p.Data;
D1 = p.Data;
BeginEdit(D1);
tp = p.Testplan;
Attach(tp, D);
```

Where `p` is an `mbcmodel.project` object, and `D` and `D1` are `mbcmodel.data` objects.

At this point `D1.IsEditable` becomes false because `D1` is now `Attach`ed to the test plan and hence can only be modified from the test plan. If you now enter:

```
OK = D1.IsEditable
```

the answer is `false`.

See Also

`BeginEdit`, `IsBeingEdited`, `CommitEdit`, `RollbackEdit`

Jacobian

Purpose

Calculate Jacobian matrix for model at existing or new X points

Syntax

```
J = Jacobian(model, optional X)
```

Description

This is a method of `mbcmodel.model`.

This calculates the Jacobian matrix for the model at existing or new X points. If X is not specified then the existing data is used. The Jacobian is the regression matrix for linear models and RBF models.

The Jacobian matrix (for linear and RBF models) is the same as the Regression Matix in the Design Evaluation Tool GUI. These matrices only include the terms currently selected in the model.

If all terms are included (none removed by Stepwise) then the Jacobian (for linear and RBF models) is the same as the Full FX matrix found in the Design Evaluation Tool GUI. The Jacobian matrix only includes the currently selected model terms.

To determine the condition number, use the MATLAB command `cond(J)`.

Examples

```
J = Jacobian(knot),
```

Purpose

Level in test plan of response

Syntax

```
level = R.Level
```

Description

This is a property for all model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse` and `mbcmodel.response`.

`R` is the response for which you want the level.

The level is usually 0 for hierarchical models, usually 1 for local models, and usually 2 or 1 for response models. See "Understanding Model Structure" for an explanation of what `Level` indicates about a response.

Examples

```
level = R.Level;
```

See Also

`Levels`

Levels

Purpose

Number of levels in hierarchical model

Syntax

```
levels = T.'Levels
```

Description

This is a property of `mbcmodel.testplan`.

See “Understanding Model Structure” for an explanation of what `Levels` mean.

Examples

```
levels = T.Levels;
```

See Also

`Level`

Purpose

Load existing project file

Syntax

```
P = Load(P, Filename)
```

Description

This is a method of `mbcmodel.project`.

`P` is a project object, and `Filename` is the full path to the project you want to load.

Examples

```
P2 = Load(P2, 'D:/MBCwork/TQproject2.mat');
```

See Also

`New`

LoadProject

Purpose

Load mbcmodel.project

Syntax

```
P = MBCMODEL.LOADPROJECT( FILENAME )
```

Description

`P = mbcmodel.LoadProject( FILENAME )` loads a `mbcmodel.project` from the file FILENAME.

See Also

`CreateProject`, `Load`

Purpose

Edit local model properties

Syntax

```
Props = localmodel.Properties
```

Description

This is a property of the `mbcmodel.localmodel` object, which is a subclass of mbcmodel.model.

See "Understanding Model Structure" for an explanation of the relationship between the different response types.

Every local model object has an mbcmodel.modelproperties object (within the Properties property). In this object, each local model type has specific properties, as described in the following tables.

Local Polynomial Properties

Property	Description
Order	Polynomial order (vector int: {[0,Inf],2})
InteractionOrder	Maximum order of interaction terms (int: [0,Inf])
TransformInputRange	Transform inputs (Boolean)
ParameterNames	List of parameter names (read-only)
StepwiseStatus	Stepwise status `{'Always','Never','Step'}` (cell)
Transform	Transform function (char) or empty (`''`)

Local Polynomial Properties (Continued)

Property	Description
CovarianceModel	Covariance Model (enum: `{'None','Power', 'Exponential','Mixed'}`)
CorrelationModel	Correlation Model (enum: `{'None','MA(1)','AR(1)', 'AR(2)'}`)

Local Hybrid Spline Properties

Property	Description
Order	Spline and polynomial order (vector int: `{[0,3],2}`)
SplineVariable	Spline variable
SplineInteraction	Order of interaction between spline and polynomial (int: `[0,3]`)
Knots: Position of knots (vector real)	ParameterNames: List of parameter names (read-only)
StepwiseStatus	Stepwise status `{'Always','Never','Step'}` (cell)
Transform	Transform function (char) or empty (`''`)
CovarianceModel	Covariance Model (enum: `{'None','Power', 'Exponential','Mixed'}`)
CorrelationModel	Correlation Model (enum: `{'None','MA(1)','AR(1)', 'AR(2)'}`)

Local Polynomial Spline Properties

Property	Description
HighOrder	Polynomial order above knot (int: `[2,Inf]`)
LowOrder	Polynomial order below knot (int: `[2,Inf]`)
Transform	Transform function (char) or empty (`''`)
CovarianceModel	Covariance Model (enum: `{'None','Power', 'Exponential','Mixed'}`)
CorrelationModel	Correlation Model (enum: `{'None','MA(1)','AR(1)', 'AR(2)'}`)
DatumType	Datum Type (enum: `{'None','Maximum','Minimum', 'Linked'}`)

Local Polynomial With Datum Properties

Property	Description
Order	Polynomial order (int: `[0,Inf]`)
Transform	Transform function (char) or empty (`''`)
CovarianceModel	Covariance Model (enum: `{'None','Power', 'Exponential','Mixed'}`)

Local Polynomial With Datum Properties (Continued)

Property	Description
CorrelationModel	Correlation Model (enum: `{'None','MA(1)','AR(1)', 'AR(2)'})`
DatumType	Datum Type (enum: `{'None','Maximum','Minimum', 'Linked'})`

Local Free Knot Spline Properties

Property	Description
Order	Spline Order (int: `[0,Inf]`)
NumKnots	Number of knots (int: `'Positive'`)
Transform	Transform function (char) or empty (`''`)
CovarianceModel	Covariance Model (enum: `{'None','Power', 'Exponential','Mixed'})`
CorrelationModel	Correlation Model (enum: `{'None','MA(1)','AR(1)', 'AR(2)'})`

Local Truncated Power Series Properties

Property	Description
Order	Polynomial order (int: `'Positive'`)

Local Truncated Power Series Properties (Continued)

Property	Description
NumKnots	Number of knots (int: `'Positive'`)
Transform	Transform function (char) or empty (`''`)
CovarianceModel	Covariance Model (enum: `{'None','Power', 'Exponential','Mixed'}`)
CorrelationModel	Correlation Model (enum: `{'None','MA(1)','AR(1)', 'AR(2)'}`)

Local Growth Properties

Property	Description
Model	Growth model (enum: `{'expgrowth','gomp', 'logistic','logistic4', 'mmf','richards', 'weibul'}`)
AlternativeModels	List of growth models (read-only)
Transform	Transform function (char) or empty (`''`)
TransformBothSides	Transform both sides (Boolean)
CovarianceModel	Covariance Model (enum: `{'None','Power', 'Exponential','Mixed'}`)
CorrelationModel	Correlation Model (enum: `{'None','MA(1)','AR(1)', 'AR(2)'}`)

Local User-Defined Properties

Property	Description
Model	Name of user-defined model (enum: `{'exponential'}`)
AlternativeModels	List of registered user-defined models (read-only)
Transform	Transform function (char) or empty (`''`)
TransformBothSides	Transform both sides (Boolean)
CovarianceModel	Covariance Model (enum: `{'None','Power', 'Exponential','Mixed'}`)
CorrelationModel	Correlation Model (enum: `{'None','MA(1)','AR(1)', 'AR(2)'}`)

Local Transient Properties

Property	Description
Model	Name of transient model (enum: `{'fuelPuddle'}`)
AlternativeModels	List of registered transient models (read-only)
Transform	Transform function (char) or empty (`''`)
TransformBothSides	Transform both sides (Boolean)

Local Transient Properties (Continued)

Property	Description
CovarianceModel	Covariance Model (enum: `{'None','Power', 'Exponential','Mixed'}`)
CorrelationModel	Correlation Model (enum: `{'None','MA(1)','AR(1)', 'AR(2)'}`)

Local Multiple Models Properties

Property	Description
ModelCandidates	List of candidate models (cell)
SelectionStatistic	Selection statistic for automatic model selection (char)
AutomaticInputRanges	Use data range as model input ranges (Boolean)
Transform	Transform function (char) or empty (`''`)

Local Average Fit Properties

Property	Description
Model	[1x1 mbcmodel.linearmodel]
Transform	Transform function (char) or empty (`''`)

Examples

To create a local model object, create a model specifying any model Type that begins with the word “local”, e.g.,

```
L = mbcmodel.CreateModel('Local Polynomial',2);
```

To show properties, at the command line enter:

```
P = L.Properties

P =
Local Polynomial Properties
                  Order: [3 3]
       InteractionOrder: 3
    TransformInputRange: 1
         ParameterNames: {10x1 cell}
         StepwiseStatus: {10x1 cell}
              Transform: ''
        CovarianceModel: 'None'
       CorrelationModel: 'None'
```

To set the Order property to a quadratic, enter:

```
>> P.Order = [2,2]

P =
Local Polynomial Properties
                  Order: [2 2]
       InteractionOrder: 2
    TransformInputRange: 1
         ParameterNames: {6x1 cell}
         StepwiseStatus: {6x1 cell}
              Transform: ''
        CovarianceModel: 'None'
       CorrelationModel: 'None'
```

To update the local model, the properties object must be reassigned to the model as follows:

```
>> L.Properties = P

L =
```

```
1 + 2*X1 + 5*X2 + 3*X1^2 + 4*X1*X2 + 6*X2^2
InputData: [0x2 double]
OutputData: [0x1 double]
Status: Being Edited
Linked to Response: not linked
```

See Also

CreateModel, Type (for models), ResponseFeatures(Local Model)

LocalResponses

Purpose

Array of local responses for response

Syntax

```
local = response.LocalResponses
```

Description

This is a property of the `mbcmodel.hierarchicalresponse` object.

It returns the local model response objects that belong to the hierarchical response `R`.

See “Understanding Model Structure” for an explanation of the relationship between the different response types.

Examples

```
local = response.LocalResponses;
```

Purpose

Build two-stage model from response feature models

Syntax

```
OK = MakeHierarchicalResponse(L,MLE)
```

Description

This method of `mbcmodel.localresponse` builds a two-stage model from the response feature models and optionally runs MLE (Maximum Likelihood Estimation). If there are more response features than the number of parameters in the local model, the subset of response features that leads to the best hierarchical response is chosen. The best hierarchical response is chosen using `PRESS RMSE` (root mean square prediction error — see "PRESS statistic") if all the response feature models are linear. Otherwise, the best hierarchical response is chosen using `Two-stage RMSE`.

This performs a similar function to `ChooseAsBest` for response models. You can call `MakeHierarchicalResponse` directly or indirectly by calling `CreateAlternativeModels` for a local model. If you call `CreateAlternativeModels` for a local model, `MakeHierarchicalResponse` is called automatically.

If the local and response models are not ready to calculate a two-stage model, an error is generated. This situation can occur if you have created alternative models and not chosen the best. A sufficient number of response features models to calculate the two-stage model must be selected.

`L` is the local model object.

`MLE` can be `true` or `false`. If `true`, MLE will be calculated.

Examples

```
OK = MakeHierarchicalResponse(L, true)
```

See Also

`ChooseAsBest`

MatchInputs

Purpose

Match design constraint inputs

Syntax

```
C = MatchInputs(C,DesignInputs)
C = MatchInputs(C,DesignInputs,mapping)
```

Description

`MatchInputs` is a method of `mbcdoe.designconstraint`. Use it to match inputs for constraints from different sources.

`C = MatchInputs(C,DesignInputs)`

`C = MatchInputs(C,DesignInputs,mapping)` matches inputs where `mapping` defines the relationship between the inputs in `C`, and `DesignInputs`.

Examples

A design constraint does not have required inputs EXH_RET and INT_ADV. Use `MatchInputs` to match the constraint inputs to the design inputs as follows:

```
c = p.Testplans.BoundaryModel('all')
c =
Star(N-3.5e+003,L-0.54)

originalInputs=c.Inputs
originalInputs =
   SPEED (N) [rpm] [500,6000]
   LOAD (L) [%] [0.06,0.95]

designInputs = Design.Inputs
designInputs =
   SPEED (N) [rpm] [500,6000]
   LOAD (L) [%] [0.06,0.95]
   EXH_RET (ECP) [DegCrank] [-5,50]
   INT_ADV (ICP) [DegCrank] [-5,50]

c2=MatchInputs(c,designInputs,[1 2]);
newInputs=c2.Inputs
newInputs =
   SPEED (N) [rpm] [500,6000]
```

```
LOAD (L) [%] [0.06,0.95]
EXH_RET (ECP) [DegCrank] [-5,50]
INT_ADV (ICP) [DegCrank] [-5,50]
```

See Also

CreateConstraint

Maximin

Purpose

Maximum of minimum of distance between design points

Syntax

```
s = Maximin(D)
```

Description

`Maximin` is a method of `mbcdoe.design`.

`s = Maximin(D)` returns the maximum of the minimum distance between design points. `Maximin` is defined over the unconstrained design and is only available for space-filling design types.

See Also

`Minimax`

Purpose

Merge designs

Syntax

```
D = Merge(D1,D2,...)
```

Description

`Merge` is a method of `mbcdoe.design`.

`D = Merge(D1,D2,...)` merges the specified designs `D1`, `D2`, etc. into a single design `D`. The resulting design is a custom design `Style`.

See Also

`Style`; `Augment`

Minimax

Purpose

Minimum of maximum distance between design points

Syntax

```
s = Minimax(D)
```

Description

`Minimax` is a method of `mbcdoe.design`.

`s = Minimax(D)` returns the minimum of the maximum distance between design points. `Minimax` is defined over the unconstrained design and is only available for space-filling designs.

See Also

`Maximin`

Purpose

Model for design

Syntax

```
D.Model = NewModel
```

Description

`Model` is a property of `mbcdoe.design`.

`D.Model = NewModel` changes the model for the design to `NewModel`.

The number of inputs cannot be changed. Many designs have `Limits` properties in addition to model input ranges.

Setting this property changes optimal designs to `custom` if the new model does not support optimal designs.

See Also

`Inputs`

Model Object

Purpose

Model object within response object

Syntax

```
M = response.Model
```

Description

This is a property of all mbcmodel.response objects.

Each response contains a model object (`mbcmodel.model`) that can be extracted and manipulated independently of the project.

Extract a model object from any response object (see `Response`), and then:

- Fit to new data (`Fit`).
- Change model type, properties, and fit algorithm settings (`ModelSetup`, `Type (for models)`; `Properties (for models)`, `CreateAlgorithm`).
- Create a copy of the model with the same inputs (`CreateModel`).
- Include and exclude terms to improve the model (`StepwiseRegression`).
- Examine coefficient values, predicted values, and regression matrices (`ParameterStatistics`; `PredictedValue`; `Jacobian`).
- If you change the model you need to use `UpdateResponse` to replace the new model back into the response object in the project. When you use `UpdateResponse` the new model is fitted to the response data.

Examples

```
M = response.Model;
```

Purpose

Model for specified test

Syntax

```
mdl = ModelForTest(L,TestNo);
```

Description

This is a method of `mbcmodel.localresponse`.

```
mdl = ModelForTest(L,TestNo);
```

Examples

To get the model for test 22, enter:

```
mdl = ModelForTest(L,22);
```

modelinput

Purpose

Create modelinput object

Syntax

```
Inputs = mbcmodel.modelinput('PropertyName1',value1,
   'PropertyName2',value2,...);
Inputs = mbcmodel.modelinput(NUMINPUTS);
Inputs = mbcmodel.modelinput(INPUTCELLARRAY);
```

Description

This is the constructor for the `mbcmodel.modelinput` object.

```
Inputs =
mbcmodel.modelinput('PropertyName1',value1,'PropertyName2',value2,...);
```

You can set the properties shown in the following table.

Property	Description
Range	[min,max]
NonlinearTransform	`{'','1./x','sqrt(x)', 'log10(x)','x.^2', 'log(x)'}`
Name	String. Signal name from data set. Inputs for a test plan must be set before selecting data.
Symbol	String. Short name for plot labels and for use in CAGE.
Units	String. Units are overwritten from the data set units when a data is selected.

Specify “property, value” pairs as follows:

```
Inputs = mbcmodel.modelinput('Symbol',{'A','B'},...
 'Range',{[0 100],[-20 20]});
```

Scalar expansion of properties is supported, e.g.,

```
Inputs = mbcmodel.modelinput('Symbol',{'A','B'},...
```

```
    'Range',[0 100]);
```

```
Inputs = mbcmodel.modelinput(NUMINPUTS);
```

`NUMINPUTS` is the number of inputs. Symbols are automatically set to `'X1', 'X2',...,'Xn'`. The default range is [-1,1]. For example:

```
   Inputs = mbcmodel.modelinput(2);
```

```
Inputs = mbcmodel.modelinput(INPUTCELLARRAY);
```

`INPUTCELLARRAY` is a cell array with one row per input and 5 columns to specify factor names, symbols, ranges and nonlinear transforms as follows.

The columns of `INPUTCELLARRAY` must be:

1 Factor symbol (string)

2 Minimum (double)

3 Maximum (double)

4 Transform (string) — empty for none

5 Signal name

These columns are the same as the columns in the Model Factor Setup dialog box, which can be launched from the test plan in the model browser.

Examples

To create a modelinput object with 2 inputs, enter:

```
   Inputs = mbcmodel.modelinput(2);
```

To create a modelinput object and define symbols and ranges, enter:

```
   Inputs = mbcmodel.modelinput('Symbol',{'A','B'},...
    'Range',{[0 100],[-20 20]});
```

```
Inputs = mbcmodel.modelinput('Symbol',{'A','B'},...
 'Range',[0 100]);
```

To create a modelinput object and define inputs with a cell array, enter:

```
Inputs = mbcmodel.modelinput( {...
 'N',   800, 5000, '', 'ENGSPEED'
 'L',   0.1,    1, '', 'LOAD'
'EXH',  -5,   50, '', 'EXHCAM'
'INT',  -5,   50, '', 'INTCAM'} );
```

See Also

`CreateModel`, `CreateTestplan`

Purpose

Open Model Setup dialog box where you can alter model type

Syntax

```
[newModel, OK] = ModelSetup(oldModel)
```

Description

This is a method of `mbcmodel.model` objects.

This method opens the **Model Setup** dialog box where you can choose new model types and settings. If you click **Cancel** to dismiss the dialog, `OK = false` and `newModel` = `oldModel`. If you click **OK** to close the dialog box, then `OK = true` and `newModel` is your new chosen model setup. Data and response remain the same as `oldModel`. The new model is refitted when you click OK.

Call UpdateResponse to put the new model type back into the response.

Examples

```
[RBF, OK] = ModelSetup(Cubic);
```

See Also

`UpdateResponse`, `Fit`

Modified

Purpose Boolean signaling whether project has been modified

Syntax

```
Name = P.Modified
```

Description This is a property of `mbcmodel.project`.

Examples

```
Name = Project.Modified;
```

Purpose

Modify user-defined filter in data set

Syntax

```
D = ModifyFilter(D, Index, expr)
```

Description

This is a method of `mbcmodel.data`.

You call this method to modify the expression that defines existing filters.

`D` is a data object.

`Index` is the input index to indicate which of the available filters you wish to modify. Use the property `Filters` to find the index for each filter.

`expr` is the input string holding the expression that defines the filter, as for `AddFilter`.

Examples

```
ModifyFilter(D, 3, 'AFR < AFR_CALC + 20');
```

The effect of this filter is to modify filter number `3` to keep all records where AFR < AFR_CALC + 20.

```
ModifyFilter(D, 2, 'MyNewFilterFunction(AFR, RPM, TQ, SPK)');
```

This modifies filter number `2` to apply the function `MyNewFilterFunction`.

See Also

`AddFilter`, `RemoveFilter`, `Filters`

ModifyTestFilter

Purpose

Modify user-defined test filter in data set

Syntax

```
D = ModifyTestFilter(D, Index, expr)
```

Description

This is a method of `mbcmodel.data`.

You call this method to modify the expression that defines existing filters.

`D` is a data object.

`Index` is the input index to indicate which of the available test filters you wish to modify. Use the property `TestFilters` to find the index for each test filter.

`expr` is the input string holding the expression that defines the test filter, as for `AddTestFilter`.

Examples

```
ModifyTestFilter(d1, 2, 'any(n>2000)');
```

The effect of this is to modify test filter number `2` to include all tests in which any records have speed (`n`) greater than 1000.

See Also

`AddTestFilter`, `RemoveTestFilter`, `TestFilters`

Purpose

Modify user-defined variable in data set

Syntax

```
D = ModifyVariable(D, Index, expr, units)
```

Description

This is a method of `mbcmodel.data`.

You call this method to modify the expression that defines existing variables.

`D` is a data object.

`Index` is the input index to indicate which of the available variables you wish to modify. Use the property `UserVariables` to find the index for each variable.

`expr` is the input string holding the expression that defines the variable, as for `AddVariable`.

`units` is an optional input string holding the units of the variable.

Examples

```
ModifyVariable(D, 2, 'MY_NEW_VARIABLE = TQ*AFR/2');
```

See Also

`AddVariable`, `RemoveVariable`, `UserVariables`

MultipleVIF

Purpose

Multiple VIF matrix for linear model parameters

Syntax

```
VIF = MultipleVIF(LINEARMODEL)
```

Description

This is a method of `mbcmodel.linearmodel`.

`VIF = MultipleVIF(LINEARMODEL)` calculates the multiple Variance Inflation Factor (VIF) matrix for the linear model parameters.

Examples

```
VIF = MultipleVIF(knot_model)
```

See Also

`ParameterStatistics`

Purpose

Name of object

Syntax

```
name = A.Name
```

Description

This is a property of project, data, test plan, input, model, fitalgorithm, design, and design constraint objects.

`A` can be any test plan (`T`), data (`D`), project (`P`) model (`L`, `R`, `HR`), fitalgorithm (F), design (D), or design constraint (C) object.

You can change the names of these objects as follows:

```
A.Name =  newName
```

For response (output or Y data) signal names, see `ResponseSignalName`.

For `mbcmodel.model.Name`, the Name property refers to the model output name. This property is set to the data signal name when the response is created or if a model is assigned to a response. This property cannot be set when a response is attached to the model.

For model parameter names, see `Names`.

For testplan and response object input names, see `InputSignalNames`, and for data objects, see `SignalNames`.

Examples

```
ResponseFeatureName = thisRF.Name;
```

See Also

`Names`, `InputSignalNames`, `SignalNames`, `ResponseSignalName`

Names

Purpose

Model parameter names

Syntax

```
N = params.Names
```

Description

This is a property of `mbcmodel.modelparameters`. It returns the names of all the parameters in the model. These are read-only.

Examples

```
N = paramsknot.Names
N =
'1'
'N'
'N^2'
'N*L'
'N*A'
'L'
'L^2'
'L*A'
'A'
'A^2';
```

See Also

`NumberOfParameters`, `Values`, `Name`

Purpose

Create new project file

Syntax

```
P = New(P)
```

Description

This is a method of `mbcmodel.project`. Use this to modify a project object to make a new project from scratch. Note the current project gets removed from memory when you open a new one.

`P` is the new project object.

Examples

```
New(P);
```

See Also

`Load`

NumberOfInputs

Purpose

Number of model or design object inputs

Syntax

```
N = model.NumberOfInputs
```

Description

This is a property of `mbcmodel.model`, `mbcmodel.modelproperties`, and the design objects `mbcdoe.design`, `mbcdoe.generator`, `mbcdoe.candidateset`, and `mbcdoe.designconstraint`. It returns the number of inputs to the model or design object.

Examples

```
N = knot.'NumberOfInputs;
```

Purpose

Number of included model parameters

Syntax

```
N = knotparams.NumberOfParameters
```

Description

This is a read-only property of `mbcmodel.linearmodelparameters`, for linear models only.

The number returned is the number of parameters currently in the model (you can remove some parameters by using StepwiseRegression). To see which parameters are currently in the model, use StepwiseSelection. Only parameters listed as '`in`' are currently included.

To see the the total possible number of parameters in a linear model, use SizeOfParameterSet.

Use Names and Values to get the parameter names and values.

Examples

```
N = knotparams.NumberOfParameters;
```

See Also

`SizeOfParameterSet`, `StepwiseSelection`, `StepwiseRegression`, `Names`, `Values`

NumberOfPoints

Purpose

Number of design points

Syntax

```
D.NumberOfPoints
```

Description

`NumberOfPoints` is a read only property of `mbcdoe.design` (constrained number of points).

`D.NumberOfPoints` is the number of points in the design after applying the constraints.

You specify the number of points for a design using the generator object. The `NumberOfPoints` property of `mbcdoe.generator` is the number of points before any constraints are applied. You cannot specify the number of points for all design types (e.g., it is not allowed for Central Composite, Box Behnken). To see which design types have an editable `NumberOfPoints` property, see the tables in `Type (for designs and generators)`.

See Also

`Type (for designs and generators)`

Purpose

Total number of records in data object

Syntax

```
numRecords = D.NumberOfRecords
```

Description

This is a property of data objects: `mbcmodel.data`.

Examples

```
numRecords = Data.NumberOfRecords;
```

NumberOfTests

Purpose

Total number of tests being used in model

Syntax

```
numtests = A.NumberOfTests
```

Description

This is a property of all model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse` and `mbcmodel.response`, and data objects `mbcmodel.data`. 'A' can be any model or data object.

Examples

```
numTests = TQ_response.NumberOfTests;
```

See Also

`DefineTestGroups`

Purpose

Optimal design criteria (V, D, A, G)

Syntax

```
s = OptimalCriteria(D)
s = OptimalCriteria(D,Criteria)
```

Description

`OptimalCriteria` is a method of `mbcdoe.design`. `OptimalCriteria` can only be used for optimal designs.

`s = OptimalCriteria(D)` returns an array with the values of optimal criteria [V,D,A,G].

`s = OptimalCriteria(D,Criteria)` returns the specified optimal criteria. `Criteria` must be one of `V`,`D`, `A`, or `G`.

OutlierIndices

Purpose

Indices of `DoubleInputData` marked as outliers

Syntax

```
indices = OutlierIndices(R)
```

Description

This is a method of all model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse` and `mbcmodel.response`.

Examples

```
ind = OutlierIndices(R);
bad = OutlierIndices(thisRF);
```

See Also

`DoubleInputData`

Purpose

Indices marked as outliers for test

Syntax

```
indices = OutlierIndicesForTest(R, TestNumber)
```

Description

This is a method of the local model object, `mbcmodel.localresponse`.

This shows the current records discarded as outliers.

You can use ':' to use all tests.

Examples

```
ind = OutlierIndicesForTest(R, ':');
bad = OutlierIndicesForTest(local, tn);
```

See Also

`OutlierIndices`

OutputData

Purpose

Output (or response) data for model

Syntax

```
D = M.OutputData
```

Description

This is a property of `mbcmodel.model`.

It returns an array of the response data currently in the model.

Examples

```
D = knot.OutputData;
```

See Also

`InputData`

Purpose

Object from which data was received

Syntax

```
O = D1.Owner
```

Description

This property of `mbcmodel.data` is:

- Empty if the data was created using mbcmodel.`CreateData`
- An `mbcmodel.project` object if the data was extracted from a project
- An `mbcmodel.testplan` object if the data was extracted from a test plan

Examples

```
O = D1.Owner;
```

Parameters

Purpose

Model parameters

Syntax

```
P = model.Parameters
```

Description

This is a property of `mbcmodel.model`., that contains an object `mbcmodel.modelparameters`. This object contains a number of read-only parameters that describe the model.

All models have these properties:

- `SizeOfParameterSet`
- `Names`
- `Values`

Linear models also have these properties:

- `StepwiseStatus`
- `NumberOfParameters`
- `StepwiseSelection`

Radial Basis Function (RBF) models have all the above properties and these additional properties:

- `Centers`
- `Widths`

Examples

```
P = model.Parameters;
```

See Also

`SizeOfParameterSet`, `Names`, `Values`, `StepwiseStatus`, `NumberOfParameters`, `StepwiseSelection`, `Centers`, `Widths`

Purpose

Calculate parameter statistics for linear model

Syntax

```
values = ParameterStatistics(linearmodel, optional statType)
```

Description

This is a method of `mbcmodel.model`, for linear models only. This calculates parameter statistics for the linear model. If you don't specify `statType`, then a structure with all valid types is output. `statType` may be a string specifying a particular statistic or a cell array of string specifying a number of statistics to output. If `statType` is a string, then `values` is an array of doubles. If `statType` is a cell array of strings, then `values` is a cell array of array of doubles.

The valid types are:

'`Alias`'

'`Covariance`'

'`Correlation`'

'`VIFsingle`'

'`VIFmultiple`'

'`VIFpartial`'

'`Stepwise`'

These types (except Stepwise) appear in the Design Evaluation tool; see the documentation for this tool for details of these matrices.

The `Stepwise` field contains the values found in the Stepwise table. In this array (and in the Stepwise GUI) you can see for each parameter in the model: the value of the coefficient, the standard error of the coefficient, the t value and Next PRESS (the value of PRESS if the status of this term is changed at the next iteration). See the documentation for the Stepwise table. You can also see these Stepwise values when you use `StepwiseRegression`.

Examples

```
values = ParameterStatistics(knot)
values =
```

```
            Alias: [7x3 double]
       Covariance: [7x7 double]
      Correlation: [7x7 double]
        VIFsingle: [5x5 double]
      VIFmultiple: [7x1 double]
       VIFpartial: [5x5 double]
         Stepwise: [10x4 double]

values.Stepwise
ans =
  1.0e+003 *
    0.0190    0.0079    0.0210       NaN
    0.0000    0.0000    0.0210    1.9801
    0.0000    0.0000    0.0200    0.2984
   -0.0000    0.0000    0.0200    0.2768
    0.0000    0.0000    0.0200    0.2890
   -0.0526    0.0367    0.0210    0.2679
    0.0911    0.0279    0.0210    0.3837
   -0.0041    0.0024    0.0210    0.2728
   -0.0178    0.0095    0.0200    0.2460
    0.0001    0.0000    0.0210    0.3246
```

See Also

StepwiseRegression

Purpose

Partial VIF matrix for linear model parameters

Syntax

```
STATS = PartialVIF(LINEARMODEL)
```

Description

This is a method of `mbcmodel.linearmodel`.

`STATS = PartialVIF(LINEARMODEL)` calculates the partial Variance Inflation Factor (VIF) matrix for the linear model parameters.

Examples

```
VIF = PartialVIF(knot_model)
```

See Also

`ParameterStatistics`

PEV

Purpose

Predicted error variance of model at specified inputs

Syntax

```
pev = PEV(R, X)
```

Description

This is a method of the hierarchical, local response, response, and model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.response`, and `mbcmodel.model`.

`R` is the model object, and `X` is the array of input values where you want to evaluate the PEV of the model. For a local response, the predicted value uses the hierarchical model.

Note that for an `mbcmodel.model` and `mbcmodel.response` objects only, the X is optional. That is, the syntax is:

```
PEV = PEV(model, optional X)
```

This calculates the Predicated Error Variance at X. If X is not specified, then X is the existing input values. An array is returned of PEV values evaluated at each data point.

Examples

```
pev = PEV(R, X);
```

See Also

`PEVForTest`

Purpose

Local model predicted error variance for test

Syntax

```
pev = PEVforTest(L, TestNumber, X)
```

Description

This is a method of the local model object, `mbcmodel.localresponse`.

`L` is the local model object.

`TestNumber` is the test for which you want to evaluate the model PEV.

`X` is the array of inputs where you want to evaluate the PEV of the model.

Examples

```
pev = PEVforTest(L, TestNumber, X);
```

See Also

`PEV`

Points

Purpose

Matrix of design points

Syntax

```
designPoints = D.Points
```

Description

`Points` is a property of `mbcdoe.design`.

`designPoints = D.Points` returns the matrix of design points.

You can perform any valid MATLAB operation on this matrix. The number of columns of the points matrix must be the same as the number of inputs when setting `Points`. If you make an assignment to the `Points`, the design type changes to `Custom`. Points are only updated in the underlying design if they have changed.

See Also

`FixPoints`; `PointTypes`; `RemovePoints`; `NumberOfPoints`

Purpose

Fixed and free point status

Syntax

```
D.PointTypes
```

Description

`PointType` is a property of `mbcdoe.design`. Each point has a type of `free`, `fixed` or `data`.

You can specify `fixed` points. `free` is the default. If a point has been matched to data then it is of type `data`.

`D.PointTypes` returns a cell array of PointTypes, one for each design point. You cannot change a PointType of `data` to something else as the `data` is set by the test plan when matching the design to `data`.

You can use the method `FixPoints` to fix all the points in a design.

See Also

`FixPoints`; `Points`; `RemovePoints`

PredictedValue

Purpose

Predicted value of model at specified inputs

Syntax

```
y = PredictedValue(R,X)
y = PredictedValue(R)
```

Description

This is a method of the hierarchical, response, local response, and model objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.response`, `mbcmodel.localresponse`, and `mbcmodel.model`.

`y = PredictedValue(R,X)` evaluates the model at the specified inputs, where `R` is the model object, and `X` is the array of inputs where you want to evaluate the output of the model.

Note that for an `mbcmodel.model`, `mbcmodel.localresponse` and `mbcmodel.response` objects, the X is optional. If X is not specified then the X is the existing input values. That is, the syntax is:

```
y = PredictedValue(model, optional X)
```

`y = PredictedValue(R)` calculates the predicted value at the fit data. An array is returned of predicted values evaluated at each data point. For local models, this is equivalent to `y= PredictedValue(L, L.InputData)`.

Note that you cannot evaluate model output for a local response or hierarchical response until you have constructed it using `MakeHierarchicalResponse` (or `CreateAlternativeModels`). If you have created alternative response feature models then a best model must be selected. If you have made changes such as removing outliers since choosing a model as best, you may need to choose a new best model. For a local response, the predicted value uses the hierarchical model. If no data is specified then the data from all tests is used.

Examples

```
y = PredictedValue(R, X);
modelPred = PredictedValue(thisRF, x);
```

See Also

`PredictedValueForTest`, `ChooseAsBest`, `PEV`, `Evaluate`

Purpose

Predicted local model response for test

Syntax

```
y = PredictedValueForTest(L, TestNumber, X)
```

Description

This is a method of the local model object, `mbcmodel.localresponse`.

`L` is a local model object.

`TestNumber` is the test for which you want to evaluate the model.

`X` is the array of inputs where you want to evaluate the output of the model.

Examples

```
y = PredictedValueForTest(L, TestNumber, X);
```

See Also

`PredictedValue`

Properties (for candidate sets)

Purpose

View and edit candidate set properties

Syntax

```
properties(CS)
CS.PropertyName = NewValue
```

Description

"`Properties`" is a method of `mbcdoe.candidateset`, which returns a list of properties.

`properties(CS)` lists the candidate set properties.

`CS.PropertyName = NewValue` sets the candidate set property.

The candidate set `Type` determines which properties you can set.

The following table lists the properties available for each candidate set type.

Candidate Set Properties (for Optimal Designs)

Candidate Set Type	Property	Description
All built-in: Grid/ Lattice, Grid, Lattice, Stratified Lattice, Sobol, Halton	NumberOfPoints (read-only for Grid and Grid/Lattice)	Number of points (int: [0,Inf])
	Limits	Design Limits
Grid	Levels	Selection criteria for best LHS design (cell)
	NumberPerLevel	Symmetric design (vector int: {[-Inf,Inf], NumberOfInputs})
Lattice	Generators	Prime number generators for lattice (vector int: {[0,Inf], NumberOfInputs})

Candidate Set Properties (for Optimal Designs) (Continued)

Candidate Set Type	Property	Description
Stratified Lattice	StratifyLevels	Number of levels for each factors (vector int: {[0,Inf], NumberOfInputs})
Sobol Sequence	Scramble	Scramble method (enum: {'none', 'MatousekAffineOwen'}
	SkipMode	Skip mode options (enum: {'None','2^k','Custom'})
	Skip	Skip size (int: [0,Inf])
Halton Sequence	Scramble	Scrambling method for sequence (enum: {'None','RR2'})
	PrimeLeap	Leap sequence points using prime number (boolean)
	SkipZero	Skip zero point (boolean)
User-defined	NumberOfPoints	User-defined points (read-only)
	Points	User-defined points

Examples

You can use property value pairs to specify candidate set properties as part of the `CreateCandidateSet` command, or you can set properties individually.

To create a candidate set with type grid and specified grid levels:

```
CandidateSet = augmentedDesign.CreateCandidateSet...
( 'Type', 'Grid' );
CandidateSet.NumberOfLevels = [21 21 21 21];
```

See Also

CreateCandidateSet

Purpose

View and edit design constraint properties

Syntax

```
properties(C)
C.PropertyName = NewValue
```

Description

"`Properties`" is a method of `mbcdoe.designconstraint`, which returns a list of properties.

`properties(C)` lists the constraint properties.

`C.PropertyName = NewValue` sets the constraint property.

The constraint `Type` determines which properties you can set. For more information, see the following table or `Type (for design constraints)`.

The following table lists the properties available for each constraint type.

Constraint Properties

Constraint Type	Property	Description
Linear design constraint: 1*Input1 + 1* Input2 + 1* Input3 <= 0	A	Matrix for linear constraint (matrix: [1,NumberOfInputs])
	b	Bound for linear constraint (double)
Ellipsoid design constraint: Ellipsoid at (Input1=0, Input2=0, Input3=0)	CenterPoint	Center of ellipse (vector: NumberOfInputs)
	Matrix	Ellipsoid form matrix (positive semi-definite) (matrix: [NumberOfInputs, NumberOfInputs])

Constraint Properties (Continued)

Constraint Type	Property	Description
1D Table design constraint: InputY(InputX) <= InputY max	Table	Table constraint (vector)
	Breakpoints	Breakpoints for rows (vector)
	Inequality	Relational Operator (enum: {'<=','>='})
	InputFactor	Column input symbol (enum: { 'InputX','InputY'})
	TableFactor	Table input symbol (enum: {'InputX','InputY '})
2D Table design constraint: InputZ(InputX,InputY) <=InputZmax	Table	: Table constraint (matrix))
	RowBreakpoints	Breakpoints for rows (vector)
	ColumnBreakpoints	Breakpoints for columns (vector)
	Inequality	Relational operator (enum: {'<=','>='})
	RowFactor	Row input symbol (enum: {'InputX','InputY, 'InputZ'})

Constraint Properties (Continued)

Constraint Type	Property	Description
	ColumnFactor	Column input symbol (enum: {'InputX','InputY', 'InputZ'})
	TableFactor	Table input symbol (enum: {'InputX','InputY', 'InputZ'}

Examples

You can use property value pairs to specify constraint properties as part of the `CreateConstraint` command, or you can set properties individually.

For examples, see `CreateConstraint`.

See Also

`CreateConstraint`

Properties (for design generators)

Purpose

View and edit design generator properties

Syntax

```
properties(Generator)
Generator.PropertyName = NewValue
```

Description

"`properties`" (lower case p) is a method of `mbcdoe.generator`, which returns a list of properties.

`properties(Generator)` lists the generator properties.

`Generator.PropertyName = NewValue` sets the generator property.

The design generator object `Type` determines which properties you can set. For more information, see `Type (for designs and generators)`.

The settings are applied immediately, you do not need to call `generate` on the design object.

The following tables list the properties available for each design type.

Optimal Design Properties (D-, V- and A-Optimal)

Property	Description
NumberOfPoints	Number of points (int: [0,Inf])
InitialPoints	Initial design points (Matrix)
CandidateSet	Candidate set (mbcdoe.candidateset)
AllowReplicates	Allow replicate points (boolean)
AugmentMethod	Methods to add points (enum: {'random','optimal'})
Tolerance	Tolerance (numeric: 'positive')
MaxIterations	Maximum Iterations (int: 'positive')

Optimal Design Properties (D-, V- and A-Optimal) (Continued)

Property	Description
NumberOfPointsToAlter	Number of points to alter per iteration using the random augment method (p) (int: `'positive'`)
NoImprovement	Number of iterations with no improvement using the random augment method (p) (int: `'positive'`)

Note Optimal designs have dependencies between `NumberOfPoints`, `InitialPoints` and `CandidateSets`. When you change `NumberOfPoints`, an initial point is drawn from the existing candidate set. Setting `NumberOfPoints` updates `InitialPoints`. Likewise setting `InitialPoints` updates `NumberOfPoints`. When changing the candidate set a new initial design is drawn from the new candidate set.

Space-Filling Design Properties

Design Type	Property	Description
All space-filling design types (Lattice, Latin Hypercube Sampling, Stratified Latin Hypercube, Sobol, Halton)	NumberOfPoints	Number of points (int: [0,Inf])
	Limits	Design Limits (matrix: [NumberOfInputs,2])
Lattice	PrimeGenerators	Prime number generators for lattice for each input (vector int: [0,Inf])

Space-Filling Design Properties (Continued)

Design Type	Property	Description
Latin Hypercube Sampling and Stratified Latin Hypercube	SelectionCriteria	Selection criteria for best LHS design (enum: {'discrepancy', 'minimax', 'maximin', 'cdfvariance', 'cdfmaximum'})
	Symmetry	Symmetric design (boolean)
Stratified Latin Hypercube	StratifyLevels	Number of levels for each factors (vector int: {[0,Inf], NumberOfInputs})
	StratifyValues	Stratify levels (cell)
Sobol Sequence	Scramble	Scramble method (enum: {'none', 'MatousekAffineOwen'}
	SkipMode	Skip mode options (enum: {'None','2^k', 'Custom'})
	Skip	Skip size (int: [0,Inf])

Space-Filling Design Properties (Continued)

Design Type	Property	Description
Halton Sequence	Scramble	Scrambling method for sequence (enum: {'None','RR2'})
	PrimeLeap	Leap sequence points using prime number (boolean)
	SkipZero	Skip zero point (boolean)

Classical Design Properties

Design Type	Property	Description
All (Box-Behnken, Central Composite, Full Factorial, Plackett-Burman, Regular Simplex)	NumberOfPoints (read-only)	Number of points (int: [0,Inf])
	Limits	Design limits
All except Plackett-Burman	NumberOfCenterPoints	Number of center points (int: [0,Inf])

Classical Design Properties (Continued)

Design Type	Property	Description
Central Composite	StarPoints	Star point position (enum: {'FaceCenteredCube', 'Spherical', 'Rotatable', 'Custom'})
	Inscribe	Inscribe points (boolean)
	Alpha	Star point location (vector: {'positive', NumberOfInputs})
Full Factorial	Levels	Cell array of levels for each input (cell)
	NumberOfLevels	Number of levels for each input (vector int: {'positive', NumberOfInputs })

Examples

You can use property value pairs to specify design generator properties as part of the `Generate` and `Augment` commands. You can also set properties individually. Some examples:

To create a full factorial design and specify the number of levels when generating the design:

```
design = CreateDesign( inputs, 'Type', 'Full Factorial' );
design = Generate( design, 'NumberOfLevels', [50 50] );
```

To create a latin hypercube sampling design:

```
globalDesign = TP.CreateDesign(2,...
'Type', 'Latin Hypercube Sampling');
```

To create and generate a halton design with 50 points:

```
haltonDesign = CreateDesign( inputs, 'Type',...
 'Halton Sequence', 'Name', 'Halton' );
haltonDesign = Generate( haltonDesign, 50 );
```

To explicitly specify the `NumberOfPoints` property:

```
haltonDesign = Generate( haltonDesign, 'NumberOfPoints', 50 );
```

To create and generate a halton design with specified scrambling and other properties:

```
haltonDesignWithScrambling = haltonDesign.CreateDesign...
( 'Name', 'Scrambled Halton' );
haltonDesignWithScrambling = Generate...
( haltonDesignWithScrambling,...
 'Scramble', 'RR2', 'PrimeLeap', true );
```

To generate an optimal design with specified properties:

```
OptDesign = Generate(OptDesign,...
    'Type','V-optimal',...
    'CandidateSet',C,...
    'MaxIterations',200,...
    'NoImprovement', 50,...
    'NumberOfPoints',200);
```

The previous code is equivalent to setting the properties individually and then calling `Generate` as follows:

```
P = OptDesign.Generator;
P.Type = `V-optimal';
P.CandidateSet.NumberOfLevels(:)=21;
P.MaxIterations = 200;
P.NumberOfPoints = 200;
P.NoImprovement = 50;
OptDesign.Generator = P;
```

To augment a design optimally with 20 points:

```
OptDesign = Augment(OptDesign,...
    'Type','V-optimal',...
    'MaxIterations',200,...
    'NoImprovement', 50,...
    'NumberOfPoints',20);
```

See Also

CreateDesign; Generate; Augment;Properties (for candidate sets); Properties (for design constraints)

Purpose

View and edit model properties

Syntax

```
properties=M.Properties
M.Properties.PropertyName = NewValue
properties(M.Properties)
f=M.Properties.properties
```

Description

"Properties" is a property of `mbcmodel.model`.

`properties=M.Properties` returns a `mbcmodel.modelproperties` object.

To edit a property, use the syntax `M.Properties.PropertyName = NewValue`

"properties" is a method of `mbcmodel.fitalgorithm` and `mbcmodel.modelproperties` which returns a list of properties.

`properties(M.Properties)` lists the property names, types and allowed values.

`f=M.Properties.properties` returns the property names as a cell array.

The model `Type` determines which properties you can set. For more information, see `Type (for models)`.

To get a `mbcmodel.modelproperties` object from a model:

```
>> M = mbcmodel.CreateModel('Polynomial', 4);
>> disp(M)
mbcmodel.linearmodel:Polynomial

>>modelproperties=M.Properties

modelproperties =
Polynomial Properties
                  Order: [3 3 3 3]
       InteractionOrder: 3
    TransformInputRange: 1
```

```
          ParameterNames: {35x1 cell}
          StepwiseStatus: {35x1 cell}
                  BoxCox: 1
```

To create a model and list the properties:

```
>> M = mbcmodel.CreateModel('RBF',2)

M =

   A radial basis function network using a multiquadric kernel
     with 0 centers
   and a global width of 2.
   The regularization parameter, lambda, is 0.0001.
   InputData: [0x2 double]
   OutputData: [0x1 double]
   Status: Not fitted
   Linked to Response: <not linked>

>> properties(M.Properties)
RBF Properties
     Kernel: RBF kernel (enum: {'multiquadric',...
'recmultiquadric','gaussian','thinplate','logisticrbf',...
'wendland', 'linearrbf','cubicrbf'})
     Continuity: Continuity for Wendland kernel...
 (0,2,4,6) (int: [0,6])
     ParameterNames: List of parameter names (read-only)
     StepwiseStatus: Stepwise status {'Always','Never',...
'Step'} (cell)
     BoxCox: Box-Cox transform (power) (numeric: [-3,3])
```

The following syntax returns the properties as a cell array:

```
>> f=M.Properties.properties

f =

    'Kernel'
```

```
'Continuity'
'ParameterNames'
'StepwiseStatus'
'BoxCox'
```

Change a property as follows:

```
>>M.Properties.Kernel = 'thinplate';
```

The model changes state to 'Being Edited'. The settings are not applied until you call Fit on the model object.

The following sections list the properties available for each model type.

Linear Models — Polynomial Properties

mbcmodel.linearmodel:Polynomial

Order: Polynomial order (vector int: {[0,Inf],NumberOfInputs})

InteractionOrder: Maximum order of interaction terms (int: [0,Inf])

TransformInputRange: Transform inputs (Boolean)

ParameterNames: List of parameter names (read-only)

StepwiseStatus: Stepwise status {'Always','Never','Step'} (cell)

BoxCox: Box-Cox transform (power) (numeric: [-3,3])

Linear Models — Hybrid Spline Properties

mbcmodel.linearmodel:Hybrid Spline

Order: Spline and polynomial order (vector int: {[0,3],NumberOfInputs})

SplineVariable: Spline variable

SplineInteraction: Order of interaction between spline and polynomial (int: [0,3])

Knots: Position of knots (vector real)

ParameterNames: List of parameter names (read-only)

StepwiseStatus: Stepwise status {'Always','Never','Step'} (cell)

BoxCox: Box-Cox transform (power) (numeric: [-3,3])

Linear Models — RBF Properties

mbcmodel.linearmodel:RBF

Kernel: RBF kernel (enum: {'multiquadric','recmultiquadric','gaussian','thinplate','logisticrbf','wendland', 'linearrbf','cubicrbf'})

Continuity: Continuity for Wendland kernel (0,2,4,6) (int: [0,6])

ParameterNames: List of parameter names (read-only)

StepwiseStatus: Stepwise status {'Always','Never','Step'} (cell)

BoxCox: Box-Cox transform (power) (numeric: [-3,3])

Linear Models — Polynomial-RBF Properties

mbcmodel.linearmodel:Polynomial-RBF

Order: Polynomial order (vector int: {[0,Inf],NumberOfInputs})

InteractionOrder: Maximum order of interaction terms (int: [0,Inf])

Kernel: RBF kernel (enum: {'multiquadric','recmultiquadric','gaussian','thinplate','logisticrbf','wendland', 'linearrbf','cubicrbf'})

Continuity: Continuity for Wendland kernel (0,2,4,6) (int: [0,6])

ParameterNames: List of parameter names (read-only)

StepwiseStatus: Stepwise status {'Always','Never','Step'} (cell)

BoxCox: Box-Cox transform (power) (numeric: [-3,3])

Linear Models — Hybrid Spline-RBF Properties

mbcmodel.linearmodel:Hybrid Spline-RBF

Order: Spline and polynomial order (vector int: {[0,3],NumberOfInputs})

SplineVariable: Spline variable

SplineInteraction: Order of interaction between spline and polynomial (int: [0,3])

Knots: Position of knots (vector real)

Kernel: RBF kernel (enum: {'multiquadric','recmultiquadric','gaussian','thinplate','logisticrbf','wendland',

'linearrbf','cubicrbf'})

Continuity: Continuity for Wendland kernel (0,2,4,6) (int: [0,6])

ParameterNames: List of parameter names (read-only)

StepwiseStatus: Stepwise status {'Always','Never','Step'} (cell)

BoxCox: Box-Cox transform (power) (numeric: [-3,3])

Nonlinear Models — Free Knot Spline Properties

mbcmodel.model:Free Knot Spline

Order: Spline order (int: [0,3])

NumKnots: Number of knots (int: 'Positive')

Nonlinear Models — Neural Network Properties

mbcmodel.model:Neural Network

HiddenLayers: Number of hidden layers (int: [1,2])

Neurons: Number of Neurons in each hidden layer (vector int: 'Positive')

Examples

```
>> properties=M.Properties

properties =
Polynomial Properties
                  Order: [3 3 3 3]
       InteractionOrder: 3
    TransformInputRange: 1
         ParameterNames: {35x1 cell}
         StepwiseStatus: {35x1 cell}
```

```
                    BoxCox: 1


>> M.Properties.Order = [3 2 2 3]

M =

   1 + 2*X1 + 10*X4 + 15*X2 + 18*X3 + 3*X1^2 + 6*X1*X4
...+ 8*X1*X2 + 9*X1*X3 +
   11*X4^2 + 13*X4*X2 + 14*X4*X3 + 16*X2^2 + 17*X2*X3
...+ 19*X3^2 + 4*X1^3 +
   5*X1^2*X4 + 7*X1*X4^2 + 12*X4^3
   InputData: [0x4 double]
   OutputData: [0x1 double]
   Status: Being Edited
   Linked to Response: <not linked>
```

See Also

Type (for models), LocalModel Properties

Purpose

Number of records in each test

Syntax

```
numRecords = D.RecordsPerTest
```

Description

This is a property of data objects: `mbcmodel.data`. It returns an array, of length `NumberOfTests`, containing the number of records in each test.

Examples

```
numRecords = D.RecordsPerTest;
```

Remove

Purpose

Remove project, test plan, or model

Syntax

```
OK = Remove(A)
```

Description

This is a method of all the non-data objects: projects, test plans and all models.

A can be any project, test plan or model object.

Datum models cannot be removed if they are in use by other models.

Examples

```
OK = Remove(R3);
```

Purpose

Remove data from project

Syntax

```
P = RemoveData(P, D)
P = RemoveData(P, Index)
```

Description

This is a method of `mbcmodel.project`.

You can refer to the data object either by name or index.

`P` is the project object.

`D` is the data object you want to remove.

`Index` is the index of the data object you want to remove.

Examples

```
RemoveData(P, D);
```

See Also

`CreateData`, `Data`, `CopyData`

RemoveDesign

Purpose

Remove design from test plan

Syntax

```
RemoveDesign(T,Name)
RemoveDesign(T,Level,Name)
RemoveDesign(T,D)
RemoveDesign(T,Level,D)
```

Description

`RemoveDesign` is a method of `mbcmodel.testplan`.

`RemoveDesign(T,Name)` removes a design with a matching name from the test plan `T`.

Name can be a string, or a cell array of strings.

`RemoveDesign(T,Level,Name)` removes a design with a matching name from the specified level of the test plan. By default the level is the outer level (i.e., Level 1 for one-stage, Level 2 (global) for two-stage).

`RemoveDesign(T,D)` removes `D`, an array of designs to be deleted. All designs with matching names are deleted.

`RemoveDesign(T,Level,D)` removes `D` from the specified level.

See Also

`AddDesign`; `UpdateDesign`; `FindDesign`

Purpose

Remove user-defined filter from data set

Syntax

```
D = RemoveFilter(D, Index)
```

Description

This is a method of the `mbcmodel.data` object.

`Index` is the input index indicating the filter to remove. Use the property `Filters` to find out which filters are present.

Examples

```
RemoveFilter(D1, 3);
```

See Also

`AddFilter`, `Filters`

RemoveOutliers

Purpose

Remove outliers in input data by index or rule, and refit models

Syntax

```
R = RemoveOutliers(R, Selection);
R = RemoveOutliers(L, LocalSelection, GlobalSelection)
```

Description

This is a method of the local model object, `mbcmodel.localresponse` and the response feature model object `mbcmodel.response`.

All the response feature models are refitted after the local models are refitted. Outlier selection is applied to all tests.

For a response model:

- `R` is a response object.
- `Selection` specifies either a set of indices or the name of an outlier selection function, of the following form:

  ```
  Indices = myMfile(model, data, factorName)
  ```

  The factors are the same as defined in `DiagnosticStatistics`.
- `data` contains the factors as columns of a matrix.
- `factorNames` is a cell array of the names for each factor.

For a local model:

- `LocalSelection` is the local outlier selection indices or function.
- `GlobalSelection` is the global outlier selection indices or function.

  Outlier selection functions must conform to this prototype:

  ```
  Indices = myMfile(model, data, factorName)
  ```

  The factors are the same as appear in the scatter plot in the Model Browser.
- `data` contains the factors as columns of a matrix.

- `factorNames` is a cell array of the names for each factor.

Examples

```
outlierind = [1 4 6 7];
RemoveOutliers(thisRF, outlierind);
```

See Also

`RemoveOutliersForTest`

RemoveOutliersForTest

Purpose

Remove outliers on test by index or rule and refit models

Syntax

```
L = RemoveOutliersForTest(LOCALRESPONSE, TESTNUMBER,
   LOCALSELECTION)
L = RemoveOutliersForTest(LOCALRESPONSE, TESTNUMBER,
   LOCALSELECTION, doUpdate)
```

Description

This is a method of `mbcmodel.localresponse`.

`L = RemoveOutliersForTest(LOCALRESPONSE, TESTNUMBER, LOCALSELECTION)` removes outliers, refits the local model, and refits the response feature models.

`L = RemoveOutliersForTest(LOCALRESPONSE, TESTNUMBER, LOCALSELECTION, doUpdate)` removes outliers and if `doUpdate` is `true`, refits all response features after the local model is refitted.

`TESTNUMBER` is the single test number to refit.

`LOCALSELECTION` can either be a set of indices or a function name.

An outlier selection function must take the following form:

```
INDICES = MYMFILE(MODEL, DATA, FACTORNAME);
```

The factors are the same as defined in `DiagnosticStatistics`.

`DATA` contains the factors as columns of a matrix, and `FACTORNAME` is a cell array of the names for each factor.

Examples

For a local response `LOCALRESPONSE`, to remove first two data points and do not update response features:

```
RemoveOutliersForTest(LOCALRESPONSE,1,1:2,false);
```

To find list of indices of removed data points:

```
indices = OutliersForTest(LOCALRESPONSE,1);
```

To restore first data point:

```
RestoreDataForTest(LOCALRESPONSE,1,1,false);
```

To restore all data:

```
RestoreDataForTest(LOCALRESPONSE,1,':',false);
```

To update response features:

```
UpdateResponseFeatures(LOCALRESPONSE);
```

See Also

`UpdateResponseFeatures`, `RestoreDataForTest`, `OutlierIndicesForTest`, `RemoveOutliers`

RemovePoints

Purpose

Remove all nonfixed design points

Syntax

```
D = RemovePoints(D)
D = RemovePoints(D,PointType)
D = RemovePoints(D,indices)
```

Description

`RemovePoints` is a method of `mbcdoe.design`.

`D = RemovePoints(D)` removes all nonfixed points from the design.

`D = RemovePoints(D,PointType)` removes the specified type of points, where `PointType` is one of `'free'`,`'fixed'` or `'data'`.

`D = RemovePoints(D,indices)` removes the points specified by `indices`.

Examples

To remove all free points:

```
Design = RemovePoints(Design,'free');
```

See Also

`FixPoints`

Purpose

Remove user-defined test filter from data set

Syntax

```
D = RemoveTestFilter(D, Index)
```

Description

This is a method of `mbcmodel.data`.

`D` is the data object.

`Index` is the input index indicating the filter to remove.

Use the property `TestFilters` to find the index of the test filter you want to remove.

Examples

```
RemoveTestFilter(D1, 2);
```

See Also

`AddTestFilter`, `TestFilters`

RemoveVariable

Purpose

Remove user-defined variable from data set

Syntax

```
D = RemoveVariable(D, Index)
```

Description

This is a method of `mbcmodel.data`.

`D` is the data object.

`Index` is the input index indicating the variable to remove.

Use `UserVariables` to find the index of the variable you want to remove.

Examples

```
RemoveVariable(D1, 2);
```

See Also

`AddVariable`, `UserVariables`

Purpose

Response for model object

Syntax

```
R = model.Response
```

Description

This is a property of `mbcmodel.model`. It returns the response the model object came from (e.g. a response object).

If you make changes to the model object (for example by changing the model type using ModelSetup, or using StepwiseRegression) you must use UpdateResponse to return the new model object to the response in the project.

Examples

```
R = model.Response;
```

See Also

`UpdateResponse`, `ModelSetup`

ResponseFeatures(Local Model)

Purpose

Set of response features for local model

Syntax

```
RFs = L.ResponseFeatures
```

Description

This is a property of the local model object, `mbcmodel.localmodel`.

`RFs = L.ResponseFeatures` returns a `mbcmodel.responsefeatures` object. `L` is the local model.

See "Understanding Model Structure" in the Getting Started documentation for an explanation of the relationships between local models, local responses, and other responses.

Available properties and methods are described in the following tables.

Property	Description
EvaluationPoints	Cell array of evaluation points for the response feature set (read-only). An element of `EvaluationPoints` is empty if the response feature does not use the Evaluation point. This property is set up when the response feature is created (see the Add method).
Types	Cell array of types for response feature set (read-only). This property is set up when the response feature is created (see the Add method).
NumberOfResponseFeatures	Number of response features in set (read-only).
IsFitted	The local model has been fitted.

Method	Description

Add	Add new response feature to response feature set
	
	`RF = Add(RF,RFtype)`
	
	`RFtype` is a description string belonging to the set of alternative response features. See getAlternativeTypes.
	
	`RF = Add(RF,RFtype,EvaluationPoint)`
	
	`EvaluationPoint` is a row vector with an element for each model input and is used for response features that require an input value to evaluate the response feature (e.g., function evaluation, derivatives). It is an error to specify an evaluation point for a response feature type that does not require an evaluation point.

Remove	Remove a response feature from the response feature set `RF = Remove(RF,index)`
Select	Select a subset of response features from the response feature set `RF = Select(RF,indices)`
getDefaultSet	List of default response features `RF = getDefaultSet(RF)` Returns an `mbcmodel.responsefeatures` object with the default set of response features for the local model.

Method	Description
getAlternativeTypes	List of all alternative response feature types for local model `RFtypes = getAlternativeTypes(RF)` Returns a cell array of response feature type strings for the local model.

Evaluate	Evaluate response features
	
	`rfvals = Evaluate(RF);`
	
	Returns the values for the response features for the current local model.
	
	`[rfvals,stderr] = Evaluate(RF)`
	
	Also returns the standard errors for the response features for the current local model. The local model must be fitted before evaluating response features.

Jacobian	Jacobian matrix of response features with respect to parameters `J = Jacobian(RF)` The local model must be fitted before calculating the Jacobian matrix.
Covariance	Covariance matrix for response features `rfvals = Covariance(RF);` The local model must be fitted before calculating the covariance matrix.

Method	Description
Correlation	Correlation matrix for response features `rfvals = Correlation(RF)` Errors occur if model is not fitted.
ReconstructSets	List of subsets of response features which can be used to reconstruct the local model `RFlist = ReconstructSets(RF)` `RFlist` is a cell array of `mbcmodel.responsefeatures`. Each element of `RFlist` can be used to reconstruct the local model from response feature values.

Examples

First, create a local model object:

```
L = mbcmodel.CreateModel('Local Polynomial',2)


L =

   1 + 2*X1 + 8*X2 + 3*X1^2 + 6*X1*X2 + 9*X2^2 + 4*X1^3...
 + 5*X1^2*X2 + 7*X1*X2^2 +
   10*X2^3
   InputData: [0x2 double]
   OutputData: [0x1 double]
   Status: Not fitted
   Linked to Response: not linked
```

The properties of the local model object are the same as the properties of an `mbcmodel.model` object with the additional property "ResponseFeatures". Look at the response features property as follows:

```
>> RFs = L.ResponseFeatures

RFs =

Response features for Polynomial
    'Beta_1'
    'Beta_X1'
    'Beta_X1^2'
    'Beta_X1^3'
    'Beta_X1^2*X2'
    'Beta_X1*X2'
    'Beta_X1*X2^2'
    'Beta_X2'
    'Beta_X2^2'
    'Beta_X2^3'

% Set up response features
RFtypes = getAlternativeTypes(RFs);
RF = Add(RF, RFtypes{end},-10);

% assign to local model
L.ResponseFeatures = RFs;
```

Purpose

Array of response features for local response

Syntax

```
RFs = L.ResponseFeatures
```

Description

This is a property of the local model object, `mbcmodel.localresponse`.

`L` is the local response.

See "Understanding Model Structure" in the Getting Started documentation for an explanation of the relationships between local responses and other responses.

Examples

```
RFs = Local.ResponseFeatures;
```

ResponseSignalName

Purpose

Name of signal or response feature being modeled

Syntax

```
ysignal = R.ResponseSignalName
```

Description

This is a property of all response objects: `mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse` and `mbcmodel.response`.

`R` can be a hierarchical response, local response or response.

Examples

```
yName = local.ResponseSignalName;
```

See Also

`InputSignalNames`

Purpose

Array of available responses for test plan

Syntax

```
R = T.Responses
```

Description

This is a property of `mbcmodel.testplan`.

`T` is the test plan object.

See “Understanding Model Structure” for an explanation of the relationship between test plans and responses.

Examples

```
R = T.Responses;
```

RestoreData

Purpose

Restore removed outliers

Syntax

```
R = RestoreData(RESPONSE)
R = RestoreData(RESPONSE, OUTLIERINDICES)
```

Description

This is a method of `mbcmodel.localresponse` and `mbcmodel.response`.

`R = RestoreData(RESPONSE)` restores all data previously removed as outliers.

`R = RestoreData(RESPONSE, OUTLIERINDICES)` restores all removed data specified in `OutlierIndices`. For a local response, the indices refer to record numbers for all tests.

Examples

```
RemoveOutliers(R, 1:5)
RestoreData(R, 1:2)
```

See Also

`RemoveOutliersForTest`, `RemoveOutliers`, `OutlierIndices`

Purpose

Restore removed outliers for test

Syntax

```
L = RestoreDataForTest(LOCALRESPONSE, TESTNUMBER, Indices)
L = RestoreDataForTest(LOCALRESPONSE, TESTNUMBER, Indices,
   doUpdate)
```

Description

This is a method of `mbcmodel.localresponse`.

`L = RestoreDataForTest(LOCALRESPONSE, TESTNUMBER, Indices)` restores all removed data for `TESTNUMBER` specified in `Indices`.

`L = RestoreDataForTest(LOCALRESPONSE, TESTNUMBER, Indices, doUpdate)` restores all specified removed data and if `doUpdate` is `true`, refits all response features. By default, all response feature models will be updated. If a number of tests are being screened it is more efficient to set `doUpdate` to `false` and call `UpdateResponseFeatures` when all the tests have been screened.

`Indices` must be numbers and must belong to the set of outliers in `OutliersForTest`.

Examples

For a local response `LOCALRESPONSE`, to remove first two data points without updating response features:

```
RemoveOutliersForTest(LOCALRESPONSE,1,1:2,false);
```

To find list of indices of removed data points:

```
indices = OutliersForTest(LOCALRESPONSE,1);
```

To restore first data point:

```
RestoreDataForTest(LOCALRESPONSE,1,1,false);
```

To restore all data:

```
RestoreDataForTest(LOCALRESPONSE,1,':',false);
```

To update response features:

```
UpdateResponseFeatures(LOCALRESPONSE);
```

See Also

UpdateResponseFeatures, RemoveOutliersForTest, OutlierIndicesForTest

Purpose

Undo most recent changes to data

Syntax

```
D = RollbackEdit(D)
```

Description

This is a method of `mbcmodel.data`. Use this if you change your mind about changes you have made to the data since you called BeginEdit, such as importing or appending data, applying filters or creating new user variables.

There are no input arguments. If for your data object `D, IsBeingEdited` is `true`, then `RollbackEdit` will return it to the same state as it was when `BeginEdit` was called. If `IsEditable(D)` is `true` then you can still modify it, if not it will revert to being read-only. See the example below.

Examples

```
D = P.Data;
BeginEdit(D);
AddVariable(D, 'TQ = tq', 'lbft');
AddFilter(D, 'TQ < 200');
DefineTestGroups(D, {'RPM' 'AFR'}, [50 10], 'MyLogNo');
RollbackEdit(D);
```

This returns the data object `D` to the same state as when `BeginEdit` was called. If the data object `IsEditable` then the returned object will still return true for `IsBeingEdited`, else it will not be editable.

For an example case where `IsEditable` is `false` and `IsBeingEdited` is `true`:

```
D = p.Data;
D1 = p.Data;
BeginEdit(D1);
tp = p.Testplan;
Attach(tp, D);
```

Where `p` is an `mbcmodel.project` object, and `D` and `D1` are `mbcmodel.data` objects.

At this point `IsEditable` for `D1` becomes false because it is now `Attached` to the test plan and hence can only be modified from the test plan. However

```
OK = D1.IsBeingEdited
```

will still be true at this point, and trying to call `CommitEdit` will fail.

See Also

`BeginEdit`, `CommitEdit`, `IsBeingEdited`

Purpose

Save project

Syntax

```
OK = Save(P)
OK = Save(P, filename)
```

Description

This is a method of `mbcmodel.project`.

`OK = Save(P)` saves the project `P` to the currently selected `Filename`. The project `Name` is used as the `Filename` if none has previously been specified. If neither has been specified then you see a warning that your project has been saved to `Untitled.mat`.

`OK = Save(P, filename)` saves the project `P` with the name specified by *`filename`*.

Examples

```
OK = Save(proj, 'Example.mat');
```

See Also

`SaveAs`

SaveAs

Purpose

Save project to new file

Syntax

```
OK = SaveAs(P, Name)
```

Description

This is a method of `mbcmodel.project`.

Examples

```
OK = SaveAs(proj, 'Example.mat');
```

See Also

`Save`

Purpose

Plot design points

Syntax

```
Scatter2D(D,Xindex,Yindex)
Scatter2D(D,xindex,yindex,plotArguments)
```

Description

`Scatter2D` is a method of `mbcdoe.design`.

`Scatter2D(D,Xindex,Yindex)` creates a scatter plot of the design points in design `D`, where X and Y are the indices or symbols for the input factors to plot on the X and Y axis.

`Scatter2D(D,xindex,yindex,plotArguments)` creates a scatter plot with additional arguments.`plotArguments` specifies additional arguments to the MATLAB `plot` command. The plot command used in `Scatter2D` is

```
plot(D.Points(:,v1),D.Points(:,v2),varargin{:})
```

The default for `varargin` is `'.'`.

Examples

```
Scatter2D( mainDesign, 1, 2 );
```

SetTermStatus

Purpose

Set status of model terms

Syntax

```
M.Properties = M.Properties.SetTermStatus(Terms, Status)
```

Description

This is a method of `mbcmodel.linearmodelproperties`.

`M.Properties = M.Properties.SetTermStatus(Terms, Status)` sets the status of the specified terms in this model. `Status` must be a cell array of status strings.

The stepwise status for each term can be Always, Never or Step. The status determines whether you can use the StepwiseRegression function to throw away terms in order to try to improve the predictive power of the model.

`M` is an `mbcmodel.linearmodel` object.

Examples

```
M = mbcmodel.CreateModel('Polynomial', 2);
M.Properties = M.Properties.SetTermStatus([1 2; 1 0],
 {'Never',  'Always'});
```

This example sets the status of the `X1*X2^2` term to `Never` and the `X1` term to `Always`.

See Also

`GetTermStatus`, `StepwiseStatus`

Purpose

Open fit algorithm setup dialog box

Syntax

```
[OPT,OK]= SetupDialog(F)
```

Description

This is a method of `mbcmodel.fitalgorithm`.

`[OPT,OK]= SetupDialog(F)` opens the fit algorithm setup dialog box, where you can edit the algorithm parameters. `F` is a `mbcmodel.fitalgorithm` object.

If you click **Cancel** to dismiss the dialog, `OK = false` and no changes are made. If you click **OK** to close the dialog box, then `OK = true` and your new chosen algorithm parameters are set up.

Examples

```
[OPT,OK]= SetupDialog(F)
```

See Also

`CreateAlgorithm`, `getAlternativeNames`

SignalNames

Purpose

Names of signals held by data

Syntax

```
names = D.SignalNames
```

Description

This is a property of `mbcmodel.data`.

This is a cell array of strings that hold the names of the signals within the data. These names can be used to reference the appropriate signals in the `Value` method. The subset of these names that are being used for modeling may also be found in the test plan and responses `InputSignalNames` properties.

Examples

```
names = D.SignalNames;
```

See Also

`SignalUnits`, `InputSignalNames`, `Value`

Purpose

Names of units in data

Syntax

```
units = D.SignalUnits
```

Description

This is a property of `mbcmodel.data`.

D is the data object.

It returns a cell array of strings holding the units of the signals.

Examples

```
units = D.SignalUnits;
```

See Also

`SignalNames`

SingleVIF

Purpose

Single VIF matrix for linear model parameters

Syntax

```
VIF = SingleVIF(LINEARMODEL)
```

Description

This is a method of `mbcmodel.linearmodel`.

`VIF = SingleVIF(LINEARMODEL)` calculates the single Variance Inflation Factor (VIF) matrix for the linear model parameters.

Examples

```
VIF = SingleVIF(knot_model)
```

See Also

`ParameterStatistics`

Purpose

Number of model parameters

Syntax

```
N = params.SizeOfParameterSet
```

Description

This is a property of `mbcmodel.linearmodelparameters`, for linear models only. It returns the total possible number of parameters in the model. Note that not all of these terms are necessarily currently included in the model, as you may remove some using StepwiseRegression.

Call NumberOfParameters to see how many terms are currently included in the model. Call StepwiseSelection to see which terms are included and excluded.

Use Names and Values to get the parameter names and values.

Examples

```
N = knotparams.SizeOfParameterSet
```

See Also

`NumberOfParameters`, `StepwiseSelection`, `Names`, `Values`

StatisticsDialog

Purpose

Open summary statistics dialog box

Syntax

```
[mdl,OK]= StatisticsDialog(mdl)
```

Description

This is a method of `mbcmodel.model`.

`[mdl,OK]= StatisticsDialog(mdl)` opens the Summary Statistics dialog box, where you can select the summary statistics you want to use.

If you click **Cancel** to dismiss the dialog, `OK = false` and no changes are made. If you click **OK** to close the dialog box, then `OK = true` and your new chosen summary statistics are set up.

See Also

`SummaryStatistics`

Purpose

Model status: fitted, not fitted or best

Syntax

```
S = model.Status
```

Description

This is a property of `mbcmodel.model`. It returns a string: '`Fitted`' if the model is fitted, '`Not fitted`' if the model is not fitted (for example there is not enough data to fit the model), or '`Best`' if the model has been selected as best from some alternative models. A model must be `Fitted` before it can be selected as `Best`.

Examples

```
S = knot.Status
S =
     `Fitted'
```

See Also

`ChooseAsBest`

StepwiseRegression

Purpose

Change stepwise selection status for specified terms

Syntax

```
[S, model] = StepwiseRegression(model, optional toggleTerms)
```

Description

This is a method of `mbcmodel.model`, for linear models only. This method returns the Stepwise table (as in the Stepwise values for `ParameterStatistics`). Leave out `toggleTerms` to get the current Stepwise values. You can choose to remove or include parameters using StepwiseRegression, as long as their StepwiseStatus is `Step`.

The Stepwise values returned are the same as those found in the table in the Stepwise GUI. For each parameter, the columns are: the value of the coefficient, the standard error of the coefficient, the t value and Next PRESS (the value of PRESS if the status of this term is changed at the next iteration). Look for the lowest Next PRESS to indicate which terms to toggle in order to improve the predictive power of the model.

Call StepwiseRegression to toggle between `in` and `out` for particular parameters. `toggleTerms` can be either an index that specifies which parameters to toggle, or an array or logical where a true value indicates that a toggle should occur. The example shown toggles parameter 4, after inspection of the Next PRESS column indicates changing the status of this term will result in the lowest PRESS. StepwiseRegression returns the new Stepwise values after toggling a parameter.

After making changes to the model using StepwiseRegression you must call UpdateResponse.

Use StepwiseStatus (on the child modelparameters object) to see which parameters have a status of `Step`; these can be toggled between `in` and `out` using StepwiseRegression (on the parent model object).

Use StepwiseSelection (on the child modelparameters object) to view which terms are `in` and `out`, as shown in the example.

Examples

```
[S, knot] = StepwiseRegression(knot)
S =

  1.0e+003 *
```

```
    0.1316    0.0606    0.0200       NaN
    0.0000    0.0000    0.0200    2.0919
    0.0000    0.0000    0.0190    0.2828
   -0.0000    0.0000    0.0190    0.2531
    0.0000    0.0000    0.0190    0.2680
   -0.0551    0.0347    0.0200    0.2566
    0.0919    0.0264    0.0200    0.3672
   -0.0040    0.0023    0.0200    0.2564
   -0.0178    0.0095    0.0200    0.2644
    0.0008    0.0004    0.0200    0.2787

[S, knot] = StepwiseRegression(knot, 4)

S =

  129.8406   60.1899   19.0000       NaN
    0.0048    0.0008   19.0000  662.3830
    0.0000    0.0000   18.0000  290.8862
   -0.0021    0.0019   19.0000  245.9833
    0.0001    0.0002   18.0000  281.4104
  -50.4091   34.7401   19.0000  262.8346
   94.9675   26.3690   19.0000  400.6572
   -4.0887    2.2488   19.0000  262.6588
  -17.9412    9.4611   19.0000  276.7535
    0.8229    0.3734   19.0000  292.0827

params = knot.Parameters;
N = params.StepwiseSelection

N =
    'in'
    'in'
    'out'
    'in'
    'out'
    'in'
```

```
    'in'
    'in'
    'in'
    'in'

>> StepwiseRegression(knot, 4);
params = knot.Parameters;
N = params.StepwiseSelection

N =
    'in'
    'in'
    'out'
    'out'
    'out'
    'in'
    'in'
    'in'
    'in'
    'in'
```

See Also

StepwiseSelection, StepwiseStatus, UpdateResponse

Purpose

Model parameters currently included and excluded

Syntax

```
N =  paramsknot.StepwiseSelection
```

Description

This is a read-only property of `mbcmodel.linearmodelparameters`, for linear models only. It returns a status for each parameter in the model, `in` or `out`, depending on whether the term is included or excluded. You can choose to remove or include parameters using StepwiseRegression, as long as their StepwiseStatus is `Step`. Call StepwiseRegression (on the parent model object) to toggle between `in` and `out` for particular parameters. You must then call UpdateResponse before calling StepwiseSelection.

Examples

```
 N = paramsknot.StepwiseSelection
N =
    'in'
    'in'
    'out'
    'out'
    'out'
    'in'
    'in'
    'in'
    'in'
    'in'
```

See Also

`StepwiseRegression`, `StepwiseStatus`, `NumberOfParameters`, `UpdateResponse`

StepwiseStatus

Purpose

Stepwise status of parameters in model

Syntax

```
N = paramsknot.StepwiseStatus
```

Description

This is a method of `mbcmodel.linearmodelparameters`, for linear models only. It returns the stepwise status of each parameter in the model.

The stepwise status for each term can be Always, Never or Step. The status determines whether you can use the `StepwiseRegression` function to throw away terms in order to try to improve the predictive power of the model.

- `Always` - Always included in the model.
- `Never` - Never included in the model.
- `Step` - You can choose whether to include or exclude this term. Do this by using StepwiseRegression to toggle between `in` and `out` for particular parameters.

Use StepwiseSelection to find out which terms are currently included and excluded.

Examples

```
N = paramsknot.StepwiseStatus
N =
    'Always'
    'Step'
    'Step'
    'Step'
    'Step'
    'Step'
    'Step'
    'Step'
    'Step'
    'Step'
```

See Also

`StepwiseRegression`, `StepwiseSelection`

Purpose

Style of design type

Syntax

```
D.Style
```

Description

`Style` is a read-only property of `mbcdoe.design`.

`D.Style`

The style of the design is one of :

- 'User-defined'
- 'Optimal'
- 'Space-filling'
- 'Classical'
- 'Experimental data'

The read-only `Style` property is derived from the design `Type`.

See Also

`Type (for designs and generators)`

SummaryStatistics

Purpose

Summary statistics for response

Syntax

```
S = SummaryStatistics(M)
S = SummaryStatistics(M, Names)
```

Description

This is a method of all model objects (mbcmodel.model and mbcmodel.localmodel) and response objects (`mbcmodel.hierarchicalresponse`, `mbcmodel.localresponse`, and `mbcmodel.response`).

These statistics appear in the Summary Statistics pane of the Model Browser GUI.

`S = SummaryStatistics(M)` returns summary statistics for the model or response in a structure array containing `Statistics` and `Names` fields.

`S = SummaryStatistics(M, Names)` returns summary statistics specified by `Names` for the model or response in an array. `Names` can be a char array, or a cell array of strings.

Examples

```
S = SummaryStatistics(R2);
```

See Also

`DiagnosticStatistics`, `AlternativeModelStatistics`

Purpose

Statistics for specified test

Syntax

```
SS = SummaryStatisticsForTest( LocalResponse, TestNumber )
SS = SummaryStatisticsForTest(LocalResponse,TestNumber,Names)
```

Description

This is a method of `mbcmodel.localresponse`.

`SS = SummaryStatisticsForTest( LocalResponse, TestNumber )` returns a structure array containing Statistics and Names fields values for the local model for test TestNumber.

`SS = SummaryStatisticsForTest(LocalResponse,TestNumber,Names)` returns an array of the statistics specified by `Names`. `Names` can be a char array, or a cell array of strings.

Examples

```
SS = SummaryStatisticsForTest( L, 22 )
```

See Also

`SummaryStatistics`

TestFilters

Purpose

Structure array holding user-defined test filters

Syntax

```
testf = data.TestFilters
```

Description

This is a property of `mbcmodel.data`.

It returns a structure array holding information about the currently defined test filters for the data object `D`. The array will be the same length as the number of currently defined test filters, with the following fields for each filter:

- `Expression` — The string expression as defined in `AddTestFilter` or `ModifyTestFilter.`
- `AppliedOK` — Boolean indicating that the filter was successfully applied.
- `RemovedTests` — Boolean vector indicating which tests the filter removed. Note that many filters could remove the same test.
- `Message` — String holding information on the success or otherwise of the filter.

Examples

```
testf = data.TestFilters;
```

See Also

`AddTestFilter`, `ModifyTestFilter`, `RemoveTestFilter`

Purpose

Array of test plan objects in project

Syntax

```
tps = project.TestPlans
```

Description

This is a property of `mbcmodel.project`.

`P` is the project object.

Examples

```
tps = project.TestPlans;
```

Type (for candidate sets)

Purpose

Candidate set type

Syntax

```
C.Type
```

Description

This is a property of `mbcdoe.candidateset`.

`C.Type` returns the candidate set type. You can only choose a type when you create the candidate set, when calling `CreateCandidateset`.

You can specify the candidate set type during creation by using the `Type` property, e.g.,

```
CandidateSet = augmentedDesign.CreateCandidateSet...
( 'Type', 'Grid' );
```

Other available properties depend on the candidate set type. To see the properties you can set, see the table of candidate set properties, Candidate Set Properties (for Optimal Designs) on page 2-158.

See Also

`CreateCandidateSet`

Purpose

Design type

Syntax

```
D.Type
G.Type = NewType
```

Description

This is a read-only property of `mbcdoe.design`, and a settable property of `mbcdoe.generator`.

`D.Type` returns the design type. You can only choose a type when you create designs. After design creation, you can only set the `Type` of a `mbcdoe.generator` object, or when calling `Generate` or `Augment`.

`G.Type = NewType` changes the Type, where `G` is a `mbcdoe.generator` object.

The design Type determines which properties you can set. To set properties, see `Properties (for design generators)`.

Get a list of types which could be used as alternative designs for current design, using `getAlternativeTypes`, by entering the following syntax:

```
Dlist = getAlternativeTypes(D)
```

where `D` is an `mbcdoe.design` object.

The design Type must be one shown in the following table. The read-only Style property is derived from the Type.

Style	Type
Optimal	D-Optimal
	V-Optimal
	A-Optimal

Type (for designs and generators)

Style	Type
Classical	Box-Behnken
	Central Composite
	Full Factorial
	Plackett-Burman
	Regular Simplex
Space-filling	Lattice
	Latin Hypercube Sampling
	Stratified Latin Hypercube
	Sobol Sequence
	Halton Sequence
Experimental data	Design points replaced by data points
Custom	Any design with a mix of Types (eg an optimally augmented space-filling design)

Examples

To specify the Type while creating and then generating a design of a given size:

```
D = CreateDesign(mdl,'Type','Sobol Sequence')
D = Generate(D,128);
```

See Also

`Properties (for design generators)`; `Generate`; `Augment`

Purpose

Design constraint type

Syntax

```
C.Type
```

Description

This is a property of `mbcdoe.constraint`.

`C.Type` returns the design constraint type. You can only choose a type when you create the constraint, when calling `CreateConstraint`.

You can specify the constraint type during creation by using the `Type` property, e.g.,

```
c = D.CreateConstraint('Type','Linear')
```

Other available properties depend on the constraint type. See the table Constraint Properties on page 2-161.

The constraint Type must be one shown in the following table.

Constraint Type	Description
'Linear'	Linear design constraint: 1*Input1 + 1* Input2 + 1* Input3 <= 0
'Ellipsoid'	Ellipsoid design constraint: Ellipsoid at (Input1=0, Input2=0, Input3=0)
'1D Table'	1D Table design constraint: InputY(InputX) <= InputY max
'2D Table'	2D Table design constraint: InputZ(InputX,InputY) <=InputZmax

See Also

`CreateConstraint`; Constraint Properties on page 2-161

Type (for models)

Purpose

Valid model types

Syntax

```
model.Type
M = mbcmodel.CreateModel(Type, NUMINPUTS)
M2 = CreateModel(M, Type)
```

Description

This is a property of `mbcmodel.model`.

`model.Type` returns the model type. This property is set at creation time. See `CreateModel`.

The model Type determines which properties you can set. To set properties, see `Properties (for models)`, and `LocalModel Properties`.

Note Spaces and case in model `Type` are ignored.

The model type must be one shown in the following table.

Type	Model Object
Polynomial	mbcmodel.linearmodel
Hybrid Spline	mbcmodel.linearmodel
RBF	mbcmodel.linearmodel
Hybrid RBF	mbcmodel.linearmodel
Polynomial-RBF	mbcmodel.linearmodel
Hybrid Spline-RBF	mbcmodel.linearmodel
Multiple Linear	mbcmodel.linearmodel
Free Knot Spline	mbcmodel.model
Transient	mbcmodel.model
User-Defined	mbcmodel.model

Type	Model Object
Neural Network	mbcmodel.model
Local Polynomial Spline	mbcmodel.localmodel
Local Polynomial with Datum	mbcmodel.localmodel
Local Polynomial	mbcmodel.localmodel
Local Hybrid Spline	mbcmodel.localmodel
Local Truncated Power Series	mbcmodel.localmodel
Local Free Knot Spline	mbcmodel.localmodel
Local Multiple Models	mbcmodel.localmodel
Local Growth	mbcmodel.localmodel
Local User-Defined	mbcmodel.localmodel
Local Transient	mbcmodel.localmodel
Local Average Fit	mbcmodel.localmodel

Get a list of types, using `getAlternativeTypes`, by entering the following syntax:

```
Mlist = getAlternativeTypes(M)
```

where `M` is an `mbcmodel.model` object.

Create an alternative model as follows: `M = mbcmodel.CreateModel(Type, NUMINPUTS)` or `M2 = CreateModel(M, Type)`.

See Also

`Properties (for models)`, `getAlternativeTypes`, `CreateModel`

Units

Purpose

Model output units

Syntax

```
model.Units
modelinput.Units
```

Description

This is a property of `mbcmodel.model` and `mbcmodel.modelinput` objects.

`model.Units` or `modelinput.Units` return the units of the model or modelinput object.

This property is set to the data signal units when the response is created or if a model is assigned to a response. This property cannot be set when a response is attached to the model.

Purpose

Update design in test plan

Syntax

```
D = UpdateDesign(T,D)
D = UpdateDesign(T,Level,D)
```

Description

`UpdateDesign` is a method of `mbcmodel.testplan`. You must call `UpdateDesign` to replace an edited design in the test plan.

```
D = UpdateDesign(T,D)
```

```
D = UpdateDesign(T,Level,D)
```

`D` is the array of designs to be updated in the test plan, `T`.

`Level` is the test plan level. By default the level is the outer level (i.e., Level 1 for One-stage, Level 2 (global) for Two-stage).

The design Name is used to decide what to update. If no name match is found in the test plan, the design is added.

Design names must be unique so any repeated names will be changed. The array of designs is an output.

See Also

`AddDesign`; `RemoveDesign`; `FindDesign`

UpdateResponse

Purpose

Replace model in response

Syntax

```
UpdateResponse(model)
M = UpdateResponse( M , R); updates the response specified by R
```

Description

This is a method of `mbcmodel.model`. This takes the model and places it back into the response it came from. Appropriate action is taken if a refit is necessary because you have modified either the model, response data or model data in the interim. For example, if you have changed the model type, the new model is fitted to the response data. If you have changed the response data (e.g. removed an outlier), the model is fitted to the new response data.

Note that when changing the model type or settings (using the ModelSetup command) the response is not refitted until you call UpdateResponse. If you have changed the model by using StepwiseRegression you must call UpdateResponse.

```
UpdateResponse( M )
```

updates the model in the response associated with the model.

```
M = UpdateResponse( M , R);
```

updates the response specified by `R`.

Examples

```
UpdateResponse(knot);
```

See Also

`ModelSetup`

Purpose

Refit response feature models

Syntax

```
UpdateResponseFeatures(L)
```

Description

This is a method of `mbcmodel.localresponse`.

`UpdateResponseFeatures(L)` refits all response feature models. You need to call this if you used RemoveOutliersForTest without specifying refitting the response features (`doUpdate` set to false).

Examples

For a local response `LOCALRESPONSE`, to remove first two data points without updating response features:

```
RemoveOutliersForTest(LOCALRESPONSE,1,1:2,false);
```

To update response features:

```
UpdateResponseFeatures(LOCALRESPONSE);
```

See Also

`RemoveOutliersForTest`, `RestoreDataForTest`

UserVariables

Purpose

Structure array holding user-defined variables

Syntax

```
userV = D.UserVariables
```

Description

This is a property of `mbcmodel.data`.

This returns a structure array holding information about the currently defined filters. The array will be the same length as the number of currently defined variables, with fields

- `Variable` — variable name
  - `Expression` — The string expression as defined in `AddVariable` or `ModifyVariable`
  - `Units` — The string defining the units
  - `AppliedOK` — Boolean indicating that the variable expression was successfully applied
  - `Message` — String holding information on the success or otherwise of the variable

Examples

```
myvars = D1.UserVariables
```

This returns the following information about the user-defined variable in the example data object `D1`:

```
      Variable: 'BSFC'
    Expression: 'BSFC = FUELFLO./(BTQ.*(ENGSPEED*2*pi/60))'
         Units: 'kg/Nm'
     AppliedOK: 1
       Message: 'Variable successfully added'
```

`Variable` is the parsed name of the variable being added. Note that this might differ from the string used in `AddVariable` because the `SignalName` must be a valid MATLAB variable name, and hence MBC will parse and modify the input string appropriately.

See Also AddVariable, ModifyVariable, RemoveVariable

Value

Purpose

Double data from data object

Syntax

```
val = Value(D, varNames, testNumbers)
```

Description

This is a method of `mbcmodel.data`.

Use this to extract particular data values.

`varNames` is an optional input that specifies either the name of the signal that you want to extract (such as `'SPK'`) or an array of names (`{'SPK' 'AFR' 'TQ'}`) the indices of the signals (`[1 4 5]`). Defaults to ':' meaning all.

`testNumbers` is an optional input that specifies which test indices you want. Defaults to ':' meaning all.

`val` outputs the double values held in the data.

Examples

```
dblValues = Value(D, 'SPK', 1);
dblValues = Value(D, {'SPK' 'AFR'}, ':');
dblValues = Value(D, [1 3 4 5]);
dblValues = Value(D, ':', [1 4 6 8]);
```

See Also

`SignalNames`

Purpose

Values of model parameters

Syntax

```
vals = paramsknot.Values
```

Description

This is a read-only property of `mbcmodel.modelparameters`. It returns the value of each parameter in the model. Use Names to find out the names of these terms.

Examples

```
vals = paramsknot.Values;
```

See Also

`Names`

Widths

Purpose

Width data from RBF model

Syntax

```
Width = params.Widths
```

Description

This is a property of `mbcmodel.rbfmodelparameters`, for Radial Basis Function (RBF) models only.

Width is usually a single value, but can also be of size 1 by number of variables in the case of the width per dimension algorithm, or number of centers by number of variables in the case of tree regression.

Examples

```
Width = params.Widths;
```

See Also

`Centers`