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 $Stateflow^{\otimes}$ Reference

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Revision History

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Function Reference

Object Retrieval (p. 1-2) Get objects in Stateflow® hierarchy

Chart Creation (p. 1-3) Create Stateflow charts and truth

tables

Chart Input/Output (p. 1-4) Read and write Stateflow charts

GUI (p. 1-5)

Launch tools for defining and

debugging Stateflow objects

Help (p. 1-6) Get help on using Stateflow software

Object Retrieval

sfclipboard Stateflow clipboard object

sfgco Recently selected objects in chart

sfroot Root object

Chart Creation

Create model containing empty Stateflow block sfnew

Create empty chart stateflow

Chart Input/Output

sfclose Close chart

sfopen Open existing model

sfprint Print graphical view of charts

Save chart in current folder

GUI

sfdebugger Open Stateflow Debugger

sfexplr Open Model Explorer

sflib Open Stateflow library window

Help

sfhelp

Open Stateflow online help

Functions — Alphabetical List

sfclipboard

Purpose Stateflow clipboard object

Syntax *object* = sfclipboard

Description object = sfclipboard returns a handle to the Stateflow clipboard

object, which you use to copy objects from one chart or state to another.

Examples

Copy the init function from the Init chart to the Pool chart in the sf pool model:

```
sf pool;
% Get handle to the root object
rt = sfroot;
% Get handle to 'init' function in Init chart
f1 = rt.find('-isa','Stateflow.EMFunction','Name','init');
% Get handle to Pool chart
chP = rt.find('-isa', 'Stateflow.Chart', 'Name', 'Pool');
% Get handle to the clipboard object
cb = sfclipboard;
% Copy 'init' function to the clipboard
cb.copy(f1);
% Paste 'init' function to the Pool chart
cb.pasteTo(chP);
% Get handle to newly pasted function
f2 = chP.find('-isa', 'Stateflow.EMFunction', 'Name', 'init');
% Reset position of new function in the Pool chart
f2.Position = [90 180 90 60];
```

See Also

sfgco | sfnew | sfroot | stateflow

Tutorials

- · "Copying Objects"
- · "Quick Start for the Stateflow API"

How To

- · "Getting a Handle on Stateflow API Objects"
- "Accessing the Chart Object"

Purpose Close chart

Syntax sfclose

sfclose('chart_name')

sfclose('all')

Description sfclose closes the current chart.

sfclose('chart_name') closes the chart called 'chart_name'.

sfclose('all') closes all open or minimized charts. 'all' is a literal

string.

See Also sfnew | sfopen | stateflow

sfdebugger

Purpose Open Stateflow Debugger

Syntax sfdebugger

sfdebugger('model_name')

Description sfdebugger opens the Stateflow Debugger for the current model.

 $\label{eq:sfdebugger} $$ sfdebugger ('model_name') opens the debugger for the Simulink $$ model called 'model_name'. Use this input argument to specify which $$ $$$

model to debug when you have multiple models open.

See Also sfexplr | sfhelp | sflib

How To • "Using the Stateflow Debugger"

sfexplr

Purpose Open Model Explorer

Syntax sfexplr

Description sfexplr opens the Model Explorer. A model does not need to be open.

See Also sfdebugger | sfhelp | sflib

How To• "Using the Model Explorer with Stateflow Objects"

sfgco

Purpose Recently selected objects in chart

Syntax object = sfgco

Description object = sfgco returns a handle or vector of handles to the most

recently selected objects in a chart.

Output Arguments

object

Handle or vector of handles to the most recently selected objects in

a chart

Empty matrix No charts are open, or you have

no edited charts.

Handle to the chart most recently

clicked

You clicked in a chart, but did not

select any objects.

Handle to the selected object You selected one object in a chart.

Vector of handles to the selected

objects

You selected multiple objects in

a chart.

Vector of handles to the most recently selected objects in the most recently selected chart

You selected multiple objects in multiple charts.

Examples

Zoom in on a state after clicking it:

myState = sfgco;

% Zoom in on the selected state

myState.fitToView;

See Also

sfnew | sfroot | stateflow

Tutorials

• "Quick Start for the Stateflow API"

How To

• "Getting a Handle on Stateflow API Objects"

• "Zooming a Chart Object with the API"

sfhelp

Purpose Open Stateflow online help

Syntax sfhelp

Description sfhelp opens the Stateflow online help in the MATLAB® Help browser.

See Also sfdebugger | sfexplr | sfnew | stateflow

Purpose Open Stateflow library window

Syntax sflib

Description sflib opens the Stateflow library window. From this window, you can

drag Chart and Truth Table blocks into Simulink models and access

the Stateflow Examples Library.

See Also sfdebugger | sfexplr | sfhelp | sfnew

Purpose Create model containing empty Stateflow block

Syntax sfnew

sfnew('chart_type')
sfnew('model name')

sfnew('chart type','model name')

Description

sfnew creates an untitled model with an empty chart that supports

full semantics.

sfnew('chart_type') creates an untitled model that contains an

empty block of type chart_type.

sfnew('model_name') creates a model called model_name with an

empty chart that supports full semantics.

sfnew('chart_type','model_name') creates a model called

model_name with an empty block of type chart_type.

Input Arguments

chart_type

Empty block to add to an empty model:

-Classic Use full chart semantics

-Mealy Use only Mealy state machine

semantics

-Moore Use only Moore state machine

semantics

-TT Use a truth table

model name

Name of the model.

Examples

Create a model called MyModel with an empty chart that uses only

Mealy semantics:

```
sfnew('-Mealy','MyModel')
```

Create a model called MyModel with an empty chart that uses only Moore semantics:

```
sfnew('-Moore','MyModel')
```

See Also

sfhelp | sfprint | sfroot | sfsave | stateflow

How To

- · "Creating an Empty State Chart"
- · "Creating Mealy and Moore Charts"
- "Building a Model with a Stateflow Truth Table"

sfopen

Purpose Open existing model

Syntax sfopen

Description stopen prompts you for a model file and opens the model that you select

from your file system.

See Also sfclose | sfdebugger | sfexplr | sflib | sfnew | stateflow

Purpose Print graphical view of charts

Syntax sfprint

sfprint(objects)

sfprint(objects, format)

sfprint(objects,format,output_option)

sfprint(objects, format, output_option, print_entire_chart)

Description

sfprint prints the current chart to a default printer.

sfprint(objects) prints all charts in objects to a default printer.

sfprint(objects, format) prints all charts in objects in the specified format to a default printer.

sfprint(objects, format, output_option) prints all charts in objects in the specified format to the file or printer specified in output option.

sfprint(objects, format, output_option, print_entire_chart) prints all charts in objects in the specified format to the file or printer specified in output_option. Prints a complete or current view of charts as specified in print entire chart.

If the *format* argument is absent, sfprint generates a PostScript file to the default printer. If the *output_option* argument is absent, the name of the chart in the current folder becomes the output file name.

Input Arguments

objects

Objects containing charts to print:

'literal_string' Path name of a chart, model,

subsystem, or block

gcb Command that specifies the

current block of the model

gcs Command that specifies the

current system of the model

format

Format of the image to print:

'bitmap'	Save the chart image to the clipboard as a bitmap (for Windows® operating systems only)
'default'	Print image to your default printer
'eps'	Generate an encapsulated PostScript file
'epsc'	Generate a color encapsulated PostScript file
'jpg'	Generate a JPEG file
'meta'	Save the chart image to the clipboard as a metafile (for Windows operating systems only)
'png'	Generate a PNG file
'ps'	Generate a PostScript file
'psc'	Generate a color PostScript file
'tif'	Generate a TIFF file
output_option	
Name of the file or printer:	
'output_file_name'	Send output to a file called output_file_name
'clipboard'	Copy output to the clipboard

file with the name path to_chart.file_extension, such as sf_pool_Init.jpg 'promptForFile' Prompt for file name interactively 'printer' Send output to the default printer (use only with 'default', 'ps', or 'eps' formats) print entire chart View of charts to print: 1 Print complete charts (default) 0 Print current view of charts Print all charts in the current system as a PostScript file to your default printer: sfprint(gcs) Print the complete chart whose path is 'sf pool/Pool' in JPEG format: sfprint('sf pool/Pool','jpg')

Print the complete chart whose path is 'sf car/shift logic' in TIFF

sfprint('sf car/shift logic','tif','myFile')

format using the name myFile:

Send output to a default

'file'

Examples

2-15

sfprint

Print the current view of all charts in the current system in PNG format using default file names:

sfprint(gcs,'png','file',0)

See Also

gcb | gcs | sfhelp | sfnew | sfsave | stateflow

How To

• "Printing Stateflow Charts"

Purpose Root object

Syntax object = sfroot

Description object = sfroot returns a handle to the top-level object in the

Stateflow hierarchy of objects. Use the root object to access all other

objects in your charts when using the API.

Examples Zoom in on a state in your chart:

old sf car;

% Get handle to the root object

rt = sfroot;

% Find the state with the name 'first'

myState = rt.find('-isa','Stateflow.State','Name','first');

% Zoom in on that state in the chart

myState.fitToView;

See Also sfclipboard | sfgco

Tutorials • "Quick Start for the Stateflow API"

How To• "Getting a Handle on Stateflow API Objects"

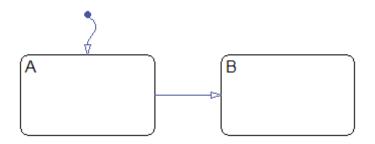
• "Accessing the Chart Object"

Purpose Save chart in current folder **Syntax** sfsave sfsave('model name') sfsave('model name', 'new model name') sfsave('Defaults') **Description** sfsave saves the chart in the current model. sfsave('model name') saves the chart in the model called 'model name'. sfsave('model name', 'new model name') saves the chart in 'model name' to 'new model name'. sfsave('Defaults') saves the settings of the current model as defaults. 'Defaults' is a literal string. The model must be open and the current folder must be writable. **Examples** Develop a script to create a baseline chart and save it in a new model: bdclose('all'); % Create an empty chart in a new model sfnew; % Get root object rt = sfroot; % Get model m = rt.find('-isa', 'Simulink.BlockDiagram'); % Get chart chart1 = m.find('-isa', 'Stateflow.Chart'); % Create two states, A and B, in the chart sA = Stateflow.State(chart1);

```
sA.Name = 'A';
sA.Position = [50 50 100 60];
sB = Stateflow.State(chart1);
sB.Name = 'B';
sB.Position = [200 50 100 60];
% Add a transition from state A to state B
tAB = Stateflow.Transition(chart1);
tAB.Source = sA;
tAB.Destination = sB;
tAB.SourceOClock = 3;
tAB.DestinationOClock = 9;
% Add a default transition to state A
dtA = Stateflow.Transition(chart1);
dtA.Destination = sA;
dtA.DestinationOClock = 0;
x = sA.Position(1) + sA.Position(3)/2;
y = sA.Position(2)-30;
dtA.SourceEndPoint = [x y];
% Add an input in1
d1 = Stateflow.Data(chart1);
d1.Scope = 'Input';
d1.Name = 'in1';
% Add an output out1
d2 = Stateflow.Data(chart1);
d2.Scope = 'Output';
d2.Name = 'out1';
% Save the chart in a model called "NewModel"
% in current folder
sfsave('untitled','NewModel');
Here is the resulting model:
```



Here is the resulting chart:



See Also

sfopen | sfclose | sfroot | sfnew | find

Tutorials

• "Quick Start for the Stateflow API"

How To

- "Creating a MATLAB Script of API Commands"

stateflow

Purpose Create empty chart

Syntax stateflow

Description stateflow creates an untitled model that contains an empty chart. The

function also opens the Stateflow library window. From this window, you can drag Chart and Truth Table blocks into models or access the

Stateflow Examples Library.

See Also sflib | sfnew

How To• "Creating an Empty State Chart"

stateflow

Block Reference

Stateflow Chart

Purpose Classic, Mealy, and Moore finite state machines for implementing

control logic

Library Stateflow

Description

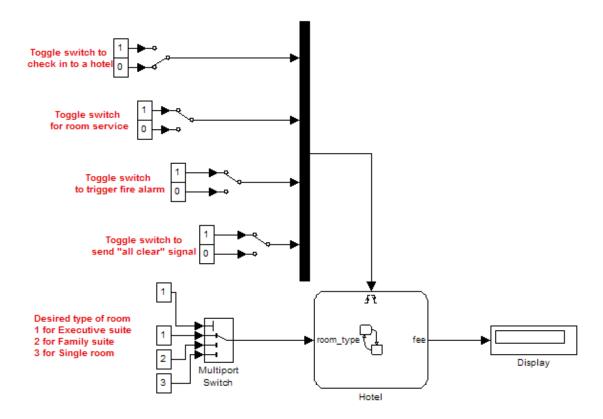


A *finite state machine* is a representation of an event-driven (reactive) system. In an event-driven system, the system responds by making a transition from one state (mode) to another. This action occurs in response to an event, as long as the condition defining the change is true.

A Stateflow chart is a graphical representation of a finite state machine, where *states* and *transitions* form the basic elements of the system. You can also represent stateless flow graphs. To add your control logic to a Simulink model, use a Stateflow block.

You can use Stateflow charts to control a physical plant in response to events such as a temperature or pressure sensor, or clock or user-driven events. For example, you can use a state machine to represent the automatic transmission of a car. The transmission has these operating states: park, reverse, neutral, drive, and low. As the driver shifts from one position to another, the system makes a transition from one state to another, for example, from park to reverse.

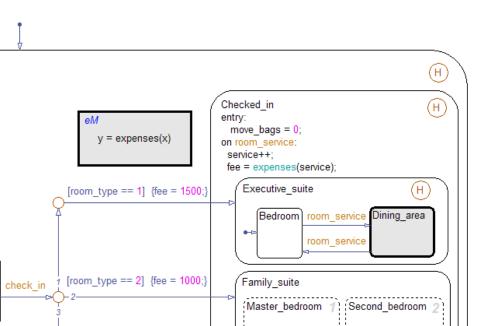
The following block diagram contains a Chart block named Hotel that responds to inputs from several Manual Switch blocks.



Check in

Front desk

move_bags = 1;



If you double-click the Chart block in the model, the chart appears.

By default, the Chart block uses *Classic* chart semantics. You can also specify Mealy or Moore semantics for your state chart. For more information, see "Building Mealy and Moore Charts".

all clear

Single_room

[room_type == 3] {fee = 500;}

fire_alarm

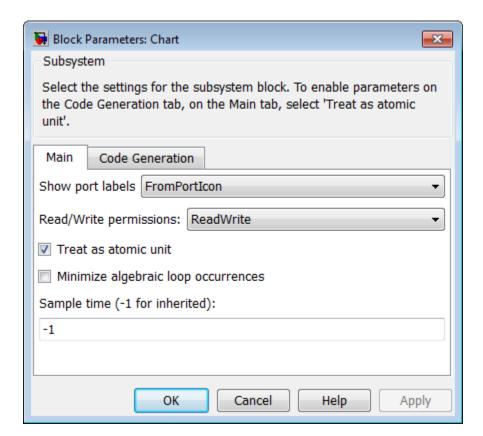
Waiting_area

Data Type Support

The Chart block accepts inputs of any type including two-dimensional matrices, fixed-point data, and enumerated data. Floating-point inputs pass through the block unchanged. Boolean inputs are treated as uint8 signals.

You can declare local data of any type or size.

Parameters and Dialog Box



For a description of the block parameters, see the Subsystem block reference page in the Simulink documentation.

Stateflow Chart

Characteristics

Direct Feedthrough	Yes
Sample Time	Specified in the Sample time parameter
Scalar Expansion	N/A
Dimensionalized	Yes
Zero-Crossing Detection	Yes, if enabled for continuous-time systems
	For more information, see "Modeling Continuous-Time Systems in Stateflow Charts" in the Stateflow documentation.

Purpose

Represent logical decision-making behavior with conditions, decisions, and actions

Library

Stateflow

Description



The Truth Table block is a truth table function that uses only MATLAB action language. Use this block when you want to use truth table logic directly in a Simulink model. This block requires a Stateflow license.

When you add a Truth Table block directly to a model instead of calling truth table functions from a Stateflow chart, these advantages apply:

- It is a more direct approach, especially if your model requires only a single truth table.
- You can define truth table inputs and outputs to have inherited types and sizes.

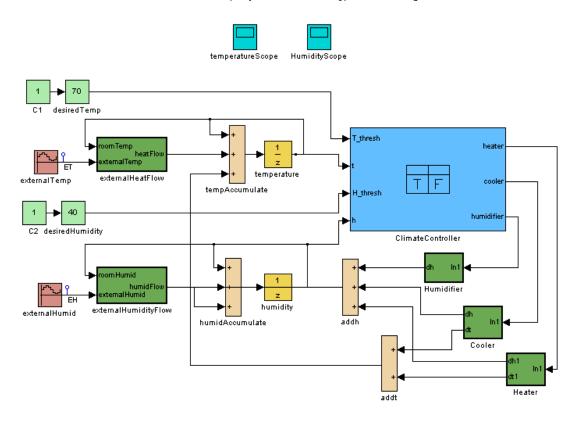
The Truth Table block works with a subset of the MATLAB language that is optimized for generating embeddable C code. This block generates content as MATLAB code. As a result, you can take advantage of other tools to debug your Truth Table block during simulation. For more information, see "Debugging a MATLAB Function in a Chart".

For purely logical behavior, truth tables are easier to program and maintain than graphical functions. Truth tables also provide diagnostics that indicate whether you have too few (underspecified) or too many (overspecified) decisions for the conditions you specify. For an introduction to truth tables, see "Truth Table Functions for Decision-Making Logic".

The following model, sf_climate_control, shows a home environment controller that attempts to maintain a selected temperature and

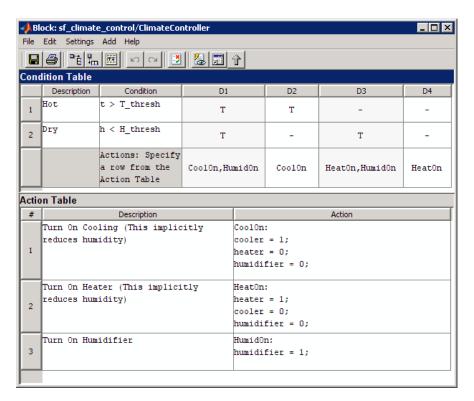
humidity. The model has a Truth Table block, ClimateController, that responds to changes in room temperature (input t) and humidity (input h).

Home climate (temperature and humidity) controller using Truth Table



Truth Table Editor

If you double-click the Truth Table block in sf_climate_control, the Truth Table Editor opens to display its conditions, actions, and decisions. Here is the display for the Truth Table block named ClimateController.



The inputs t and h define the conditions, and the outputs heater, cooler, and humidifier define the actions for this Truth Table block. For more details, refer to the demo description for this model.

Using the Truth Table Editor, you can:

- Enter and edit conditions, actions, and decisions
- Add or modify Stateflow data and ports using the Ports and Data Manager
- Run diagnostics to detect parser errors
- View generated content after simulation

For more information about the Truth Table Editor, see "Truth Table Editor Operations".

Ports and Data Manager

To add or edit data in a Truth Table block, open the Ports and Data Manager by selecting **Add > Edit Data/Ports** in the Truth Table Editor.

Using the Ports and Data Manager, you can add these elements to a Truth Table block.

Element	Tool	Description
Data		You can add these types of data:
		• Local
		• Constant
		Parameter
		Data store memory
Input trigger	4	An <i>input trigger</i> causes a Truth Table block to execute when a Simulink control signal changes or through a Simulink block that outputs function-call events. You can use one of these input triggers:
		• Rising edge
		Falling edge
		Either rising or falling edge
		Function call

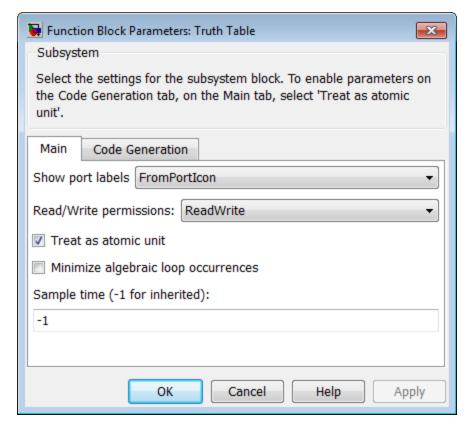
Element	Tool	Description
		For more information, see "Defining Events".
Function-call output	fO	A function-call output triggers a function call to a subsystem. For more information, see "Function-Call Subsystems" in the Simulink documentation.

Data Type Support

The Truth Table block accepts signals of any data type that Simulink supports, including fixed-point and enumerated data types. The block also accepts frame-based signals. Truth Table blocks work with frame-based signals in the same way as MATLAB Function blocks (see "Working with Frame-Based Signals" in the Simulink documentation).

For a discussion of data types that Simulink supports, refer to the Simulink documentation.

Parameters and Dialog Box



For a description of the block parameters, see the Subsystem block reference page in the Simulink documentation.

Characteristics

Direct Feedthrough	Yes
Sample Time	Specified in the Sample time parameter
Scalar Expansion	N/A

Dimensionalized	Yes
Zero-Crossing Detection	No

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