

**fuzzCont**

**Design Description**

**chows**

# **fuzzCont: Design Description**

by chows

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# Chapter 1. Model Version

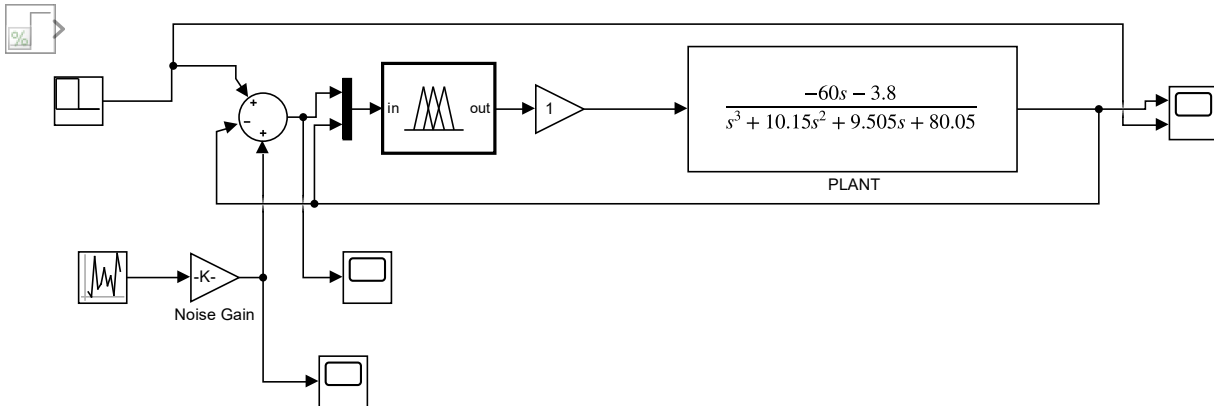
**Version:** 1.1

**Last modified:** Tue Apr 30 04:28:23 2019

**Checksum:** 3035767819 3300279783 665439817 2899838947

# Chapter 2. Root System

Figure 2.1. fuzzCont



## Blocks

## Parameters

### " PLANT" (TransferFcn)

Table 2.1. " PLANT" Parameters

Parameter	Value
Numerator coefficients	[-60 -3.8]
Denominator coefficients	[1 10.15 9.505 80.05]
State Name (e.g., 'position')	"

### "Fuzzy Logic Controller" (SubSystem)

Table 2.2. "Fuzzy Logic Controller" Parameters

Parameter	Value
fuzzydialogsfllcMask_ParameterLabel_FIS	control
fuzzydialogsfllcMask_ParameterLabel_NumSamples	101
fuzzydialogsfllcMask_ParameterLabel_DataType	double
fuzzydialogsfllcMask_OutportLabel_FuzzifiedInputs	off

## Chapter 2. Root System

Parameter	Value
fuzzydialogsflcMask_OutputLabel_RuleFiringStrengths	off
fuzzydialogsflcMask_OutputLabel_RuleOutputs	off
fuzzydialogsflcMask_OutputLabel_AggregatedOutputs	off
fuzzydialogsflcMask_ParameterLabel_SimulateUsing	Interpreted execution
fuzzydialogsflcMask_ParameterLabel_OutOfRangeInputValueDiagnostic	warning
fuzzydialogsflcMask_ParameterLabel_ZeroRuleFiringStrengthDiagnostic	warning
fuzzydialogsflcMask_ParameterLabel_EmptyOutputFuzzySetDiagnostic	warning

**Table 2.3. Defuzzify Outputs Function Properties**

Property	Value
Update Method	INHERITED
Sample Time	
Support variable-size arrays	1
Saturate on integer overflow	1
Treat these inherited Simulink signal types as fixed-point objects	Fixed-point
MATLAB Function block fimath	Other:UserSpecified
Input fixed-point math	fimath(... 'RoundingMethod',fm.RoundingMethod,... 'ProductMode',fm.ProductMode,... 'ProductWordLength',fm.ProductWordLength,... 'ProductFractionLength',fm.ProductFractionLength,... 'SumMode',fm.SumMode,... 'SumWordLength',fm.SumWordLength,... 'SumFractionLength',fm.SumFractionLength... )
Description	

**Table 2.4. Defuzzify Outputs Argument Summary**

Name	Scope	Port	Data Type	Size
sumAntecedentOutputs	Input	1	double	1
aggregatedOutputs	Input	2	double	[101, 1]
defuzzifiedOutputs	Output	1	double	1
fis	Parameter	NaN	s3DQRlIzcNGN Q1lOkYYgymH	1

Name	Scope	Port	Data Type	Size
samplePoints	Input	3	double	[1, 101]
SimulateUsing	Parameter	NaN	double	1
diagnostics	Parameter	NaN	sysmypvOZS2uJx5i J5NmK0E	1

### Defuzzify Outputs Function Script

```

function defuzzifiedOutputs = fcn(sumAntecedentOutputs,...
    aggregatedOutputs,fis,samplePoints,SimulateUsing,diagnostics)

if SimulateUsing==1 && coder.target('SFun') && ...
    (isa(aggregatedOutputs,'double') || isa(aggregatedOutputs,'single'))

    defuzzifiedOutputs = zeros(fis.numOutputs,1, ...
        'like',aggregatedOutputs);
    if strcmp(char(fis.type),'mamdani')
        if isa(aggregatedOutputs,'double')
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applyMamdaniDefuzzificationMethod_double_mex'],...
                samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        else
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applyMamdaniDefuzzificationMethod_single_mex'],...
                samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        end
    else
        if isa(aggregatedOutputs,'double')
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applySugenoDefuzzificationMethod_double_mex'],...
                sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        else
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applySugenoDefuzzificationMethod_single_mex'],...
                sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        end
    end
end

else

    if isequal(fis.type,uint8('mamdani'))
        defuzzifiedOutputs = ...
            fuzzy.internal.codegen.applyMamdaniDefuzzificationMethod(...
                samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
    else
        defuzzifiedOutputs = ...
            fuzzy.internal.codegen.applySugenoDefuzzificationMethod(...)
    end
end

```

```

sumAntecedentOutputs,aggregatedOutputs,fis,diagnostics);
end
end
end

```

**Table 2.5. Defuzzify Outputs Supporting Functions**

Function	Defined By	Path
centroid	MATLAB	
char	MATLAB	
coder.internal.applyScalarFunctionInPlace	MATLAB	
coder.internal.avoidArrayFlattening	MATLAB	
coder.internal.charCastCheck	MATLAB	
coder.internal.constNonSingletonDim	MATLAB	
coder.internal.div	MATLAB	
coder.internal.isBuiltInNumeric	MATLAB	
coder.internal.isIntegerClass	MATLAB	
coder.internal.length	MATLAB	
coder.internal.narginchk	MATLAB	
coder.internal.prodsizes	MATLAB	
coder.internal.scalar.floor	MATLAB	
coder.internal.scalarEg	MATLAB	
coder.internal.scaleCompatible	MATLAB	
combineVectorElements	MATLAB	
floor	MATLAB	
full	MATLAB	
fuzzy.internal.codegen.applyMamdaniDefuzzificationMethod	MATLAB	
fuzzy.internal.codegen.generateConstantCode	MATLAB	
intmax	MATLAB	
intmin	MATLAB	
isequal	MATLAB	



## Chapter 2. Root System

Function	Defined By	Path
isfi	MATLAB	
isfimath	MATLAB	
isnan	MATLAB	
isnumericitype	MATLAB	
issparse	MATLAB	
mean	MATLAB	
mrdivide	MATLAB	
process_sumprod_inputs	MATLAB	
rdivide	MATLAB	
sum	MATLAB	
sumprod	MATLAB	
throwEmptyFuzzySetDiagnostic	MATLAB	
throwNoRuleFiredDiagnostic	MATLAB	

**Table 2.6. Evaluate Rule Antecedents Function Properties**

Property	Value
Update Method	INHERITED
Sample Time	
Support variable-size arrays	1
Saturate on integer overflow	1
Treat these inherited Simulink signal types as fi objects	Fixed-point
MATLAB Function block fimath	Other:UserSpecified
Input fi math	fimath(... 'RoundingMethod',fm.RoundingMethod,... 'ProductMode',fm.ProductMode,... 'ProductWordLength',fm.ProductWordLength,... 'ProductFractionLength',fm.ProductFractionLength,... 'SumMode',fm.SumMode,... 'SumWordLength',fm.SumWordLength,... 'SumFractionLength',fm.SumFractionLength... )
Description	

**Table 2.7. Evaluate Rule Antecedents Argument Summary**

Name	Scope	Port	Data Type	Size
inputs	Input	1	double	2
antecedentOutputs	Output	1	double	[11, 1]
fis	Parameter	NaN	s3DQRlIzcNGN Q1lOkYYgymH	1
sumAntecedentOutputs	Output	2	double	1
SimulateUsing	Parameter	NaN	double	1
diagnostics	Parameter	NaN	sysmypoZS2uJx5i J5NmK0E	1

**Evaluate Rule Antecedents Function Script**

```

function [antecedentOutputs,sumAntecedentOutputs] = fcn(inputs, ...
    fis,SimulateUsing,diagnostics)

if SimulateUsing==1 && coder.target('SFun') ...
    && (isa(inputs,'double') || isa(inputs,'single'))

    antecedentOutputs = zeros(fis.numRules,1, ...
        'like',inputs);
    sumAntecedentOutputs = zeros('like',inputs);

    if isa(inputs,'double')
        [antecedentOutputs(:,sumAntecedentOutputs(:))] = feval(...
            'fuzzy.internal.codegen.evaluateRuleAntecedent_double_mex',...
            inputs,fis,diagnostics);
    else
        [antecedentOutputs(:,sumAntecedentOutputs(:))] = feval(...
            'fuzzy.internal.codegen.evaluateRuleAntecedent_single_mex',...
            inputs,fis,diagnostics);
    end

else

    [antecedentOutputs,sumAntecedentOutputs] = ...
        fuzzy.internal.codegen.evaluateRuleAntecedent(...
            inputs,fis,diagnostics);

end

end

```

**Table 2.8. Evaluate Rule Antecedents Supporting Functions**

Function	Defined By	Path
abs	MATLAB	

## Chapter 2. Root System

Function	Defined By	Path
char	MATLAB	
coder.gpu.internal.isGpuEnabled	MATLAB	
coder.internal.applyBinaryScalarFunction	MATLAB	
coder.internal.applyScalarFunction	MATLAB	
coder.internal.applyScalarFunctionInPlace	MATLAB	
coder.internal.avoidArrayFlattening	MATLAB	
coder.internal.charCastCheck	MATLAB	
coder.internal.constNonSingletonDim	MATLAB	
coder.internal.div	MATLAB	
coder.internal.error	MATLAB	
coder.internal.isBuiltInNumeric	MATLAB	
coder.internal.isIntegerClass	MATLAB	
coder.internal.length	MATLAB	
coder.internal.minOrMax	MATLAB	
coder.internal.narginchk	MATLAB	
coder.internal.prodsize	MATLAB	
coder.internal.scalar.abs	MATLAB	
coder.internal.scalar.exp	MATLAB	
coder.internal.scalar.floor	MATLAB	
coder.internal.scalarEg	MATLAB	
coder.internal.scalexpCompatible	MATLAB	
coder.internal.unaryMinOrMax	MATLAB	
combineVectorElements	MATLAB	
createInputMFCache	MATLAB	
exp	MATLAB	
extractVarMF	MATLAB	
floor	MATLAB	
full	MATLAB	

## Chapter 2. Root System

Function	Defined By	Path
fuzzy.internal.codegen.evaluateAndMethod	MATLAB	
fuzzy.internal.codegen.evaluateCommonMembershipFcn	MATLAB	
fuzzy.internal.codegen.evaluateOrMethod	MATLAB	
fuzzy.internal.codegen.evaluateRuleAntecedent	MATLAB	
fuzzy.internal.codegen.generateConstantCode	MATLAB	
fuzzy.internal.utility.validateGaussMFPParameterValues	MATLAB	
gaussmf	MATLAB	
intmax	MATLAB	
intmin	MATLAB	
iscolumn	MATLAB	
isequal	MATLAB	
isfi	MATLAB	
isfimath	MATLAB	
ismatrix	MATLAB	
isnan	MATLAB	
isnumericitype	MATLAB	
isrow	MATLAB	
issparse	MATLAB	
max	MATLAB	
min	MATLAB	
mpower	MATLAB	
mrdivide	MATLAB	
power	MATLAB	
process_sumprod_inputs	MATLAB	
rdivide	MATLAB	
sum	MATLAB	
sumprod	MATLAB	

**Table 2.9. Evaluate Rule Consequents Function Properties**

Property	Value
Update Method	INHERITED

Property	Value
Sample Time	
Support variable-size arrays	1
Saturate on integer overflow	1
Treat these inherited Simulink signal types as fi objects	Fixed-point
MATLAB Function block fimath	Other:UserSpecified
Input fi math	fimath(... 'RoundingMethod',fm.RoundingMethod,... 'ProductMode',fm.ProductMode,... 'ProductWordLength',fm.ProductWordLength,... 'ProductFractionLength',fm.ProductFractionLength,... 'SumMode',fm.SumMode,... 'SumWordLength',fm.SumWordLength,... 'SumFractionLength',fm.SumFractionLength... )
Description	

**Table 2.10. Evaluate Rule Consequents Argument Summary**

Name	Scope	Port	Data Type	Size
inputs	Input	1	double	2
antecedentOutputs	Input	2	double	[11, 1]
aggregatedOutputs	Output	1	double	[101, 1]
fis	Parameter	NaN	s3DQRlIzcNGN Q1lOkYYgymH	1
samplePoints	Input	3	double	[1, 101]
SimulateUsing	Parameter	NaN	double	1

### Evaluate Rule Consequents Function Script

```

function aggregatedOutputs = fcn(inputs,antecedentOutputs, ...
    fis,samplePoints,SimulateUsing)

if SimulateUsing==1 && coder.target('SFun') ...
    && (isa(inputs,'double') || isa(inputs,'single'))

    aggregatedOutputs = zeros(fis.aggSize,'like',inputs);
    if strcmp(char(fis.type),'mamdani')
        if isa(inputs,'double')
            aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'evaluateRuleConsequentForMamdaniFIS_double_mex'],...

```

```

        antecedentOutputs,fis,samplePoints);
    else
        aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
            'evaluateRuleConsequentForMamdaniFIS_single_mex'],...
            antecedentOutputs,fis,samplePoints);
    end
    else
        if isa(inputs,'double')
            aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'evaluateRuleConsequentForSugenoFIS_double_mex'],...
                inputs,antecedentOutputs,fis);
        else
            aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'evaluateRuleConsequentForSugenoFIS_single_mex'],...
                inputs,antecedentOutputs,fis);
        end
    end
end

else

    if strcmp(char(fis.type),'mamdani')
        aggregatedOutputs = ...
            fuzzy.internal.codegen.evaluateRuleConsequentForMamdaniFIS(...
                antecedentOutputs,fis,samplePoints);
    else
        aggregatedOutputs = ...
            fuzzy.internal.codegen.evaluateRuleConsequentForSugenoFIS(...
                inputs,antecedentOutputs,fis);
    end

end

end

end

```

**Table 2.11. Evaluate Rule Consequents Supporting Functions**

Function	Defined By	Path
abs	MATLAB	
char	MATLAB	
coder.gpu.internal.isGpuEnabled	MATLAB	
coder.internal.applyBinaryScalarFunction	MATLAB	
coder.internal.applyScalarFunction	MATLAB	
coder.internal.applyScalarFunctionInPlace	MATLAB	
coder.internal.avoidArrayFlattening	MATLAB	

## Chapter 2. Root System

Function	Defined By	Path
coder.internal.charCastCheck	MATLAB	
coder.internal.constNonSingletonDim	MATLAB	
coder.internal.div	MATLAB	
coder.internal.error	MATLAB	
coder.internal.isBuiltInNumeric	MATLAB	
coder.internal.isIntegerClass	MATLAB	
coder.internal.length	MATLAB	
coder.internal.minOrMax	MATLAB	
coder.internal.narginchk	MATLAB	
coder.internal.prodsize	MATLAB	
coder.internal.scalar.abs	MATLAB	
coder.internal.scalar.exp	MATLAB	
coder.internal.scalar.floor	MATLAB	
coder.internal.scalarEg	MATLAB	
coder.internal.scalexpAlloc	MATLAB	
coder.internal.scalexpAllocNoCheck	MATLAB	
coder.internal.scalexpCompatible	MATLAB	
coder.internal.unaryMinOrMax	MATLAB	
coder.internal.useParforConst	MATLAB	
combineVectorElements	MATLAB	
createMamdaniOutputMFCache	MATLAB	
exp	MATLAB	
extractVarMF	MATLAB	
floor	MATLAB	
full	MATLAB	
fuzzy.internal.codegen.evaluateAndMethod	MATLAB	
fuzzy.internal.codegen.evaluateCommonMembershipFcn	MATLAB	

## Chapter 2. Root System

Function	Defined By	Path
fuzzy.internal.codegen.evaluateOrMethod	MATLAB	
fuzzy.internal.codegen.evaluateRuleConsequentForMamdaniFIS	MATLAB	
fuzzy.internal.codegen.generateConstantCode	MATLAB	
fuzzy.internal.utility.validateGaussMFParameterValues	MATLAB	
gaussmf	MATLAB	
intmax	MATLAB	
intmin	MATLAB	
iscolumn	MATLAB	
isequal	MATLAB	
isfi	MATLAB	
isfimath	MATLAB	
ismatrix	MATLAB	
isnan	MATLAB	
isnumerictype	MATLAB	
isrow	MATLAB	
issparse	MATLAB	
max	MATLAB	
min	MATLAB	
mpower	MATLAB	
mrdivide	MATLAB	
power	MATLAB	
process_sumprod_inputs	MATLAB	
rdivide	MATLAB	
sum	MATLAB	
sumprod	MATLAB	

## "Gain" (Gain)

**Table 2.12. "Gain" Parameters**

Parameter	Value
Gain	1
Multiplication	Element-wise(K.*u)



Parameter	Value
Parameter minimum	[]
Parameter maximum	[]
Parameter data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

## "Mux" (Mux)

**Table 2.13. "Mux" Parameters**

Parameter	Value
Number of inputs	2
Display option	bar

## "Noise Gain" (Gain)

**Table 2.14. "Noise Gain" Parameters**

Parameter	Value
Gain	0.01
Multiplication	Element-wise(K.*u)
Parameter minimum	[]
Parameter maximum	[]
Parameter data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock output data type setting against changes by the fixed-point tools	off

Parameter	Value
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

## "Repeating Sequence Stair" (SubSystem)

**Table 2.15. "Repeating Sequence Stair" Parameters**

Parameter	Value
SimulinkmasksVectorOfOutputValues_MP	[1 0].'
SimulinkmasksSampleTime_MP	50
SimulinkmasksOutputMinimum_MP	[]
SimulinkmasksOutputMaximum_MP	[]
SimulinkmasksOutputDataType_MP	double
SimulinkmasksLockOutputDataTypeAgainstFxpTools_MP	off

## "Sum" (Sum)

**Table 2.16. "Sum" Parameters**

Parameter	Value
Icon shape	round
List of signs	+ - +
Sum over	All dimensions
Dimension	1
Require all inputs to have the same data type	off
Accumulator data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via internal rule
Lock data type settings against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

## "Uniform Random Number" (UniformRandomNumber)

**Table 2.17. "Uniform Random Number" Parameters**

Parameter	Value
Minimum	-1
Maximum	1
Seed	0
Sample time	0.1
Interpret vector parameters as 1-D	on

## Block Execution Order

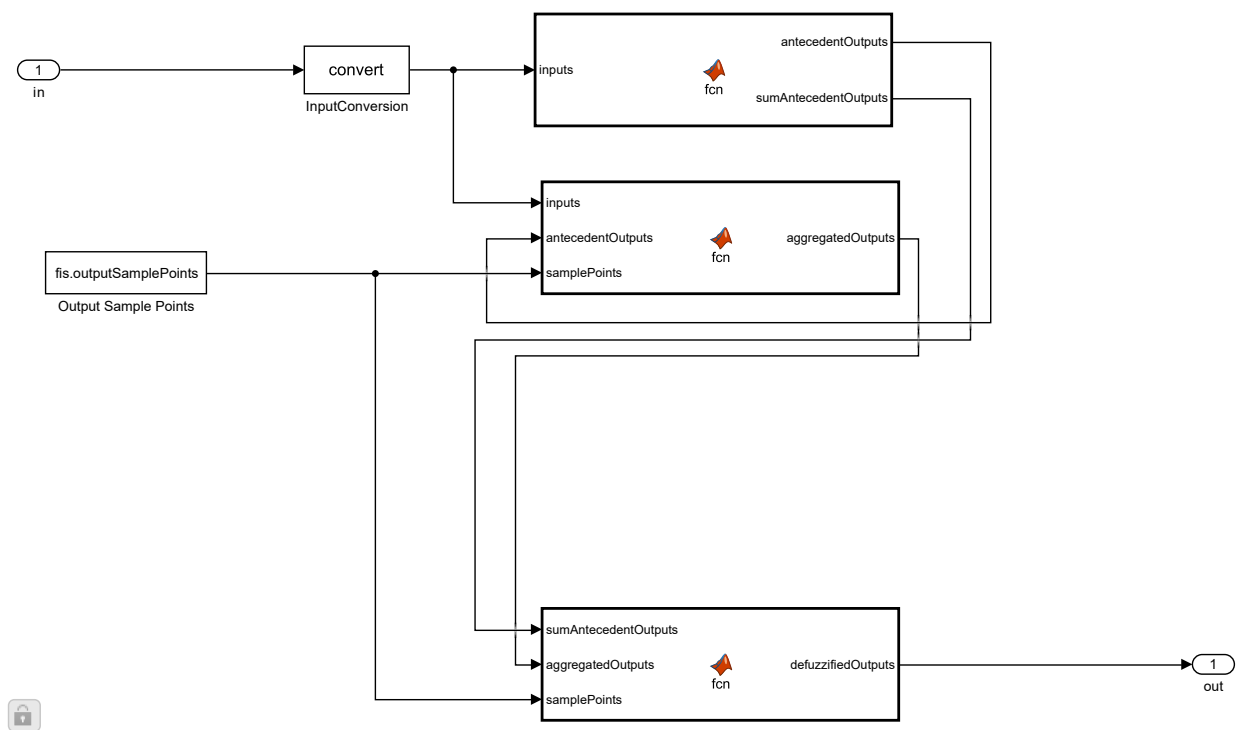
1. [PLANT](#) (TransferFcn)
2. [Output](#) (UnitDelay)
3. [Vector](#) (Constant)
4. [Output](#) (MultiPortSwitch)
5. [Scope](#) (Scope)
6. [Uniform Random Number](#) (UniformRandomNumber)
7. [Noise Gain](#) (Gain)
8. [Sum](#) (Sum)
9. [Scope1](#) (Scope)
10. [Scope2](#) (Scope)
11. [Fuzzy Logic Controller](#)
  1. [Evaluate Rule Antecedents](#)
    1. [TmpSignal ConversionAt SFunction Inport1](#) (SignalConversion)
    2. [SFunction](#) (S-Function)
  2. [Output Sample Points](#) (Constant)
  3. [Evaluate Rule Consequents](#)
    1. [TmpSignal ConversionAt SFunction Inport1](#) (SignalConversion)
    2. [SFunction](#) (S-Function)
  4. [Defuzzify Outputs](#)
    1. [SFunction](#) (S-Function)
12. [Gain](#) (Gain)
13. [FixPt Constant](#) (Constant)
14. [FixPt Sum1](#) (Sum)
15. [Constant](#) (Constant)
16. [FixPt Switch](#) (Switch)

# Chapter 3. Subsystems

## Fuzzy Logic Controller

Checksum: 2846552074 3461676337 1552350959 2275994910

Figure 3.1. fuzzCont/Fuzzy Logic Controller



## Blocks

### Parameters

#### "Defuzzify Outputs" (MATLAB Function)

Table 3.1. Defuzzify Outputs Function Properties

Property	Value
Update Method	INHERITED
Sample Time	

## Chapter 3. Subsystems

Property	Value
Support variable-size arrays	1
Saturate on integer overflow	1
Treat these inherited Simulink signal types as fixed-point objects	Fixed-point
MATLAB Function block fimath	Other:UserSpecified
Input fixed-point math	fimath(... 'RoundingMethod',fm.RoundingMethod,... 'ProductMode',fm.ProductMode,... 'ProductWordLength',fm.ProductWordLength,... 'ProductFractionLength',fm.ProductFractionLength,... 'SumMode',fm.SumMode,... 'SumWordLength',fm.SumWordLength,... 'SumFractionLength',fm.SumFractionLength... )
Description	

**Table 3.2. Defuzzify Outputs Argument Summary**

Name	Scope	Port	Data Type	Size
sumAntecedentOutputs	Input	1	double	1
aggregatedOutputs	Input	2	double	[101, 1]
defuzzifiedOutputs	Output	1	double	1
fis	Parameter	NaN	s3DQRllzcNGNQ1lOkYYgymH	1
samplePoints	Input	3	double	[1, 101]
SimulateUsing	Parameter	NaN	double	1
diagnostics	Parameter	NaN	sysmypoZS2uJx5iJ5NmK0E	1

### Defuzzify Outputs Function Script

```
function defuzzifiedOutputs = fcn(sumAntecedentOutputs,...
    aggregatedOutputs,fis,samplePoints,SimulateUsing,diagnostics)

if SimulateUsing==1 && coder.target('SFun') && ...
    (isa(aggregatedOutputs,'double') || isa(aggregatedOutputs,'single'))

    defuzzifiedOutputs = zeros(fis.numOutputs,1, ...
        'like',aggregatedOutputs);
    if strcmp(char(fis.type),'mamdani')
```

```

    if isa(aggregatedOutputs,'double')
        defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
            'applyMamdaniDefuzzificationMethod_double_mex'],...
            samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
            fis,diagnostics);
    else
        defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
            'applyMamdaniDefuzzificationMethod_single_mex'],...
            samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
            fis,diagnostics);
    end
else
    if isa(aggregatedOutputs,'double')
        defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
            'applySugenoDefuzzificationMethod_double_mex'],...
            sumAntecedentOutputs,aggregatedOutputs, ...
            fis,diagnostics);
    else
        defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
            'applySugenoDefuzzificationMethod_single_mex'],...
            sumAntecedentOutputs,aggregatedOutputs, ...
            fis,diagnostics);
    end
end
else
    if isequal(fis.type,uint8('mamdani'))
        defuzzifiedOutputs = ...
            fuzzy.internal.codegen.applyMamdaniDefuzzificationMethod(...
            samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
            fis,diagnostics);
    else
        defuzzifiedOutputs = ...
            fuzzy.internal.codegen.applySugenoDefuzzificationMethod(...
            sumAntecedentOutputs,aggregatedOutputs,fis,diagnostics);
    end
end
end
end

```

**Table 3.3. Defuzzify Outputs Supporting Functions**

Function	Defined By	Path
centroid	MATLAB	
char	MATLAB	
coder.internal.applyScalarFunctionInPlace	MATLAB	
coder.internal.avoidArrayFlattening	MATLAB	

## Chapter 3. Subsystems

Function	Defined By	Path
<code>coder.internal.charCastCheck</code>	MATLAB	
<code>coder.internal.constNonSingletonDim</code>	MATLAB	
<code>coder.internal.div</code>	MATLAB	
<code>coder.internal.isBuiltInNumeric</code>	MATLAB	
<code>coder.internal.isIntegerClass</code>	MATLAB	
<code>coder.internal.length</code>	MATLAB	
<code>coder.internal.narginchk</code>	MATLAB	
<code>coder.internal.prodsize</code>	MATLAB	
<code>coder.internal.scalar.floor</code>	MATLAB	
<code>coder.internal.scalarEg</code>	MATLAB	
<code>coder.internal.scalexpCompatible</code>	MATLAB	
<code>combineVectorElements</code>	MATLAB	
<code>floor</code>	MATLAB	
<code>full</code>	MATLAB	
<code>fuzzy.internal.codegen.applyMamdaniDefuzzificationMethod</code>	MATLAB	
<code>fuzzy.internal.codegen.generateConstantCode</code>	MATLAB	
<code>intmax</code>	MATLAB	
<code>intmin</code>	MATLAB	
<code>isequal</code>	MATLAB	
<code>isfi</code>	MATLAB	
<code>isfimath</code>	MATLAB	
<code>isnan</code>	MATLAB	
<code>isnumericType</code>	MATLAB	
<code>issparse</code>	MATLAB	
<code>mean</code>	MATLAB	
<code>mrdivide</code>	MATLAB	
<code>process_sumprod_inputs</code>	MATLAB	
<code>rdivide</code>	MATLAB	
<code>sum</code>	MATLAB	
<code>sumprod</code>	MATLAB	

Function	Defined By	Path
throwEmptyFuzzySetDiagnostic	MATLAB	
throwNoRuleFiredDiagnostic	MATLAB	

### "Evaluate Rule Antecedents" (MATLAB Function)

**Table 3.4. Evaluate Rule Antecedents Function Properties**

Property	Value
Update Method	INHERITED
Sample Time	
Support variable-size arrays	1
Saturate on integer overflow	1
Treat these inherited Simulink signal types as fixed-point objects	Fixed-point
MATLAB Function block fimath	Other:UserSpecified
Input fixed-point math	fimath(... 'RoundingMethod',fm.RoundingMethod,... 'ProductMode',fm.ProductMode,... 'ProductWordLength',fm.ProductWordLength,... 'ProductFractionLength',fm.ProductFractionLength,... 'SumMode',fm.SumMode,... 'SumWordLength',fm.SumWordLength,... 'SumFractionLength',fm.SumFractionLength... )
Description	

**Table 3.5. Evaluate Rule Antecedents Argument Summary**

Name	Scope	Port	Data Type	Size
inputs	Input	1	double	2
antecedentOutputs	Output	1	double	[11, 1]
fis	Parameter	NaN	s3DQRlIzcNGN Q1lOkYYgymH	1
sumAntecedentOutputs	Output	2	double	1
SimulateUsing	Parameter	NaN	double	1



Name	Scope	Port	Data Type	Size
diagnostics	Parameter	NaN	sysmypvOZS2uJx5i J5NmK0E	1

### Evaluate Rule Antecedents Function Script

```

function [antecedentOutputs,sumAntecedentOutputs] = fcn(inputs, ...
    fis,SimulateUsing,diagnostics)

if SimulateUsing==1 && coder.target('SFun') ...
    && (isa(inputs,'double') || isa(inputs,'single'))

    antecedentOutputs = zeros(fis.numRules,1, ...
        'like',inputs);
    sumAntecedentOutputs = zeros('like',inputs);

    if isa(inputs,'double')
        [antecedentOutputs(:,sumAntecedentOutputs(:)) = feval(...
            'fuzzy.internal.codegen.evaluateRuleAntecedent_double_mex',...
            inputs,fis,diagnostics);
    else
        [antecedentOutputs(:,sumAntecedentOutputs(:)) = feval(...
            'fuzzy.internal.codegen.evaluateRuleAntecedent_single_mex',...
            inputs,fis,diagnostics);
    end

else

    [antecedentOutputs,sumAntecedentOutputs] = ...
        fuzzy.internal.codegen.evaluateRuleAntecedent(...
            inputs,fis,diagnostics);

end

end

```

**Table 3.6. Evaluate Rule Antecedents Supporting Functions**

Function	Defined By	Path
abs	MATLAB	
char	MATLAB	
coder.gpu.internal.isG puEnabled	MATLAB	
coder.internal.applyBina ryScalarFunction	MATLAB	
coder.internal.applyS calarFunction	MATLAB	
coder.internal.applyS calarFunctionInPlace	MATLAB	

## Chapter 3. Subsystems

Function	Defined By	Path
<code>coder.internal.avoidArrayFlattening</code>	MATLAB	
<code>coder.internal.charCastCheck</code>	MATLAB	
<code>coder.internal.constNonSingletonDim</code>	MATLAB	
<code>coder.internal.div</code>	MATLAB	
<code>coder.internal.error</code>	MATLAB	
<code>coder.internal.isBuiltInNumeric</code>	MATLAB	
<code>coder.internal.isIntegerClass</code>	MATLAB	
<code>coder.internal.length</code>	MATLAB	
<code>coder.internal.minOrMax</code>	MATLAB	
<code>coder.internal.narginchk</code>	MATLAB	
<code>coder.internal.prodsizes</code>	MATLAB	
<code>coder.internal.scalar.abs</code>	MATLAB	
<code>coder.internal.scalar.exp</code>	MATLAB	
<code>coder.internal.scalar.floor</code>	MATLAB	
<code>coder.internal.scalarEg</code>	MATLAB	
<code>coder.internal.scalexpCompatible</code>	MATLAB	
<code>coder.internal.unaryMinOrMax</code>	MATLAB	
<code>combineVectorElements</code>	MATLAB	
<code>createInputMFCache</code>	MATLAB	
<code>exp</code>	MATLAB	
<code>extractVarMF</code>	MATLAB	
<code>floor</code>	MATLAB	
<code>full</code>	MATLAB	
<code>fuzzy.internal.codegen.evaluateAndMethod</code>	MATLAB	
<code>fuzzy.internal.codegen.evaluateCommonMembershipFcn</code>	MATLAB	
<code>fuzzy.internal.codegen.evaluateOrMethod</code>	MATLAB	
<code>fuzzy.internal.codegen.evaluateRuleAntecedent</code>	MATLAB	

## Chapter 3. Subsystems

Function	Defined By	Path
fuzzy.internal.code gen.generateConstantCode	MATLAB	
fuzzy.internal.utility.val idateGaussMFPParameter Values	MATLAB	
gaussmf	MATLAB	
intmax	MATLAB	
intmin	MATLAB	
iscolumn	MATLAB	
isequal	MATLAB	
isfi	MATLAB	
isfmath	MATLAB	
ismatrix	MATLAB	
isnan	MATLAB	
isnumericitype	MATLAB	
isrow	MATLAB	
issparse	MATLAB	
max	MATLAB	
min	MATLAB	
mpower	MATLAB	
mrdivide	MATLAB	
power	MATLAB	
process_sumprod_inputs	MATLAB	
rdivide	MATLAB	
sum	MATLAB	
sumprod	MATLAB	

### "Evaluate Rule Consequents" (MATLAB Function)

**Table 3.7. Evaluate Rule Consequents Function Properties**

Property	Value
Update Method	INHERITED
Sample Time	
Support vari able-size arrays	1
Saturate on inte ger overflow	1

## Chapter 3. Subsystems

Property	Value
Treat these inherited Simulink signal types as fixed-point objects	Fixed-point
MATLAB Function block fimath	Other:UserSpecified
Input fixed-point math	fimath(... 'RoundingMethod',fm.RoundingMethod,... 'ProductMode',fm.ProductMode,... 'ProductWordLength',fm.ProductWordLength,... 'ProductFractionLength',fm.ProductFractionLength,... 'SumMode',fm.SumMode,... 'SumWordLength',fm.SumWordLength,... 'SumFractionLength',fm.SumFractionLength... )
Description	

**Table 3.8. Evaluate Rule Consequents Argument Summary**

Name	Scope	Port	Data Type	Size
inputs	Input	1	double	2
antecedentOutputs	Input	2	double	[11, 1]
aggregatedOutputs	Output	1	double	[101, 1]
fis	Parameter	NaN	s3DQRlIzcNGN Q1lOkYYgymH	1
samplePoints	Input	3	double	[1, 101]
SimulateUsing	Parameter	NaN	double	1

### Evaluate Rule Consequents Function Script

```

function aggregatedOutputs = fcn(inputs,antecedentOutputs, ...
    fis,samplePoints,SimulateUsing)

if SimulateUsing==1 && coder.target('SFun') ...
    && (isa(inputs,'double') || isa(inputs,'single'))

    aggregatedOutputs = zeros(fis.aggSize,'like',inputs);
    if strcmp(char(fis.type),'mamdani')
        if isa(inputs,'double')
            aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'evaluateRuleConsequentForMamdaniFIS_double_mex'],...
                antecedentOutputs,fis,samplePoints);
        else
            aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'evaluateRuleConsequentForMamdaniFIS_single_mex'],...
                antecedentOutputs,fis,samplePoints);
        end
    else

```

```

    if isa(inputs,'double')
        aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
            'evaluateRuleConsequentForSugenoFIS_double_mex'],...
            inputs,antecedentOutputs,fis);
    else
        aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
            'evaluateRuleConsequentForSugenoFIS_single_mex'],...
            inputs,antecedentOutputs,fis);
    end
end

else

    if strcmp(char(fis.type),'mamdani')
        aggregatedOutputs = ...
            fuzzy.internal.codegen.evaluateRuleConsequentForMamdaniFIS(...
                antecedentOutputs,fis,samplePoints);
    else
        aggregatedOutputs = ...
            fuzzy.internal.codegen.evaluateRuleConsequentForSugenoFIS(...
                inputs,antecedentOutputs,fis);
    end

end

end

end

```

**Table 3.9. Evaluate Rule Consequents Supporting Functions**

Function	Defined By	Path
abs	MATLAB	
char	MATLAB	
coder.gpu.internal.isG puEnabled	MATLAB	
coder.internal.applyBina ryScalarFunction	MATLAB	
coder.internal.applyS calarFunction	MATLAB	
coder.internal.applyS calarFunctionInPlace	MATLAB	
coder.internal.avoidAr rayFlattening	MATLAB	
coder.internal.char CastCheck	MATLAB	
coder.internal.const NonSingletonDim	MATLAB	
coder.internal.div	MATLAB	
coder.internal.error	MATLAB	

## Chapter 3. Subsystems

Function	Defined By	Path
<code>coder.internal.isBuiltInNumeric</code>	MATLAB	
<code>coder.internal.isIntegerClass</code>	MATLAB	
<code>coder.internal.length</code>	MATLAB	
<code>coder.internal.minOrMax</code>	MATLAB	
<code>coder.internal.narginchk</code>	MATLAB	
<code>coder.internal.prodsizes</code>	MATLAB	
<code>coder.internal.scalar.abs</code>	MATLAB	
<code>coder.internal.scalar.exp</code>	MATLAB	
<code>coder.internal.scalar.floor</code>	MATLAB	
<code>coder.internal.scalarEg</code>	MATLAB	
<code>coder.internal.scalexpAlloc</code>	MATLAB	
<code>coder.internal.scalexpAllocNoCheck</code>	MATLAB	
<code>coder.internal.scalexpCompatible</code>	MATLAB	
<code>coder.internal.unaryMinOrMax</code>	MATLAB	
<code>coder.internal.useParforConst</code>	MATLAB	
<code>combineVectorElements</code>	MATLAB	
<code>createMamdaniOutputMFCache</code>	MATLAB	
<code>exp</code>	MATLAB	
<code>extractVarMF</code>	MATLAB	
<code>floor</code>	MATLAB	
<code>full</code>	MATLAB	
<code>fuzzy.internal.codegen.evaluateAndMethod</code>	MATLAB	
<code>fuzzy.internal.codegen.evaluateCommonMembershipFcn</code>	MATLAB	
<code>fuzzy.internal.codegen.evaluateOrMethod</code>	MATLAB	
<code>fuzzy.internal.codegen.evaluateRuleConsequentForMamdaniFIS</code>	MATLAB	
<code>fuzzy.internal.codegen.generateConstantCode</code>	MATLAB	

## Chapter 3. Subsystems

Function	Defined By	Path
fuzzy.internal.utility.validateGaussMFParameterValues	MATLAB	
gaussmf	MATLAB	
intmax	MATLAB	
intmin	MATLAB	
iscolumn	MATLAB	
isequal	MATLAB	
isfi	MATLAB	
isfmath	MATLAB	
ismatrix	MATLAB	
isnan	MATLAB	
isnumericitype	MATLAB	
isrow	MATLAB	
issparse	MATLAB	
max	MATLAB	
min	MATLAB	
mpower	MATLAB	
mrdivide	MATLAB	
power	MATLAB	
process_sumprod_inputs	MATLAB	
rdivide	MATLAB	
sum	MATLAB	
sumprod	MATLAB	

### "in" (Inport)

**Table 3.10. "in" Parameters**

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

**"InputConversion" (DataTypeConversion)****Table 3.11. "InputConversion" Parameters**

Parameter	Value
Output minimum	[]
Output maximum	[]
Output data type	DataType
Lock output data type setting against changes by the fixed-point tools	off
Input and output to have equal	Real World Value (RWV)
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

**"out" (Output)****Table 3.12. "out" Parameters**

Parameter	Value
Port number	1
Icon display	Port number
Minimum	[]
Maximum	[]
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Unit (e.g., m, m/s <sup>2</sup> , N*m)	inherit
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Ensure outputport is virtual	off
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]
MustResolveToSignalObject	off
Specify output when source is unconnected	off
Constant value	0
Interpret vector parameters as 1-D	off

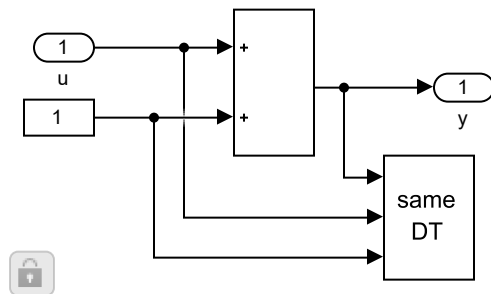


**"Output Sample Points" (Constant)****Table 3.13. "Output Sample Points" Parameters**

Parameter	Value
Constant value	fis.outputSamplePoints
Interpret vector parameters as 1-D	on
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit from 'Constant value'
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

**Block Execution Order**

1. [Evaluate Rule Antecedents](#)
  1. [TmpSignal ConversionAt SFunction Inport1](#) (SignalConversion)
  2. [SFunction](#) (S-Function)
2. [Output Sample Points](#) (Constant)
3. [Evaluate Rule Consequents](#)
  1. [TmpSignal ConversionAt SFunction Inport1](#) (SignalConversion)
  2. [SFunction](#) (S-Function)
4. [Defuzzify Outputs](#)
  1. [SFunction](#) (S-Function)

**Increment Real World****Figure 3.2. fuzzCont/Repeating Sequence Stair/LimitedCounter/Increment Real World**

## Blocks

### Parameters

#### "FixPt Constant" (Constant)

**Table 3.14. "FixPt Constant" Parameters**

Parameter	Value
Constant value	1
Interpret vector parameters as 1-D	on
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via back propagation
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

#### "FixPt Data Type Duplicate" (DataTypeDuplicate)

**Table 3.15. "FixPt Data Type Duplicate" Parameters**

Parameter	Value
Number of input ports	3

#### "FixPt Sum1" (Sum)

**Table 3.16. "FixPt Sum1" Parameters**

Parameter	Value
Icon shape	rectangular
List of signs	++
Sum over	All dimensions
Dimension	1
Require all inputs to have the same data type	on
Accumulator data type	Inherit: Inherit via internal rule
Output minimum	[]
Output maximum	[]

Parameter	Value
Output data type	Inherit: Inherit via back propagation
Lock data type settings against changes by the fixed-point tools	on
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

## "u" (Inport)

**Table 3.17. "u" Parameters**

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

## "y" (Outport)

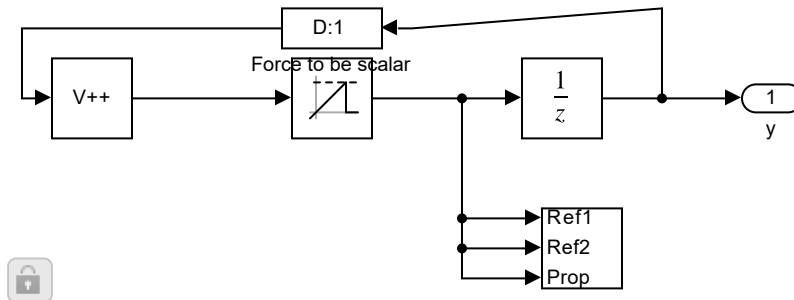
**Table 3.18. "y" Parameters**

Parameter	Value
Port number	1
Icon display	Port number
Minimum	[]
Maximum	[]
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Unit (e.g., m, m/s <sup>2</sup> , N*m)	inherit
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Ensure outport is virtual	off
Source of initial output value	Dialog
Output when disabled	held

Parameter	Value
Initial output	[]
MustResolveToSignalObject	off
Specify output when source is unconnected	off
Constant value	0
Interpret vector parameters as 1-D	off

## LimitedCounter

**Figure 3.3. fuzzCont/Repeating Sequence Stair/LimitedCounter**



## Blocks

### Parameters

#### "Data Type Propagation" (S-Function)

**Table 3.19. "Data Type Propagation" Parameters**

Parameter	Value
Simulinkmasksx1PropagatedDataType_MP	Specify via dialog
Simulinkmasksx11PropagatedDataTypeeegFixdt116Fixdtsingle_MP	uint(nbits)
Simulinkmasksx2PropagatedScaling_MP	Specify via dialog
Simulinkmasksx21PropagatedScalingSlopeEg29OrSlopeBiasEg1253_MP	1

#### "Force to be scalar" (SignalSpecification)

**Table 3.20. "Force to be scalar" Parameters**

Parameter	Value
Minimum	[]

Parameter	Value
Maximum	[]
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Require nonvirtual bus	off
Unit (e.g., m, m/s^2, N*m)	inherit
Dimensions (-1 for inherited)	1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1

## "Output" (UnitDelay)

**Table 3.21. "Output" Parameters**

Parameter	Value
Initial condition	0.0
Input processing	Inherited
Sample time (-1 for inherited)	tsamp
State name must resolve to Simulink signal object	off

## "Wrap To Zero" (SubSystem)

**Table 3.22. "Wrap To Zero" Parameters**

Parameter	Value
SimulinkmasksThreshold_MP	uplimit

## "y" (Outport)

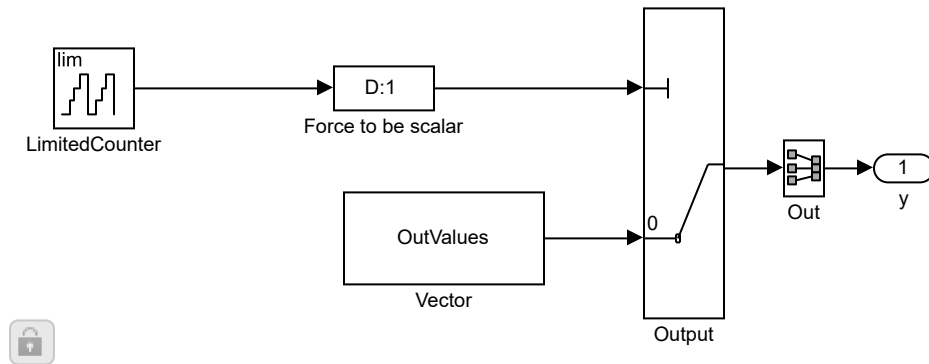
**Table 3.23. "y" Parameters**

Parameter	Value
Port number	1
Icon display	Port number
Minimum	[]
Maximum	[]
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Unit (e.g., m, m/s^2, N*m)	inherit

Parameter	Value
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Ensure output is virtual	off
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]
MustResolveToSignalObject	off
Specify output when source is unconnected	off
Constant value	0
Interpret vector parameters as 1-D	off

## Repeating Sequence Stair

Figure 3.4. fuzzCont/Repeating Sequence Stair



## Blocks

### Parameters

#### "Force to be scalar" (SignalSpecification)

Table 3.24. "Force to be scalar" Parameters

Parameter	Value
Minimum	[]
Maximum	[]
Data type	Inherit: auto

Parameter	Value
Lock output data type setting against changes by the fixed-point tools	off
Require nonvirtual bus	off
Unit (e.g., m, m/s <sup>2</sup> , N*m)	inherit
Dimensions (-1 for inherited)	1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1

### "LimitedCounter" (SubSystem)

**Table 3.25. "LimitedCounter" Parameters**

Parameter	Value
SimulinkmasksUpperLimit_MP	nn
SimulinkmasksSampleTime_MP	tsamp

### "Out" (SignalConversion)

**Table 3.26. "Out" Parameters**

Parameter	Value
Output	Signal copy
Data type	Inherit: auto
Exclude this block from 'Block reduction' optimization	off

### "Output" (MultiPortSwitch)

**Table 3.27. "Output" Parameters**

Parameter	Value
Data port order	Zero-based contiguous
Number of data ports	1
Data port indices (e.g. {1,[2,3]})	{1,2,3}
Data port for default case	Last data port
Diagnostic for default case	Error
Require all data port inputs to have the same data type	off
Output minimum	OutMin
Output maximum	OutMax
Output data type	Inherit: Inherit via internal rule

Parameter	Value
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	tsamp
Allow different data input sizes (Results in variable-size output signal)	off

### "Vector" (Constant)

**Table 3.28. "Vector" Parameters**

Parameter	Value
Constant value	OutValues
Interpret vector parameters as 1-D	on
Output minimum	OutMin
Output maximum	OutMax
Output data type	OutDataTypeStr
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

### "y" (Outport)

**Table 3.29. "y" Parameters**

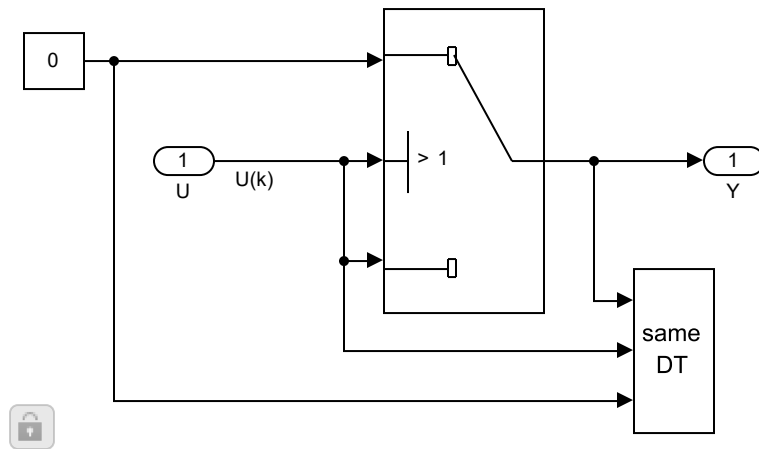
Parameter	Value
Port number	1
Icon display	Port number
Minimum	OutMin
Maximum	OutMax
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Unit (e.g., m, m/s <sup>2</sup> , N*m)	inherit
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Ensure outport is virtual	off



Parameter	Value
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]
MustResolveToSignalObject	off
Specify output when source is unconnected	off
Constant value	0
Interpret vector parameters as 1-D	off

## Wrap To Zero

Figure 3.5. fuzzCont/Repeating Sequence Stair/LimitedCounter/Wrap To Zero



## Blocks

### Parameters

#### "Constant" (Constant)

Table 3.30. "Constant" Parameters

Parameter	Value
Constant value	0
Interpret vector parameters as 1-D	on
Output minimum	[]
Output maximum	[]

Parameter	Value
Output data type	Inherit: Inherit via back propagation
Lock output data type setting against changes by the fixed-point tools	off
Sample time	inf
Frame period	inf

### "FixPt Data Type Duplicate1" (DataTypeDuplicate)

**Table 3.31. "FixPt Data Type Duplicate1" Parameters**

Parameter	Value
Number of input ports	3

### "FixPt Switch" (Switch)

**Table 3.32. "FixPt Switch" Parameters**

Parameter	Value
Criteria for passing first input	$u_2 > \text{Threshold}$
Threshold	Threshold
Require all data port inputs to have the same data type	off
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Inherit via back propagation
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	off
Enable zero-crossing detection	off
Sample time (-1 for inherited)	-1
Allow different data input sizes (Results in variable-size output signal)	off

**"U" (Inport)****Table 3.33. "U" Parameters**

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

**"Y" (Outport)****Table 3.34. "Y" Parameters**

Parameter	Value
Port number	1
Icon display	Port number
Minimum	[]
Maximum	[]
Data type	Inherit: auto
Lock output data type setting against changes by the fixed-point tools	off
Output as nonvirtual bus in parent model	off
Unit (e.g., m, m/s <sup>2</sup> , N*m)	inherit
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Ensure outport is virtual	off
Source of initial output value	Dialog
Output when disabled	held
Initial output	0
MustResolveToSignalObject	off
Specify output when source is unconnected	off
Constant value	0
Interpret vector parameters as 1-D	off

---

# Chapter 4. System Design Variables

## Design Variable Summary

Table 4.1. Design Variables

Variable Name	Parent Blocks	Size	Bytes	Class	Value
control	<a href="#">Fuzzy Logic Controller</a>	1x1	13932	struct	name: 'control' type: 'mamdani' andMethod: 'min' orMethod: 'max' defuzzMethod: 'centroid' impMethod: 'min' aggMethod: 'max' input: [1×2 struct] output: [1×1 struct] rule: [1×11 struct]

## Design Variable Details

Table 4.2. control

Field	Value
name	control
type	mamdani
andMethod	min
orMethod	max
defuzzMethod	centroid
impMethod	min
aggMethod	max
input	<a href="#">[control.input(1), control.input(2)]</a>

output	<a href="#">control.output</a>
rule	<a href="#">[control.rule(1), control.rule(2), control.rule(3), control.rule(4), control.rule(5), control.rule(6), control.rule(7), control.rule(8), control.rule(9), control.rule(10), control.rule(11)]</a>

**Table 4.3. [control.input\(1\)](#)**

Field	Value
name	error
range	[-2 2 ]
mf	<a href="#">[control.input(1).mf(1), control.input(1).mf(2), control.input(1).mf(3), control.input(1).mf(4), control.input(1).mf(5)]</a>

**Table 4.4. [control.input\(2\)](#)**

Field	Value
name	feedback
range	[-2 2 ]
mf	<a href="#">[control.input(2).mf(1), control.input(2).mf(2), control.input(2).mf(3), control.input(2).mf(4)]</a>

**Table 4.5. [control.output](#)**

Field	Value
name	plant-in
range	[-1 1 ]
mf	<a href="#">[control.output.mf(1), control.output.mf(2), control.output.mf(3)]</a>

**Table 4.6. [control.rule\(1\)](#)**

Field	Value
antecedent	[5 4 ]
consequent	3
weight	1
connection	1

**Table 4.7. [control.rule\(2\)](#)**

Field	Value
antecedent	[2 3 ]

consequent	3
weight	1
connection	1

**Table 4.8. control.rule(3)**

Field	Value
antecedent	[4 2 ]
consequent	3
weight	1
connection	1

**Table 4.9. control.rule(4)**

Field	Value
antecedent	[1 1 ]
consequent	3
weight	1
connection	1

**Table 4.10. control.rule(5)**

Field	Value
antecedent	[3 4 ]
consequent	2
weight	1
connection	1

**Table 4.11. control.rule(6)**

Field	Value
antecedent	[5 3 ]
consequent	2
weight	1
connection	1

**Table 4.12. control.rule(7)**

Field	Value
-------	-------

antecedent	[2 2 ]
consequent	2
weight	1
connection	1

**Table 4.13. control.rule(8)**

Field	Value
antecedent	[4 1 ]
consequent	2
weight	1
connection	1

**Table 4.14. control.rule(9)**

Field	Value
antecedent	[3 3 ]
consequent	1
weight	1
connection	1

**Table 4.15. control.rule(10)**

Field	Value
antecedent	[5 2 ]
consequent	1
weight	1
connection	1

**Table 4.16. control.rule(11)**

Field	Value
antecedent	[2 1 ]
consequent	1
weight	1
connection	1

**Table 4.17. control.input(1).mf(1)**

Field	Value
name	VL
type	gaussmf
params	[0.50835 -2.07 ]

**Table 4.18. control.input(1).mf(2)**

Field	Value
name	M
type	gaussmf
params	[0.431 0.016913 ]

**Table 4.19. control.input(1).mf(3)**

Field	Value
name	VH
type	gaussmf
params	[0.38426 2 ]

**Table 4.20. control.input(1).mf(4)**

Field	Value
name	L
type	gaussmf
params	[0.431 -1.007 ]

**Table 4.21. control.input(1).mf(5)**

Field	Value
name	H
type	gaussmf
params	[0.421 1.0354 ]

**Table 4.22. control.input(2).mf(1)**

Field	Value
name	L



type	gaussmf
params	[0.67994 -1.79 ]

**Table 4.23. control.input(2).mf(2)**

Field	Value
name	M
type	gaussmf
params	[0.575 -0.21993 ]

**Table 4.24. control.input(2).mf(3)**

Field	Value
name	H
type	gaussmf
params	[0.605 0.9408 ]

**Table 4.25. control.input(2).mf(4)**

Field	Value
name	VH
type	gaussmf
params	[0.425 1.8732 ]

**Table 4.26. control.output.mf(1)**

Field	Value
name	L
type	gaussmf
params	[0.38965 -1 ]

**Table 4.27. control.output.mf(2)**

Field	Value
name	M
type	gaussmf
params	[0.27652 0 ]

**Table 4.28. `control.output.mf(3)`**

Field	Value
name	H
type	gaussmf
params	[0.37169 1 ]

**Used by Blocks:**

- [fuzzCont/Fuzzy Logic Controller](#)

**Resolved in:** base workspace

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# Chapter 5. Requirements

fuzzCont does not contain requirements traceability links.

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# Chapter 6. System Model Configuration

Source: Model  
Source Name: fuzzCont

**Table 6.1. fuzzCont Configuration Set**

Property	Value
Description	
Components	[ <a href="#">fuzzCont Configuration Set.Components(1)</a> , <a href="#">fuzzCont Configuration Set.Components(2)</a> , <a href="#">fuzzCont Configuration Set.Components(3)</a> , <a href="#">fuzzCont Configuration Set.Components(4)</a> , <a href="#">fuzzCont Configuration Set.Components(5)</a> , <a href="#">fuzzCont Configuration Set.Components(6)</a> , <a href="#">fuzzCont Configuration Set.Components(7)</a> , <a href="#">fuzzCont Configuration Set.Components(8)</a> , <a href="#">fuzzCont Configuration Set.Components(9)</a> , <a href="#">fuzzCont Configuration Set.Components(10)</a> ]
Name	Configuration
SimulationMode	normal
ConfigType	Model

**Table 6.2. fuzzCont Configuration Set.Components(1)**

Property	Value
Name	Solver
Description	
Components	
StartTime	0.0
StopTime	200
AbsTol	auto
AutoScaleAbsTol	on
FixedStep	auto
InitialStep	auto
MaxNumMinSteps	-1
MaxOrder	5
ZcThreshold	auto
ConsecutiveZCsStepRelTol	10*128*eps
MaxConsecutiveZCs	1000

ExtrapolationOrder	4
NumberNewtonIterations	1
MaxStep	auto
MinStep	auto
MaxConsecutiveMinStep	1
RelTol	1e-3
SolverMode	SingleTasking
EnableMultiTasking	off
EnableExplicitPartitioning	off
EnableConcurrentExecution	on
ConcurrentTasks	off
Solver	VariableStepAuto
SolverName	VariableStepAuto
SolverType	Variable-step
SolverJacobianMethodControl	auto
ShapePreserveControl	DisableAll
ZeroCrossControl	UseLocalSettings
ZeroCrossAlgorithm	Nonadaptive
SolverResetMethod	Fast
PositivePriorityOrder	off
AutoInsertRateTranBlk	off
SampleTimeConstraint	Unconstrained
InsertRTBMode	Whenever possible
SampleTimeProperty	
DecoupledContinuousIntegration	off
MinimalZcImpactIntegration	off

**Table 6.3. fuzzCont Configuration Set.Components(2)**

Property	Value
Name	Data Import/Export
Description	
Components	
Decimation	1
ExternalInput	[t, u]
FinalStateName	xFinal
InitialState	xInitial
LimitDataPoints	off

MaxDataPoints	1000
LoadExternalInput	off
LoadInitialState	off
SaveFinalState	off
SaveCompleteFinalSimState	off
SaveFormat	Dataset
SaveOutput	on
SaveState	off
SignalLogging	on
DSMLogging	on
InspectSignalLogs	off
SaveTime	on
ReturnWorkspaceOutputs	off
StateSaveName	xout
TimeSaveName	tout
OutputSaveName	yout
SignalLoggingName	logout
DSMLoggingName	dsmout
OutputOption	RefineOutputTimes
OutputTimes	[]
ReturnWorkspaceOutputsName	out
Refine	1
LoggingToFile	off
DatasetSignalFormat	timeseries
LoggingFileName	out.mat
LoggingIntervals	[-inf, inf]

**Table 6.4. fuzzCont Configuration Set.Components(3)**

Property	Value
Name	Optimization
Description	
Components	
BlockReduction	on
BooleanDataType	on
ConditionallyExecuteInputs	on
DefaultParameterBehavior	Tunable
InlineParams	off

## Chapter 6. System Model Configuration

UseDivisionForNetSlopeComputation	off
UseFloatMulNetSlope	off
DefaultUnderspecifiedDataType	double
UseSpecifiedMinMax	off
InlineInvariantSignals	off
OptimizeBlockIOStorage	on
BufferReuse	on
GlobalBufferReuse	on
GlobalVariableUsage	None
StrengthReduction	off
AdvancedOptControl	
EnforceIntegerDowncast	on
ExpressionFolding	on
BooleansAsBitfields	off
BitfieldContainerType	uint_T
EnableMemcpy	on
MemcpyThreshold	64
PassReuseOutputArgsAs	Structure reference
PassReuseOutputArgsThreshold	12
FoldNonRolledExpr	on
LocalBlockOutputs	on
RollThreshold	5
StateBitsets	off
DataBitsets	off
ActiveStateOutputEnumStorageType	Native Integer
UseTempVars	off
ZeroExternalMemoryAtStartup	on
ZeroInternalMemoryAtStartup	on
InitFltsAndDblsToZero	off
NoFixptDivByZeroProtection	off
EfficientFloat2IntCast	off
EfficientMapNaN2IntZero	on
LifeSpan	auto
EvaldLifeSpan	Inf
MaxStackSize	Inherit from target
BufferReusableBoundary	on
SimCompilerOptimization	off
AccelVerboseBuild	off

OptimizeBlockOrder	off
OptimizeDataStoreBuffers	on
BusAssignmentInplaceUpdate	on
DifferentSizesBufferReuse	off
OptimizationLevel	level2
OptimizationPriority	Balanced
OptimizationCustomize	on
LabelGuidedReuse	off

**Table 6.5. fuzzCont Configuration Set.Components(4)**

Property	Value
Name	Diagnostics
Description	
Components	
RTPrefix	error
ConsistencyChecking	none
ArrayBoundsChecking	none
SignalInfNanChecking	none
StringTruncationChecking	error
SignalRangeChecking	none
ReadBeforeWriteMsg	UseLocalSettings
WriteAfterWriteMsg	UseLocalSettings
WriteAfterReadMsg	UseLocalSettings
AlgebraicLoopMsg	warning
ArtificialAlgebraicLoopMsg	warning
SaveWithDisabledLinksMsg	warning
SaveWithParameterizedLinksMsg	warning
CheckSSInitialOutputMsg	on
UnderspecifiedInitializationDetection	Simplified
MergeDetectMultiDrivingBlocksExec	error
CheckExecutionContextRuntimeOutputMsg	off
SignalResolutionControl	UseLocalSettings
BlockPriorityViolationMsg	warning
MinStepSizeMsg	warning
TimeAdjustmentMsg	none
MaxConsecutiveZCsMsg	error
MaskedZcDiagnostic	warning



## Chapter 6. System Model Configuration

IgnoredZcDiagnostic	warning
SolverPrmCheckMsg	none
InheritedTsInSrcMsg	warning
MultiTaskDSMMsg	error
MultiTaskCondExecSysMsg	error
MultiTaskRateTransMsg	error
SingleTaskRateTransMsg	none
TasksWithSamePriorityMsg	warning
SigSpecEnsureSampleTimeMsg	warning
CheckMatrixSingularityMsg	none
IntegerOverflowMsg	warning
Int32ToFloatConvMsg	warning
ParameterDowncastMsg	error
ParameterOverflowMsg	error
ParameterUnderflowMsg	none
ParameterPrecisionLossMsg	warning
ParameterTunabilityLossMsg	warning
FixptConstUnderflowMsg	none
FixptConstOverflowMsg	none
FixptConstPrecisionLossMsg	none
UnderSpecifiedDataTypeMsg	none
UnnecessaryDatatypeConvMsg	none
VectorMatrixConversionMsg	none
InvalidFcnCallConnMsg	error
FcnCallInpInsideContextMsg	error
SignalLabelMismatchMsg	none
UnconnectedInputMsg	warning
UnconnectedOutputMsg	warning
UnconnectedLineMsg	warning
UseOnlyExistingSharedCode	error
SFcnCompatibilityMsg	none
FrameProcessingCompatibilityMsg	error
UniqueDataStoreMsg	none
BusObjectLabelMismatch	warning
RootOutportRequireBusObject	warning
AssertControl	UseLocalSettings
Echo	
EnableOverflowDetection	off

## Chapter 6. System Model Configuration

AllowSymbolicDim	on
ModelReferenceIOMsg	none
ModelReferenceVersionMismatchMessage	none
ModelReferenceIOMismatchMessage	none
ModelReferenceCSMismatchMessage	none
ModelReferenceSimTargetVerbose	off
UnknownTsInhSupMsg	warning
ModelReferenceDataLoggingMessage	warning
ModelReferenceSymbolNameMessage	warning
ModelReferenceExtraNoncontSigs	error
StateNameClashWarn	none
SimStateInterfaceChecksumMismatchMsg	warning
SimStateOlderReleaseMsg	error
InitInArrayFormatMsg	warning
StrictBusMsg	ErrorLevel1
BusNameAdapt	WarnAndRepair
NonBusSignalsTreatedAsBus	none
SFUnusedDataAndEventsDiag	warning
SFUnexpectedBacktrackingDiag	error
SFInvalidInputDataAccessInChartInitDiag	warning
SFNoUnconditionalDefaultTransitionDiag	error
SFTransitionOutsideNaturalParentDiag	warning
SFUnconditionalTransitionShadowingDiag	warning
SFUnreachableExecutionPathDiag	warning
SFUndirectedBroadcastEventsDiag	warning
SFTransitionActionBeforeConditionDiag	warning
SFOutputUsedAsStateInMooreChartDiag	error
SFTemporalDelaySmallerThanSampleTimeDiag	warning
SFUnconditionalPathOutOfParentDiag	warning
SFSelfTransitionDiag	warning
SFExecutionAtInitializationDiag	warning
SFMachineParentedDataDiag	warning
SFUnreachableStateOrJunctionDiag	warning
SFDanglingTransitionDiag	warning
IntegerSaturationMsg	warning
AllowedUnitSystems	all
UnitsInconsistencyMsg	warning
AllowAutomaticUnitConversions	on

RCSCRenamedMsg	warning
RCSCObservableMsg	warning
ForceCombineOutputUpdateInSim	off

**Table 6.6. fuzzCont Configuration Set.Components(5)**

Property	Value
Name	Hardware Implementation
Description	
Components	
ProdBitPerChar	8
ProdBitPerShort	16
ProdBitPerInt	32
ProdBitPerLong	32
ProdBitPerLongLong	64
ProdBitPerFloat	32
ProdBitPerDouble	64
ProdBitPerPointer	64
ProdBitPerSizeT	64
ProdBitPerPtrDiffT	64
ProdLargestAtomicInteger	Char
ProdLargestAtomicFloat	Float
ProdIntDivRoundTo	Zero
ProdEndianess	LittleEndian
ProdWordSize	64
ProdShiftRightIntArith	on
ProdLongLongMode	off
ProdHWDeviceType	Intel->x86-64 (Windows64)
TargetBitPerChar	8
TargetBitPerShort	16
TargetBitPerInt	32
TargetBitPerLong	32
TargetBitPerLongLong	64
TargetBitPerFloat	32
TargetBitPerDouble	64
TargetBitPerPointer	32
TargetBitPerSizeT	32
TargetBitPerPtrDiffT	32

TargetLargestAtomicInteger	Char
TargetLargestAtomicFloat	None
TargetShiftRightIntArith	on
TargetLongLongMode	off
TargetIntDivRoundTo	Undefined
TargetEndianness	Unspecified
TargetWordSize	32
TargetPreprocMaxBitsSint	32
TargetPreprocMaxBitsUint	32
TargetHWDeviceType	Specified
TargetUnknown	off
ProdEqTarget	on
UseEmbeddedCoderFeatures	on
UseSimulinkCoderFeatures	on

**Table 6.7. fuzzCont Configuration Set.Components(6)**

Property	Value
Name	Model Referencing
Description	
Components	
UpdateModelReferenceTargets	IfOutOfDateOrStructuralChange
SkipRefExpFcnMdlSchedulingOrderCheck	off
EnableRefExpFcnMdlSchedulingChecks	on
CheckModelReferenceTargetMessage	error
EnableParallelModelReferenceBuilds	off
ParallelModelReferenceErrorOnInvalidPool	on
ParallelModelReferenceMATLABWorkerInit	None
ModelReferenceNumInstancesAllowed	Multi
PropagateVarSize	Infer from blocks in model
ModelDependencies	
ModelReferencePassRootInputsByReference	on
ModelReferenceMinAlgLoopOccurrences	off
PropagateSignalLabelsOutOfModel	on
SupportModelReferenceSimTargetCustomCode	off

**Table 6.8. fuzzCont Configuration Set.Components(7)**

Property	Value
Name	Simulation Target
Description	
Components	
SimCustomSourceCode	
SimCustomHeaderCode	
SimCustomInitializer	
SimCustomTerminator	
SimReservedNameArray	
SimUserSources	
SimUserIncludeDirs	
SimUserLibraries	
SimUserDefines	
SFSimEnableDebug	off
SFSimOverflowDetection	on
SFSimEcho	on
SimBlas	on
SimCtrlC	on
SimExtrinsic	on
SimIntegrity	on
SimUseLocalCustomCode	off
SimParseCustomCode	on
SimBuildMode	sf_incremental_build
SimDataInitializer	
SimGenImportedTypeDefs	off
CompileTimeRecursionLimit	50
EnableRuntimeRecursion	on
MATLABDynamicMemAlloc	on
MATLABDynamicMemAllocThreshold	65536
CustomSymbolStrEMXArray	nothing
CustomSymbolStrEMXArrayFcn	nothing

**Table 6.9. fuzzCont Configuration Set.Components(8)**

Property	Value
Name	Code Generation

## Chapter 6. System Model Configuration

SystemTargetFile	grt.tlc
HardwareBoard	None
TLCOptions	
CodeGenDirectory	
GenCodeOnly	off
MakeCommand	make_rtw
GenerateMakefile	on
PackageGeneratedCodeAndArtifacts	off
PackageName	
TemplateMakefile	grt_default_tmf
PostCodeGenCommand	
Description	
GenerateReport	off
SaveLog	off
RTWVerbose	on
RetainRTWFile	off
ProfileTLC	off
TLCDebug	off
TLCCoverage	off
TLCAssert	off
ProcessScriptMode	Default
ConfigurationMode	Optimized
ProcessScript	
ConfigurationScript	
ConfigAtBuild	off
RTWUseLocalCustomCode	off
RTWUseSimCustomCode	off
CustomSourceCode	
CustomHeaderCode	
CustomInclude	
CustomSource	
CustomLibrary	
CustomDefine	
CustomLAPACKCallback	
CustomFFTCallback	
CustomInitializer	
CustomTerminator	
Toolchain	Automatically locate an installed toolchain

## Chapter 6. System Model Configuration

BuildConfiguration	Faster Builds
CustomToolchainOptions	
IncludeHyperlinkInReport	off
LaunchReport	off
RecursionLimit	50
PortableWordSizes	off
GenerateErtSFunction	off
CreateSILPILBlock	None
CodeExecutionProfiling	off
CodeExecutionProfileVariable	executionProfile
CodeProfilingSaveOptions	SummaryOnly
CodeProfilingInstrumentation	off
CodeCoverageSettings	<a href="#">fuzzCont Configuration Set.Components(8).CodeCoverageSettings</a>
SILDebugging	off
TargetLang	C
IncludeERTFirstTime	off
GenerateTraceInfo	off
GenerateTraceReport	off
GenerateTraceReportSl	off
GenerateTraceReportSf	off
GenerateTraceReportEml	off
GenerateCodeInfo	off
GenerateWebview	off
GenerateCodeMetricsReport	off
GenerateCodeReplacementReport	off
RTWCompilerOptimization	off
ObjectivePriorities	
RTWCustomCompilerOptimizations	
CheckMdlBeforeBuild	Off
CustomRebuildMode	OnUpdate
DataInitializer	
Components	<a href="#">[fuzzCont Configuration Set.Components(8).Components(1), fuzzCont Configuration Set.Components(8).Components(2)]</a>

**Table 6.10. [fuzzCont Configuration Set.Components\(9\)](#)**

Property	Value
----------	-------

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Description	Simulink Coverage Configuration Component
Components	
Name	Simulink Coverage
CovEnable	off
CovScope	EntireSystem
CovIncludeTopModel	on
RecordCoverage	off
CovPath	/
CovSaveName	covdata
CovCompData	
CovMetricSettings	dwe
CovFilter	
CovHTMLOptions	
CovNameIncrementing	off
CovHtmlReporting	off
CovForceBlockReductionOff	on
CovEnableCumulative	on
CovSaveCumulativeToWorkspaceVar	off
CovSaveSingleToWorkspaceVar	off
CovCumulativeVarName	covCumulativeData
CovCumulativeReport	off
CovSaveOutputData	on
CovOutputDir	slcov_output/\$ModelName\$
CovDataFileName	\$ModelName\$_cvdata
CovShowResultsExplorer	on
CovReportOnPause	on
CovModelRefEnable	off
CovModelRefExcluded	
CovExternalEMLEnable	on
CovSFcnEnable	on
CovBoundaryAbsTol	1.0000e-05
CovBoundaryRelTol	0.0100
CovUseTimeInterval	off
CovStartTime	0
CovStopTime	0
CovMetricStructuralLevel	Decision
CovMetricLookupTable	off
CovMetricSignalRange	off



CovMetricSignalSize	off
CovMetricObjectiveConstraint	off
CovMetricSaturateOnIntegerOverflow	off
CovMetricRelationalBoundary	off
CovLogicBlockShortCircuit	off
CovUnsupportedBlockWarning	on
CovHighlightResults	off
CovMcdcMode	Masking

**Table 6.11. fuzzCont Configuration Set.Components(10)**

Property	Value
Description	HDL Coder custom configuration component
Components	
Name	HDL Coder

**Table 6.12. fuzzCont Configuration Set.Components(8).CodeCoverageSettings**

Property	Value
TopModelCoverage	off
ReferencedModelCoverage	off
CoverageTool	None

**Table 6.13. fuzzCont Configuration Set.Components(8).Components(1)**

Property	Value
Name	Code Appearance
Description	
Components	
ForceParamTrailComments	off
GenerateComments	on
CommentStyle	Auto
IgnoreCustomStorageClasses	on
IgnoreTestpoints	off
IncHierarchyInIds	off
MaxIdLength	31
ShowEliminatedStatement	off
OperatorAnnotations	off

## Chapter 6. System Model Configuration

IncAutoGenComments	off
SimulinkDataObjDesc	off
SFDataObjDesc	off
MATLABFcnDesc	off
IncDataTypeInIds	off
PrefixModelToSubsysFcnNames	on
MangleLength	1
SharedChecksumLength	8
CustomSymbolStr	\$R\$N\$M
CustomSymbolStrGlobalVar	\$R\$N\$M
CustomSymbolStrType	\$N\$R\$M_T
CustomSymbolStrField	\$N\$M
CustomSymbolStrFcn	\$R\$N\$M\$F
CustomSymbolStrSimulinkFcn	\$R\$N
CustomSymbolStrFcnArg	rt\$I\$N\$M
CustomSymbolStrBlkIO	rtb_\$N\$M
CustomSymbolStrTmpVar	\$N\$M
CustomSymbolStrMacro	\$R\$N\$M
CustomSymbolStrUtil	\$N\$C
CustomSymbolStrEmxType	emxArray_\$M\$N
CustomSymbolStrEmxFcn	emx\$M\$N
CustomUserTokenString	
CustomCommentsFcn	
DefineNamingRule	None
DefineNamingFcn	
ParamNamingRule	None
ParamNamingFcn	
SignalNamingRule	None
SignalNamingFcn	
InsertBlockDesc	off
InsertPolySpaceComments	off
SimulinkBlockComments	on
BlockCommentType	BlockPathComment
StateflowObjectComments	off
MATLABSourceComments	off
EnableCustomComments	off
InternalIdentifier	Shortened
InlinedPrmAccess	Literals

ReqsInCode	off
UseSimReservedNames	off
ReservedNameArray	

**Table 6.14. fuzzCont Configuration Set.Components(8).Components(2)**

Property	Value
Name	Target
Description	
Components	
IsERTTarget	off
TargetLibSuffix	
TargetPreCompLibLocation	
GenFloatMathFcnCalls	NOT IN USE
TargetLangStandard	C99 (ISO)
TargetFunctionLibrary	NOT IN USE
CodeReplacementLibrary	None
UtilityFuncGeneration	Auto
ERTMultiwordTypeDef	System defined
MultiwordTypeDef	System defined
ERTMultiwordLength	2048
MultiwordLength	2048
DynamicStringBufferSize	256
GenerateFullHeader	on
InferredTypesCompatibility	off
ExistingSharedCode	
SharedCodeLocation	
GenerateSampleERTMain	off
GenerateTestInterfaces	off
ModelReferenceCompliant	on
ParMdlRefBuildCompliant	on
CompOptLevelCompliant	on
ConcurrentExecutionCompliant	on
IncludeMdlTerminateFcn	on
CombineOutputUpdateFcns	on
CombineSignalStateStructs	off
SuppressErrorStatus	off
ERTFirstTimeCompliant	off

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IncludeFileDelimiter	Auto
ERTCustomFileBanners	off
SupportAbsoluteTime	on
LogVarNameModifier	rt_
MatFileLogging	on
MultiInstanceERTCode	off
CodeInterfacePackaging	Nonreusable function
SupportNonFinite	on
SupportComplex	on
PurelyIntegerCode	off
SupportContinuousTime	on
SupportNonInlinedSFcns	on
RemoveDisableFunc	off
RemoveResetFunc	off
SupportVariableSizeSignals	off
ParenthesesLevel	Nominal
CastingMode	Nominal
GenerateClassInterface	off
ModelStepFunctionPrototypeControlCompliant	off
CPPClassGenCompliant	on
GRTInterface	off
GenerateAllocFcn	off
UseToolchainInfoCompliant	on
GenerateSharedConstants	on
LUTObjectStructOrderExplicitValues	Size,Breakpoints,Table
LUTObjectStructOrderEvenSpacing	Size,Breakpoints,Table
ERTHeaderFileRootName	\$R\$E
ERTSourceFileRootName	\$R\$E
ERTDataFileRootName	\$R_data
ExtMode	off
ExtModeStaticAlloc	off
ExtModeTesting	off
ExtModeStaticAllocSize	1000000
ExtModeTransport	0
ExtModeMexFile	ext_comm
ExtModeMexArgs	
ExtModeIntrflLevel	Level1
RTWCAPISignals	off

RTWCAPIParams	off
RTWCAPIStates	off
RTWCAPIRootIO	off
GenerateASAP2	off
MultiInstanceErrorCode	Error

**Table 6.15. HDL Coder**

Property	Value
HDLSubsystem	fuzzCont
Workflow	Generic ASIC/FPGA
TargetPlatform	
ReferenceDesign	
ReferenceDesignPath	
CoeffPrefix	coeff
InputType	std_logic_vector
OutputType	Same as input type
ScalarizePorts	off
CoeffMultipliers	Multiplier
ResetType	Asynchronous
FIRAdderStyle	linear
MultiplierInputPipeline	0
MultiplierOutputPipeline	0
FoldingFactor	1
NumMultipliers	-1
OptimizeForHDL	off
TimingControllerPostfix	_tc
OptimizeTimingController	on
TimingControllerArch	default
CastBeforeSum	on
CheckHDL	off
EnablePrefix	enb
ClockEnableInputPort	clk_enable
ClockEnableOutputPort	ce_out
ClockInputPort	clk
ClockEdge	Rising
ResetInputPort	reset
SimulatorFlags	

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HDLCompileFilePostfix	_compile.do
HDLCompileInit	vlib %s\n
HDLCompileTerm	
HDLCompileVerilogCmd	vlog %s %s\n
HDLCompileVHDLCmd	vcom %s %s\n
EnableForGenerateLoops	on
HDLMapFilePostfix	_map.txt
HDLMapSeparator	
HDLSimCmd	vsim -novopt %s.%s\n
HDLSimFilePostfix	_sim.do
HDLSimProjectFilePostfix	_init.do
HDLSimInit	onbreak resume\nnonerror resume\n
HDLSimProjectCmd	project addfile %s\n
HDLSimProjectTerm	project compileall\n
HDLSimProjectInit	project new . %s work\n
HDLSimTerm	run -all\n
HDLSimViewWaveCmd	add wave sim:%s\n
HDLSynthTool	None
HDLSynthCmd	
HDLSynthFilePostfix	
HDLSynthInit	
HDLSynthLibCmd	
HDLSynthLibSpec	
HDLSynthTerm	
ReservedWordPostfix	_rsvd
BlockGenerateLabel	_gen
VHDLLibraryName	work
UseSingleLibrary	off
VHDLArchitectureName	rtl
ClockProcessPostfix	_process
ComplexImagPostfix	_im
ComplexRealPostfix	_re
EntityConflictPostfix	_block
InstancePrefix	u_
InstancePostfix	
InstanceGenerateLabel	_gen
OutputGenerateLabel	outputgen
PackagePostfix	_pkg

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SplitEntityArch	off
SplitEntityFilePostfix	_entity
SplitArchFilePostfix	_arch
VectorPrefix	vector_of_
ClockInputs	Single
TriggerAsClock	off
ConditionalizePipeline	off
InferControlPorts	off
UseRisingEdge	off
TargetDirectory	hdlsrc
TargetSubdirectory	Model
EDAScriptGeneration	on
AddInputRegister	on
AddOutputRegister	on
AddPipelineRegisters	off
PipelinePostfix	_pipe
InputPort	filter_in
OutputPort	filter_out
FracDelayPort	filter_fd
Name	filter
RemoveResetFrom	None
ResetAssertedLevel	Active-high
ReuseAccum	off
ScaleWarnBits	3
SerialPartition	-1
DALUTPartition	-1
DARadix	2
CoefficientSource	Internal
CoefficientMemory	Registers
InputComplex	off
AddRatePort	off
InputDataType	
GenerateHDLCode	on
GenerateModel	on
GenerateTB	off
GenerateCEGenModel	off
Traceability	off
ResourceReport	off

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OptimizationReport	off
ErrorCheckReport	on
HDLGenerateWebview	off
IPCoreReport	off
Recommendations	off
RequirementComments	on
Backannotation	off
HierarchicalDistPipelining	off
PreserveDesignDelays	off
ClockRatePipelining	on
CRPWithoutFlattening	on
IncreaseCRPBudget	on
AdaptivePipelining	on
MinDelaysRequiredAtLocalMultirateOutput	1
ClockRatePipelineOutputPorts	off
CriticalPathEstimation	off
optimizeserializer	on
shareequalwl	on
sharedmulsign	Signed
MultiplierPromotionThreshold	0
RoutingFudgeFactor	0.5000
OptimizationCompatibilityCheck	off
NumCriticalPathsEstimated	1
CriticalPathEstimationFile	criticalPathEstimated
HardwarePipeliningCharacterizationFile	
HighlightFeedbackLoops	on
HighlightFeedbackLoopsFile	highlightFeedbackLoop
HighlightClockRatePipeliningDiagnostic	on
HighlightClockRatePipeliningFile	highlightClockRatePipelining
DistributedPipeliningBarriers	on
DistributedPipeliningBarriersFile	highlightDistributedPipeliningBarriers
BlocksWithNoCharacterizationFile	highlightCriticalPathEstimationOffendingBlocks
AXIStreamingTransformFeatureControl	off
SerializerRatioThreshold	8192
RetimingCP	off
RetimingCPFile	highlightRetimingCP
ClearHighlightingFile	clearhighlighting
FunctionallyEquivalentRetiming	on



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DistributedPipeliningPriority	NumericalIntegrity
RetimingDetails	on
CriticalPathDetails	off
SignalNamesMangling	off
GuidedRetiming	off
LatencyConstraint	0
ReduceMatchingDelays	on
OptimizationData	
CPGuidanceFile	
CPAnnotationFile	
HandleAtomicSubsystem	on
OptimizeMdlGen	on
MulticyclePathInfo	off
MulticyclePathConstraints	off
FloatingPointTargetConfiguration	
GenerateTargetComps	on
NativeFloatingPoint	off
FPToleranceValue	1.0000e-07
FPToleranceStrategy	DEFAULT
nfpLatency	DEFAULT
nfpDenormals	DEFAULT
AlteraBackwardIncompatibleSinCosPipeline	off
FamilyDevicePackageSpeed	
ToolName	
SynthesisToolChipFamily	
SynthesisToolDeviceName	
SynthesisToolPackageName	
SynthesisToolSpeedValue	
SynthesisTool	
SynthesisProjectAdditionalFiles	
SimulationLibPath	
XilinxSimulatorLibPath	
AdderSharingMinimumBitwidth	0
MultiplierSharingMinimumBitwidth	0
MultiplyAddSharingMinimumBitwidth	0
ShareAdders	off
ShareMultipliers	on
ShareMultiplyAdds	on

## Chapter 6. System Model Configuration

ShareMATLABBlocks	on
ShareAtomicSubsystems	on
ShareFloatingPointIPs	on
PipelinedSharing	on
OptimizeCRPSharingRegisters	on
ClockRatePipeliningBudgetCheck	off
EnableFPGAWorkflow	off
FPGAWorkflowParameters	
GainMultipliers	Multiplier
ProductOfElementsStyle	linear
UserComment	
CustomFileHeaderComment	
CustomFileFooterComment	
DateComment	on
SafeZeroConcat	on
SumOfElementsStyle	linear
TargetLanguage	VHDL
Oversampling	1
ClockRatePipeliningFraction	1
Verbosity	1
TestBenchName	filter_tb
MultifileTestBench	off
IgnoreDataChecking	0
TestBenchPostfix	_tb
TestBenchDataPostfix	_data
TestBenchStimulus	
TestBenchUserStimulus	
TestBenchFracDelayStimulus	
TestBenchCoeffStimulus	
TestBenchRateStimulus	
ForceClockEnable	on
MinimizeClockEnables	off
MinimizeGlobalResets	off
NoResetInitializationMode	InsideModule
NoResetInitScript	noresetinitscript.tcl
ComplexMulElaboration	MultiplyAddBlock
FlattenBus	off
TestBenchClockEnableDelay	1

## Chapter 6. System Model Configuration

ForceClock	on
ClockHighTime	5
ClockLowTime	5
HoldTime	2
InputDataInterval	0
ForceReset	on
ErrorMargin	4
HoldInputDataBetweenSamples	on
InitializeTestBenchInputs	off
ResetLength	2
TestBenchReferencePostFix	_ref
GenerateValidationModel	off
RAMMappingThreshold	256
MapPipelineDelaysToRAM	off
RemoveRedundantCounters	on
ReplaceUnitDelayWithIntegerDelay	on
ConcatenateDelays	on
MergeDelaysOnFanouts	on
FoldDelaysToConstant	on
RAMArchitecture	WithClockEnable
InlineMATLABBlockCode	off
InlineHDLCode	off
MaskParameterAsGeneric	off
BalanceDelays	on
TargetFrequency	0
ExtraEffortMargin	1
MaxOversampling	Inf
MaxComputationLatency	1
MultiplierPartitioningThreshold	Inf
TreatDelayBalancingFailureAs	Error
TransformNonZeroInitValDelay	on
DelayElaborationLimit	20
GenerateCoSimBlock	off
HDLCodeCoverage	off
GenerateHDLTestBench	on
GenerateCoSimModel	None
GenerateSVPITestBench	None
SimulationTool	Mentor Graphics Modelsim

## Chapter 6. System Model Configuration

CoSimModelSetup	CosimBlockAndDut
SynthesisOnDirective	
SynthesisOffDirective	
LoopUnrolling	off
InlineConfigurations	on
UseAggregatesForConst	off
UseVerilogTimescale	on
VerilogFileExtension	.v
SystemVerilogFileExtension	.sv
VHDLFileExtension	.vhd
CodeGenerationOutput	GenerateHDLCode
GeneratedModelName	
GeneratedModelNamePrefix	gm_
UseDotLayout	off
ShowCodeGenPIR	off
SerializeModel	0
SerializeIO	0
UseSLAutoRoute	on
UseAutoPlace	on
HighlightAncestors	on
HighlightColor	cyan
InitializeBlockRAM	on
InitializeRealPort	off
MapVectorPortToStream	off
UseFileIOInTestBench	on
TurnkeyWorkflow	off
AlteraWorkflow	off
GenerateFILBlock	off
CoSimLibPostfix	_cosim
TestBenchInitializeInputs	off
MinimizeIntermediateSignals	off
GenerateCodeInfo	off
GatewayoutWithDTC	off
IncrementalCodeGenForTopModel	off
HDLWFSmartbuild	on
HDLCodingStandard	None
HDLCodingStandardCustomizations	
ReferenceDesignParameter	

## Chapter 6. System Model Configuration

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HDLLintTool	None
HDLLintInit	
HDLLintTerm	
HDLLintCmd	
ModulePrefix	
DetectBlackBoxNameCollision	Warning
PIRTB	on
PIRTC	off
EmitNetlist	off
UsePipelinedToolboxFunctions	on
savepirtoscript	off
ConcatenateHDLModules	off
AMS	off
ML2PIR	off
EnableTestpoints	off
TraceabilityStyle	Line Level
lineLevelTraceability	on
commentTraceability	off
TreatRealsInGeneratedCodeAs	Error
EnumEncodingScheme	default
BuildToProtectModel	off
OptimizeConstants	on

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# Chapter 7. Glossary

**Atomic Subsystem.** A subsystem treated as a unit by an implementation of the design documented in this report. The implementation computes the outputs of all the blocks in the atomic subsystem before computing the next block in the parent system's block execution order (sorted list).

**Block Diagram.** A Simulink block diagram represents a set of simultaneous equations that relate a system or subsystem's inputs to its outputs as a function of time. Each block in the diagram represents an equation of the form  $y = f(t, x, u)$  where  $t$  is the current time,  $u$  is a block input,  $y$  is a block output, and  $x$  is a system state (see the Simulink documentation for information on the functions represented by the various types of blocks that make up the diagram). Lines connecting the blocks represent dependencies among the blocks, i.e., inputs whose current values are the outputs of other blocks. An implementation of a design described in this document computes a root or atomic system's outputs at each time step by computing the outputs of the blocks in an order determined by block input/output dependencies.

**Block Parameter.** A variable that determines the output of a block along with its inputs, for example, the gain parameter of a Gain block.

**Block Execution Order.** The order in which Simulink evaluates blocks during simulation of a model. The block execution order determined by Simulink ensures that a block executes only after all blocks on whose outputs it depends are executed.

**Checksum.** A number that indicates whether different versions of a model or atomic subsystem differ functionally or only cosmetically. Different checksums for different versions of the same model or subsystem indicate that the versions differ functionally.

**Design Variable.** A symbolic (MATLAB) variable or expression used as the value of a block parameter. Design variables allow the behavior of the model to be altered by altering the value of the design variable.

**Signal.** A block output, so-called because block outputs typically vary with time.

**Virtual Subsystem.** A subsystem that is purely graphical, i.e., is intended to reduce the visual complexity of the block diagram of which it is a subsystem. An implementation of the design treats the blocks in the subsystem as part of the first nonvirtual ancestor of the virtual subsystem (see Atomic Subsystem).

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# Chapter 8. About this Report

## Report Overview

This report describes the design of the fuzzCont system. The report was generated automatically from a Simulink model used to validate the design. It contains the following sections:

**Model Version.** Specifies information about the version of the model from which this design description was generated. Includes the model checksum, a number that indicates whether different versions of the model differ functionally or only cosmetically. Different checksums for different versions indicate that the versions differ functionally.

**Root System.** Describes the design's root system.

**Subsystems.** Describes each of the design's subsystems.

**Design Variables.** Describes system design variables, i.e., MATLAB variables and expressions used as block parameter values.

**System Model Configuration.** Lists the configuration parameters, e.g., start and stop time, of the model used to simulate the system described by this report.

**Requirements.** Shows design requirements associated with elements of the design model. This section appears only if the design model contains requirements links.

**Glossary.** Defines Simulink terms used in this report.

## Root System Description

This section describes a design's root system. It contains the following sections:

**Diagram.** Simulink block diagram that represents the algorithm used to compute the root system's outputs.

**Description.** Description of the root system. This section appears only if the model's root system has a Documentation property or a Doc block.

**Interface.** Name, data type, width, and other properties of the root system's input and output signals. The number of the block port that outputs the signal appears in angle brackets appended to the signal name. This section appears only if the root system has input or output ports.

**Blocks.** This section has two subsections:

- **Parameters.** Describes key parameters of blocks in the root system. This section also includes graphical and/or tabular representations of lookup table data used by lookup table blocks, i.e., blocks that use lookup tables to compute their outputs.

- **Block Execution Order.** Order in which blocks must be executed at each time step in order to ensure that each block's inputs are available when it executes.

**State Charts.** Describes state charts used in the root system. This section appears only if the root system contains Stateflow blocks.

## Subsystem Descriptions

This section describes a design's subsystems. Each subsystem description contains the following sections:

**Checksum.** This section appears only if the subsystem is an atomic subsystem. The checksum indicates whether the version of the model subsystem used to generate this report differs functionally from other versions of the model subsystem. If two model checksums differ, the corresponding versions of the model differ functionally.

**Diagram.** Simulink block diagram that graphically represents the algorithm used to compute the subsystem's outputs.

**Description.** Description of the subsystem. This section appears only if the subsystem has a Documentation property or contains a Doc block.

**Interface.** Name, data type, width, and other properties of the subsystem's input and output signals. The number of the block port that outputs the signal appears in angle brackets appended to the signal name. This section appears only if the subsystem is atomic and has input or output ports.

**Blocks.** Blocks that this subsystem contains. This section has two subsections:

- **Parameters.** Key parameters of blocks in the subsystem. This section also includes graphical and/or tabular representations of lookup table data used by lookup table blocks, blocks that use lookup tables to compute their outputs.
- **Block Execution Order.** Order in which the subsystem's blocks must be executed at each time step in order to ensure that each block's inputs are available when the block executes. This section appears only if the subsystem is atomic. Note: in Acrobat(PDF) reports, the number in square brackets next to the block name is a hyperlink to the block parameter table. The number has no model significance.

**State Charts.** Describes state charts used in the subsystem. This section appears only if the root system contains Stateflow blocks.

## State Chart Descriptions

This section describes the state machines used by Stateflow blocks to compute their outputs, i.e., Stateflow blocks. Each state machine description contains the following sections:

**Chart.** Diagram representing the state machine.

**States.** Describes the state machine's states. Each state description includes the state's diagram and diagrams and/or descriptions of graphical functions, Simulink functions, truth tables, and MATLAB functions parented by the state.

**Transitions.** Transitions between the state machine's states. Each transition description specifies the values of key transition properties. Appears only if a transition has properties that do not appear on the chart.

**Junctions.** Transition junctions. Each junction description specifies the values of key junction properties. Appears only if a junction has properties that do not appear on the chart.



**Events.** Events that trigger state transitions. Each event description specifies the values of key event properties.

**Data.** Data types and other properties of the Stateflow block's inputs, outputs, and other state machine data.

**Targets.** Executable implementations of the state machine used to compute the outputs of the corresponding Stateflow block.

**MATLAB Supporting Functions.** List of functions invoked by MATLAB functions defined in the chart.