

Linear_heli_model_estimator_PID

Design Description

ShingWai

Linear_heli_model_estimator_PID: Design Description

ShingWai

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Chapter 1. Model Version

Version: 1.96

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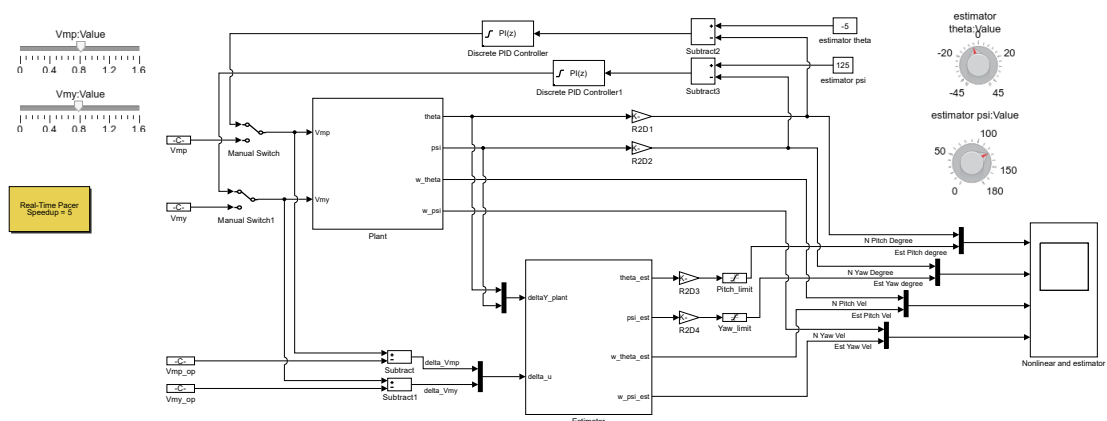
Checksum: 993299232 781502148 1773691499 2505002699

Chapter 2. Root System

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Figure 2.1. Linear_heli_model_estimator_PID



2.1. Blocks

2.1.1. Parameters

2.1.1.1. "Discrete PID Controller" (SubSystem)

Table 2.1. "Discrete PID Controller" Parameters

Parameter	Value
SimulinkmasksContr- oller_MP	PI
SimulinkmasksTime- Domain_MP	Discrete-time
SimulinkmasksSamp- leTime1ForInherited- _MP	-1
SimulinkmasksInteg- ratorMethod_MP	Forward Euler
SimulinkmasksFilter- Method_MP	Forward Euler
SimulinkmasksForm- _MP	Parallel

Parameter	Value
SimulinkmasksUseFilter_MP	on
SimulinkmasksSource_MP	internal
SimulinkmasksProportionalP_MP	0
SimulinkmasksIntegralI_MP	0.000907573361479579
SimulinkmasksDerivativeD_MP	0.0132997774455979
SimulinkmasksFilterCoefficientN_MP	30.9531371143485
SimulinkmasksSource_MP	internal
SimulinkmasksIntegrator_MP	0
SimulinkmasksFilter_MP	0
SimulinkmasksExternalReset_MP	none
SimulinkmasksIgnoreResetWhenLinearizing_MP	off
SimulinkmasksEnableZerocrossingDetection_MP	on
SimulinkmasksLimitOutput_MP	on
SimulinkmasksUpperSaturationLimit_MP	2
SimulinkmasksLowerSaturationLimit_MP	0
SimulinkmasksIgnoreSaturationWhenLinearizing_MP	off
SimulinkmasksAntiwindupMethod_MP	clamping
SimulinkmasksBackcalculationCoefficientKb_MP	1
SimulinkmasksEnableTrackingMode_MP	off
SimulinkmasksTrackingCoefficientKt_MP	1

Parameter	Value
SimulinkmasksIntegerRoundingMode_MP	Floor
SimulinkmasksSaturateOnIntegerOverflow_MP	off
SimulinkmasksLockDataTypeAgainstFxpTools_MP	off
SimulinkmasksPPParameterMinimum_MP	[]
SimulinkmasksPPParameterMaximum_MP	[]
SimulinkmasksPPParameter_MP	Inherit: Inherit via internal rule
SimulinkmasksIPParameterMinimum_MP	[]
SimulinkmasksIPParameterMaximum_MP	[]
SimulinkmasksIPParameter_MP	Inherit: Inherit via internal rule
SimulinkmasksDPParameterMinimum_MP	[]
SimulinkmasksDPParameterMaximum_MP	[]
SimulinkmasksDPParameter_MP	Inherit: Inherit via internal rule
SimulinkmasksNPParameterMinimum_MP	[]
SimulinkmasksNPParameterMaximum_MP	[]
SimulinkmasksNPParameter_MP	Inherit: Inherit via internal rule
SimulinkmasksKbParameterMinimum_MP	[]
SimulinkmasksKbParameterMaximum_MP	[]
SimulinkmasksKbParameter_MP	Inherit: Inherit via internal rule
SimulinkmasksKtParameterMinimum_MP	[]
SimulinkmasksKtParameterMaximum_MP	[]

Parameter	Value
SimulinkmasksKtParameter_MP	Inherit: Inherit via internal rule
SimulinkmasksPPProductOutputMinimum_MP	[]
SimulinkmasksPPProductOutputMaximum_MP	[]
SimulinkmasksPPProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksIPProductOutputMinimum_MP	[]
SimulinkmasksIPProductOutputMaximum_MP	[]
SimulinkmasksIPProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksDProductOutputMinimum_MP	[]
SimulinkmasksDProductOutputMaximum_MP	[]
SimulinkmasksDProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksNProductOutputMinimum_MP	[]
SimulinkmasksNProductOutputMaximum_MP	[]
SimulinkmasksNProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksKbProductOutputMinimum_MP	[]
SimulinkmasksKbProductOutputMaximum_MP	[]
SimulinkmasksKbProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksKtProductOutputMinimum_MP	[]

Parameter	Value
SimulinkmasksKtProductOutputMaximum_MP	[]
SimulinkmasksKtProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksIntegratorOutputMinimum_MP	[]
SimulinkmasksIntegratorOutputMaximum_MP	[]
SimulinkmasksIntegratorOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksFilterOutputMinimum_MP	[]
SimulinkmasksFilterOutputMaximum_MP	[]
SimulinkmasksFilterOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksSumOutputMinimum_MP	[]
SimulinkmasksSumOutputMaximum_MP	[]
SimulinkmasksSumOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksSumI1OutputMinimum_MP	[]
SimulinkmasksSumI1OutputMaximum_MP	[]
SimulinkmasksSumI1Output_MP	Inherit: Inherit via internal rule
SimulinkmasksSumI2OutputMinimum_MP	[]
SimulinkmasksSumI2OutputMaximum_MP	[]
SimulinkmasksSumI2Output_MP	Inherit: Inherit via internal rule
SimulinkmasksSumI3OutputMinimum_MP	[]

Parameter	Value
SimulinkmasksSumI3OutputMaximum_MP	[]
SimulinkmasksSumI3Output_MP	Inherit: Inherit via internal rule
SimulinkmasksSumDOutputMinimum_MP	[]
SimulinkmasksSumDOutputMaximum_MP	[]
SimulinkmasksSumDOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksAccumulatorOfSum_MP	Inherit: Inherit via internal rule
SimulinkmasksAccumulatorOfSumI1_MP	Inherit: Inherit via internal rule
SimulinkmasksAccumulatorOfSumI2_MP	Inherit: Inherit via internal rule
SimulinkmasksAccumulatorOfSumI3_MP	Inherit: Inherit via internal rule
SimulinkmasksAccumulatorOfSumD_MP	Inherit: Inherit via internal rule
SimulinkmasksSaturationOutputMinimum_MP	[]
SimulinkmasksSaturationOutputMaximum_MP	[]
SimulinkmasksSaturationOutput_MP	Inherit: Same as input
SimulinkmasksStateNameegposition_MP	"
SimulinkmasksStateNameMustResolveToSimulinkSignalObject_MP	off
SimulinkmasksStateNameegposition_MP	"
SimulinkmasksStateNameMustResolveToSimulinkSignalObject_MP	off
SimulinkmasksDifferentiator_MP	0

Parameter	Value
SimulinkmasksDifferentiatorOutputMinimum_MP	[]
SimulinkmasksDifferentiatorOutputMaximum_MP	[]
SimulinkmasksDifferentiatorOutput_MP	Inherit: Inherit via internal rule
Simulinkblkprm_promptsIntegratorInitConditionSetting	State (most efficient)

2.1.1.2. "Discrete PID Controller1" (SubSystem)

Table 2.2. "Discrete PID Controller1" Parameters

Parameter	Value
SimulinkmasksController_MP	PI
SimulinkmasksTimeDomain_MP	Discrete-time
SimulinkmasksSampleTime1ForInherited_MP	-1
SimulinkmasksIntegratorMethod_MP	Forward Euler
SimulinkmasksFilterMethod_MP	Forward Euler
SimulinkmasksForm_MP	Parallel
SimulinkmasksUseFilter_MP	on
SimulinkmasksSource_MP	internal
SimulinkmasksProportionalP_MP	-0.0211292479754596
SimulinkmasksIntegralI_MP	-0.00097032283605342
SimulinkmasksDerivativeD_MP	-0.0494385294991883
SimulinkmasksFilterCoefficientN_MP	316.412826035343
SimulinkmasksSource_MP	internal

Parameter	Value
SimulinkmasksIntegrator_MP	0
SimulinkmasksFilter_MP	0
SimulinkmasksExternalReset_MP	none
SimulinkmasksIgnoreResetWhenLinearizing_MP	off
SimulinkmasksEnableZerocrossingDetection_MP	on
SimulinkmasksLimitOutput_MP	on
SimulinkmasksUpperSaturationLimit_MP	2
SimulinkmasksLowerSaturationLimit_MP	0
SimulinkmasksIgnoreSaturationWhenLinearizing_MP	off
SimulinkmasksAntiwindupMethod_MP	clamping
SimulinkmasksBackcalculationCoefficientKb_MP	1
SimulinkmasksEnableTrackingMode_MP	off
SimulinkmasksTrackingCoefficientKt_MP	1
SimulinkmasksIntegerRoundingMode_MP	Floor
SimulinkmasksSaturateOnIntegerOverflow_MP	off
SimulinkmasksLockDataTypeAgainstFxpTools_MP	off
SimulinkmasksPPParameterMinimum_MP	[]
SimulinkmasksPPParameterMaximum_MP	[]
SimulinkmasksPPParameter_MP	Inherit: Inherit via internal rule

Parameter	Value
SimulinkmasksIPar- ameterMinimum_MP	[]
SimulinkmasksIPar- ameterMaximum_MP	[]
SimulinkmasksIPar- ameter_MP	Inherit: Inherit via internal rule
SimulinkmasksDPar- ameterMinimum_MP	[]
SimulinkmasksDPar- ameterMaximum_MP	[]
SimulinkmasksDPar- ameter_MP	Inherit: Inherit via internal rule
SimulinkmasksNPar- ameterMinimum_MP	[]
SimulinkmasksNPar- ameterMaximum_MP	[]
SimulinkmasksNPar- ameter_MP	Inherit: Inherit via internal rule
SimulinkmasksKbP- arameterMinimum_- MP	[]
SimulinkmasksKbPa- rameterMaximum_- MP	[]
SimulinkmasksKbPa- rameter_MP	Inherit: Inherit via internal rule
SimulinkmasksKtPar- ameterMinimum_MP	[]
SimulinkmasksKtPar- ameterMaximum_MP	[]
SimulinkmasksKtPar- ameter_MP	Inherit: Inherit via internal rule
SimulinkmasksPPro- ductOutputMinimu- m_MP	[]
SimulinkmasksPPro- ductOutputMaximu- m_MP	[]
SimulinkmasksPPro- ductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksIProd- uctOutputMinimum_- MP	[]

Parameter	Value
SimulinkmasksIProductOutputMaximum_MP	[]
SimulinkmasksIProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksDProductOutputMinimum_MP	[]
SimulinkmasksDProductOutputMaximum_MP	[]
SimulinkmasksDProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksNProductOutputMinimum_MP	[]
SimulinkmasksNProductOutputMaximum_MP	[]
SimulinkmasksNProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksKbProductOutputMinimum_MP	[]
SimulinkmasksKbProductOutputMaximum_MP	[]
SimulinkmasksKbProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksKtProductOutputMinimum_MP	[]
SimulinkmasksKtProductOutputMaximum_MP	[]
SimulinkmasksKtProductOutput_MP	Inherit: Inherit via internal rule
SimulinkmasksIntegratorOutputMinimum_MP	[]
SimulinkmasksIntegratorOutputMaximum_MP	[]
SimulinkmasksIntegratorOutput_MP	Inherit: Inherit via internal rule

Parameter	Value
SimulinkmasksFilter-OutputMinimum_MP	[]
SimulinkmasksFilter-OutputMaximum_MP	[]
SimulinkmasksFilter-Output_MP	Inherit: Inherit via internal rule
SimulinkmasksSum-OutputMinimum_MP	[]
SimulinkmasksSum-OutputMaximum_MP	[]
SimulinkmasksSum-Output_MP	Inherit: Inherit via internal rule
SimulinkmasksSum-I1OutputMinimum_-MP	[]
SimulinkmasksSum-I1OutputMaximum_-MP	[]
SimulinkmasksSum-I1Output_MP	Inherit: Inherit via internal rule
SimulinkmasksSum-I2OutputMinimum_-MP	[]
SimulinkmasksSum-I2OutputMaximum_-MP	[]
SimulinkmasksSum-I2Output_MP	Inherit: Inherit via internal rule
SimulinkmasksSum-I3OutputMinimum_-MP	[]
SimulinkmasksSum-I3OutputMaximum_-MP	[]
SimulinkmasksSum-I3Output_MP	Inherit: Inherit via internal rule
SimulinkmasksSum-DOutputMinimum_-MP	[]
SimulinkmasksSum-DOutputMaximum_-MP	[]
SimulinkmasksSum-DOutput_MP	Inherit: Inherit via internal rule

Parameter	Value
SimulinkmasksAccumulatorOfSum_MP	Inherit: Inherit via internal rule
SimulinkmasksAccumulatorOfSumI1_MP	Inherit: Inherit via internal rule
SimulinkmasksAccumulatorOfSumI2_MP	Inherit: Inherit via internal rule
SimulinkmasksAccumulatorOfSumI3_MP	Inherit: Inherit via internal rule
SimulinkmasksAccumulatorOfSumD_MP	Inherit: Inherit via internal rule
SimulinkmasksSaturationOutputMinimum_MP	[]
SimulinkmasksSaturationOutputMaximum_MP	[]
SimulinkmasksSaturationOutput_MP	Inherit: Same as input
SimulinkmasksStateNameegposition_MP	"
SimulinkmasksStateNameMustResolveToSimulinkSignalObject_MP	off
SimulinkmasksStateNameegposition_MP	"
SimulinkmasksStateNameMustResolveToSimulinkSignalObject_MP	off
SimulinkmasksDifferentiator_MP	0
SimulinkmasksDifferentiatorOutputMinimum_MP	[]
SimulinkmasksDifferentiatorOutputMaximum_MP	[]
SimulinkmasksDifferentiatorOutput_MP	Inherit: Inherit via internal rule
Simulinkblkprm_promptsIntegratorInitCondSetting	State (most efficient)

2.1.1.3. "estimator psi" (Constant)

Table 2.3. "estimator psi" Parameters

Parameter	Value
Constant value	125
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

2.1.1.4. "estimator theta" (Constant)

Table 2.4. "estimator theta" Parameters

Parameter	Value
Constant value	-5
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

2.1.1.5. "Knob" (SubSystem)

Table 2.5. "Knob" Parameters

Parameter	Value
WebBlock Id	f7d6c496-e7f3-45e5-b299-ebdecf5f4c4e

2.1.1.6. "Knob1" (SubSystem)

Table 2.6. "Knob1" Parameters

Parameter	Value
WebBlock Id	7ec695cf-c3d5-415a-ba20-dfe3f8e66350

2.1.1.7. "Manual Switch" (ManualSwitch)

Table 2.7. "Manual Switch" Parameters

Parameter	Value
Allow the two inputs to differ in size (Results in variable-size output signal)	off
Sample time (-1 for inherited)	-1

2.1.1.8. "Manual Switch1" (ManualSwitch)

Table 2.8. "Manual Switch1" Parameters

Parameter	Value
Allow the two inputs to differ in size (Results in variable-size output signal)	off
Sample time (-1 for inherited)	-1

2.1.1.9. "Mux" (Mux)

Table 2.9. "Mux" Parameters

Parameter	Value
Number of inputs	2
Display option	bar

2.1.1.10. "Mux1" (Mux)**Table 2.10. "Mux1" Parameters**

Parameter	Value
Number of inputs	2
Display option	bar

2.1.1.11. "Mux2" (Mux)**Table 2.11. "Mux2" Parameters**

Parameter	Value
Number of inputs	2
Display option	bar

2.1.1.12. "Mux3" (Mux)**Table 2.12. "Mux3" Parameters**

Parameter	Value
Number of inputs	2
Display option	bar

2.1.1.13. "Mux4" (Mux)**Table 2.13. "Mux4" Parameters**

Parameter	Value
Number of inputs	2
Display option	bar

2.1.1.14. "Mux5" (Mux)**Table 2.14. "Mux5" Parameters**

Parameter	Value
Number of inputs	2

Parameter	Value
Display option	bar

2.1.1.15. "Pitch_limit" (Saturate)

Table 2.15. "Pitch_limit" Parameters

Parameter	Value
Upper limit	45
Lower limit	-45
Treat as gain when linearizing	off
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor

2.1.1.16. "R2D1" (Gain)

Table 2.16. "R2D1" Parameters

Parameter	Value
Gain	180/pi
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	off

Parameter	Value
changes by the fixed-point tools	
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

2.1.1.17. "R2D2" (Gain)

Table 2.17. "R2D2" Parameters

Parameter	Value
Gain	180/pi
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
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

2.1.1.18. "R2D3" (Gain)

Table 2.18. "R2D3" Parameters

Parameter	Value
Gain	180/pi
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

2.1.1.19. "R2D4" (Gain)

Table 2.19. "R2D4" Parameters

Parameter	Value
Gain	180/pi
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
Integer rounding mode	Floor
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

2.1.1.20. "Real-Time Pacer" (M-S-Function)

Table 2.20. "Real-Time Pacer" Parameters

Parameter	Value
Speedup (Simulation Time / Real Time)	5

2.1.1.21. "Slider" (SubSystem)

Table 2.21. "Slider" Parameters

Parameter	Value
WebBlock Id	ee768af0-5787-424b-83ad-de7ba901ce7c

2.1.1.22. "Slider1" (SubSystem)

Table 2.22. "Slider1" Parameters

Parameter	Value
WebBlock Id	fc4e30f5-1f0f-4f3d-9211-693a563b3a2e

2.1.1.23. "Subtract" (Sum)

Table 2.23. "Subtract" Parameters

Parameter	Value
Icon shape	rectangular
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

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

2.1.1.24. "Subtract1" (Sum)

Table 2.24. "Subtract1" Parameters

Parameter	Value
Icon shape	rectangular
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

2.1.1.25. "Subtract2" (Sum)

Table 2.25. "Subtract2" Parameters

Parameter	Value
Icon shape	rectangular
List of signs	+ -

Parameter	Value
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

2.1.1.26. "Subtract3" (Sum)

Table 2.26. "Subtract3" Parameters

Parameter	Value
Icon shape	rectangular
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

Parameter	Value
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

2.1.1.27. "Vmp" (Constant)

Table 2.27. "Vmp" Parameters

Parameter	Value
Constant value	0.8248704663212
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

2.1.1.28. "Vmp_op" (Constant)

Table 2.28. "Vmp_op" Parameters

Parameter	Value
Constant value	Vmp_op
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

2.1.1.29. "Vmy" (Constant)

Table 2.29. "Vmy" Parameters

Parameter	Value
Constant value	0.7917098445596
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

2.1.1.30. "Vmy_op" (Constant)

Table 2.30. "Vmy_op" Parameters

Parameter	Value
Constant value	Vmy_op
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

2.1.1.31. "Yaw_limit" (Saturate)

Table 2.31. "Yaw_limit" Parameters

Parameter	Value
Upper limit	180

Parameter	Value
Lower limit	0
Treat as gain when linearizing	off
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor

2.1.2. Block Execution Order

1. theta_rad [67] (Integrator)
2. R2D1 [17] (Gain)
3. Integrator [50] (Integrator)
4. p_operation [54] (Constant)
5. Add [45] (Sum)
6. R2D3 [18] (Gain)
7. Pitch_limit [17] (Saturate)
8. psi_rad [64] (Integrator)
9. R2D2 [18] (Gain)
10. Integrator1 [50] (Integrator)
11. y_operation [59] (Constant)
12. Add1 [46] (Sum)
13. R2D4 [19] (Gain)
14. Yaw_limit [24] (Saturate)
15. theta_velocity_rad [68] (Integrator)
16. Integrator2 [51] (Integrator)
17. PA_operation [55] (Constant)
18. Add2 [46] (Sum)
19. psi_velocity_rad [65] (Integrator)
20. Integrator3 [52] (Integrator)
21. YA_operation [60] (Constant)
22. Add3 [47] (Sum)
23. Nonlinear and estimator [17] (Scope)
24. estimator theta [14] (Constant)
25. Subtract2 [21] (Sum)
26. Proportional Gain [40] (Gain)
27. Integrator [40] (DiscreteIntegrator)
28. Sum [42] (Sum)
29. ZeroGain [32] (Gain)

30. DeadZone [29] (DeadZone)
31. NotEqual [30] (RelationalOperator)
32. SignDeltaU [31] (Signum)
33. DataTypeConv1 [29] (DataTypeConversion)
34. Integral Gain [39] (Gain)
35. SignPreIntegrator [32] (Signum)
36. DataTypeConv2 [29] (DataTypeConversion)
37. Equal [30] (RelationalOperator)
38. AND [27] (Logic)
39. Constant [39] (Constant)
40. Switch [42] (Switch)
41. estimator psi [13] (Constant)
42. Subtract3 [22] (Sum)
43. Proportional Gain (Gain)
44. Integrator (DiscreteIntegrator)
45. Sum (Sum)
46. ZeroGain [38] (Gain)
47. DeadZone [35] (DeadZone)
48. NotEqual [36] (RelationalOperator)
49. SignDeltaU [37] (Signum)
50. DataTypeConv1 [34] (DataTypeConversion)
51. Integral Gain (Gain)
52. SignPreIntegrator [37] (Signum)
53. DataTypeConv2 [35] (DataTypeConversion)
54. Equal [36] (RelationalOperator)
55. AND [33] (Logic)
56. Constant (Constant)
57. Switch (Switch)
58. AC-matrix [45] (Constant)
59. BC_matrix [48] (Constant)
60. Cc_matrix [48] (Constant)
61. L_matrix [52] (Constant)
62. Vmp [23] (Constant)
63. *TmpAtomicSubsysAtManual SwitchInport1*
 1. Saturate [41] (Saturate)
64. Manual Switch [15] (ManualSwitch)
65. Vmp_op [23] (Constant)
66. Subtract [20] (Sum)
67. Vmy [23] (Constant)
68. *TmpAtomicSubsysAtManual Switch1Inport1*
 1. Saturate (Saturate)
69. Manual Switch1 [15] (ManualSwitch)
70. Vmy_op [24] (Constant)
71. Subtract1 [21] (Sum)
72. p_operation1 [55] (Constant)
73. y_operation1 [60] (Constant)
74. Subtract2 [57] (Sum)
75. *Linear estimate Helicopter*
 1. TmpSignal ConversionAt SFunction Inport1 (SignalConversion)
 2. TmpSignal ConversionAt SFunction Inport2 (SignalConversion)
 3. SFunction (S-Function)
76. *Nonlinear Helicopter model*
 1. SFunction (S-Function)
77. Real-Time Pacer [19] (M-S-Function)

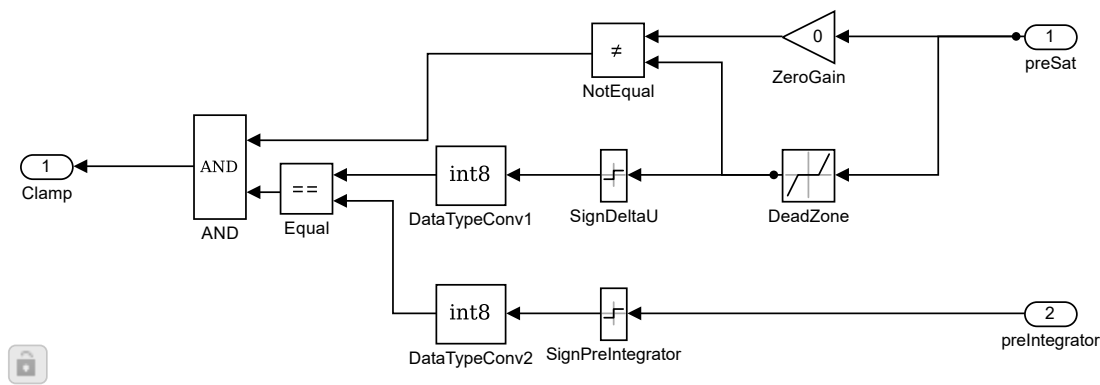
Chapter 3. Subsystems

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 - 3.5.1. Blocks 61

3.1. Clamping circuit

Figure 3.1. Linear_heli_model_estimator_PID/Discrete PID Controller/Clamping circuit



3.1.1. Blocks

3.1.1.1. Parameters

3.1.1.1.1. "AND" (Logic)

Table 3.1. "AND" Parameters

Parameter	Value
Operator	AND

Parameter	Value
Number of input ports	2
Icon shape	rectangular
Require all inputs and output to have the same data type	on
Output data type	Inherit: Logical (see Configuration Parameters: Optimization)
Sample time (-1 for inherited)	SampleTime

3.1.1.1.2. "Clamp" (Outport)

Table 3.2. "Clamp" 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
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	SampleTime
Ensure outport is virtual	off
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]
MustResolveToSignalObject	off

3.1.1.1.3. "DataTypeConv1" (DataTypeConversion)

Table 3.3. "DataTypeConv1" Parameters

Parameter	Value
Output minimum	[]
Output maximum	[]
Output data type	int8
Lock output data type setting against changes by the fixed-point tools	on
Input and output to have equal	Real World Value (RWV)
Integer rounding mode	Zero
Saturate on integer overflow	on
Sample time (-1 for inherited)	-1

3.1.1.1.4. "DataTypeConv2" (DataTypeConversion)

Table 3.4. "DataTypeConv2" Parameters

Parameter	Value
Output minimum	[]
Output maximum	[]
Output data type	int8
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)	SampleTime

3.1.1.1.5. "DeadZone" (DeadZone)

Table 3.5. "DeadZone" Parameters

Parameter	Value
Start of dead zone	LowerSaturationLimit
End of dead zone	UpperSaturationLimit
Saturate on integer overflow	off
Treat as gain when linearizing	on
Enable zero-crossing detection	on
Sample time (-1 for inherited)	SampleTime

3.1.1.1.6. "Equal" (RelationalOperator)

Table 3.6. "Equal" Parameters

Parameter	Value
Relational operator	==
Require all inputs to have the same data type	on
Output data type	Inherit: Logical (see Configuration Parameters: Optimization)
Enable zero-crossing detection	on
Sample time (-1 for inherited)	SampleTime
Integer rounding mode	Nearest

3.1.1.1.7. "NotEqual" (RelationalOperator)

Table 3.7. "NotEqual" Parameters

Parameter	Value
Relational operator	~=
Require all inputs to have the same data type	on
Output data type	Inherit: Logical (see Configuration Parameters: Optimization)

Parameter	Value
Enable zero-crossing detection	on
Sample time (-1 for inherited)	SampleTime
Integer rounding mode	Nearest

3.1.1.1.8. "preIntegrator" (Inport)

Table 3.8. "preIntegrator" Parameters

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	SampleTime
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.1.1.1.9. "preSat" (Inport)

Table 3.9. "preSat" Parameters

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

3.1.1.1.10. "SignDeltaU" (Signum)

Table 3.10. "SignDeltaU" Parameters

Parameter	Value
Enable zero-crossing detection	on

Parameter	Value
Sample time (-1 for inherited)	-1

3.1.1.1.11. "SignPreIntegrator" (Signum)

Table 3.11. "SignPreIntegrator" Parameters

Parameter	Value
Enable zero-crossing detection	on
Sample time (-1 for inherited)	SampleTime

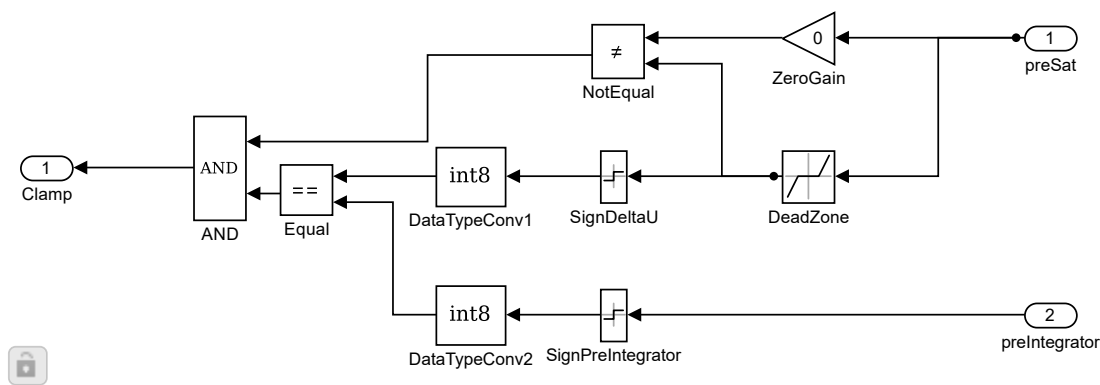
3.1.1.1.12. "ZeroGain" (Gain)

Table 3.12. "ZeroGain" Parameters

Parameter	Value
Gain	0
Multiplication	Element-wise(K.*u)
Parameter minimum	[]
Parameter maximum	[]
Parameter data type	Inherit: Same as input
Output minimum	[]
Output maximum	[]
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off
Integer rounding mode	Floor
Saturate on integer overflow	on
Sample time (-1 for inherited)	-1

3.2. Clamping circuit

Figure 3.2. Linear_heli_model_estimator_PID/Discrete Controller1/Clamping circuit



3.2.1. Blocks

3.2.1.1. Parameters

3.2.1.1.1. "AND" (Logic)

Table 3.13. "AND" Parameters

Parameter	Value
Operator	AND
Number of input ports	2
Icon shape	rectangular
Require all inputs and output to have the same data type	on
Output data type	Inherit: Logical (see Configuration Parameters: Optimization)
Sample time (-1 for inherited)	SampleTime

3.2.1.1.2. "Clamp" (Outport)

Table 3.14. "Clamp" Parameters

Parameter	Value
Port number	1

Parameter	Value
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
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	SampleTime
Ensure outport is virtual	off
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]
MustResolveToSignalObject	off

3.2.1.1.3. "DataTypeConv1" (DataTypeConversion)

Table 3.15. "DataTypeConv1" Parameters

Parameter	Value
Output minimum	[]
Output maximum	[]
Output data type	int8
Lock output data type setting against changes by the fixed-point tools	on
Input and output to have equal	Real World Value (RWV)
Integer rounding mode	Zero

Parameter	Value
Saturate on integer overflow	on
Sample time (-1 for inherited)	-1

3.2.1.1.4. "DataTypeConv2" (DataTypeConversion)

Table 3.16. "DataTypeConv2" Parameters

Parameter	Value
Output minimum	[]
Output maximum	[]
Output data type	int8
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)	SampleTime

3.2.1.1.5. "DeadZone" (DeadZone)

Table 3.17. "DeadZone" Parameters

Parameter	Value
Start of dead zone	LowerSaturationLimit
End of dead zone	UpperSaturationLimit
Saturate on integer overflow	off
Treat as gain when linearizing	on
Enable zero-crossing detection	on
Sample time (-1 for inherited)	SampleTime

3.2.1.1.6. "Equal" (RelationalOperator)

Table 3.18. "Equal" Parameters

Parameter	Value
Relational operator	==
Require all inputs to have the same data type	on
Output data type	Inherit: Logical (see Configuration Parameters: Optimization)
Enable zero-crossing detection	on
Sample time (-1 for inherited)	SampleTime
Integer rounding mode	Nearest

3.2.1.1.7. "NotEqual" (RelationalOperator)

Table 3.19. "NotEqual" Parameters

Parameter	Value
Relational operator	~=
Require all inputs to have the same data type	on
Output data type	Inherit: Logical (see Configuration Parameters: Optimization)
Enable zero-crossing detection	on
Sample time (-1 for inherited)	SampleTime
Integer rounding mode	Nearest

3.2.1.1.8. "preIntegrator" (Inport)

Table 3.20. "preIntegrator" Parameters

Parameter	Value
Port number	2

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

3.2.1.1.9. "preSat" (Inport)

Table 3.21. "preSat" Parameters

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

3.2.1.1.10. "SignDeltaU" (Signum)

Table 3.22. "SignDeltaU" Parameters

Parameter	Value
Enable zero-crossing detection	on
Sample time (-1 for inherited)	-1

3.2.1.1.11. "SignPreIntegrator" (Signum)

Table 3.23. "SignPreIntegrator" Parameters

Parameter	Value
Enable zero-crossing detection	on

3.3.1. Blocks

3.3.1.1. Parameters

3.3.1.1.1. "Constant" (Constant)

Table 3.25. "Constant" Parameters

Parameter	Value
Constant value	0
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

3.3.1.1.2. "Integral Gain" (Gain)

Table 3.26. "Integral Gain" Parameters

Parameter	Value
Gain	I
Multiplication	Element-wise($K \cdot u$)
Parameter minimum	IParamMin
Parameter maximum	IParamMax
Parameter data type	Inherit: Inherit via internal rule
Output minimum	IOutMin
Output maximum	IOutMax
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

Parameter	Value
Sample time (-1 for inherited)	SampleTime

3.3.1.1.3. "Integrator" (DiscreteIntegrator)

Table 3.27. "Integrator" Parameters

Parameter	Value
Integrator method	Integration: Forward Euler
Gain value	1.0
External reset	none
Initial condition source	internal
Initial condition	InitialConditionForIntegrator
Initial condition setting	State (most efficient)
Sample time (-1 for inherited)	SampleTime
Output minimum	IntegratorOutMin
Output maximum	IntegratorOutMax
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
Limit output	off
Upper saturation limit	inf
Lower saturation limit	-inf
Show saturation port	off
Show state port	off
Ignore limit and reset when linearizing	off
State name must resolve to Simulink signal object	off

3.3.1.1.4. "Proportional Gain" (Gain)

Table 3.28. "Proportional Gain" Parameters

Parameter	Value
Gain	P
Multiplication	Element-wise($K \cdot u$)
Parameter minimum	PParamMin
Parameter maximum	PParamMax
Parameter data type	Inherit: Inherit via internal rule
Output minimum	POutMin
Output maximum	POutMax
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)	SampleTime

3.3.1.1.5. "Saturate" (Saturate)

Table 3.29. "Saturate" Parameters

Parameter	Value
Upper limit	UpperSaturationLimit
Lower limit	LowerSaturationLimit
Treat as gain when linearizing	on
Enable zero-crossing detection	on
Sample time (-1 for inherited)	SampleTime
Output minimum	SaturationOutMin
Output maximum	SaturationOutMax
Output data type	Inherit: Same as input
Lock output data type setting against changes by the fixed-point tools	off

Parameter	Value
Integer rounding mode	Floor

3.3.1.1.6. "Sum" (Sum)

Table 3.30. "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	SumOutMin
Output maximum	SumOutMax
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)	SampleTime

3.3.1.1.7. "Switch" (Switch)

Table 3.31. "Switch" Parameters

Parameter	Value
Criteria for passing first input	u2 > Threshold
Threshold	0
Require all data port inputs to have the same data type	on

Parameter	Value
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
Enable zero-crossing detection	on
Sample time (-1 for inherited)	SampleTime
Allow different data input sizes (Results in variable-size output signal)	off

3.3.1.1.8. "u" (Inport)

Table 3.32. "u" Parameters

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

3.3.1.1.9. "y" (Outport)

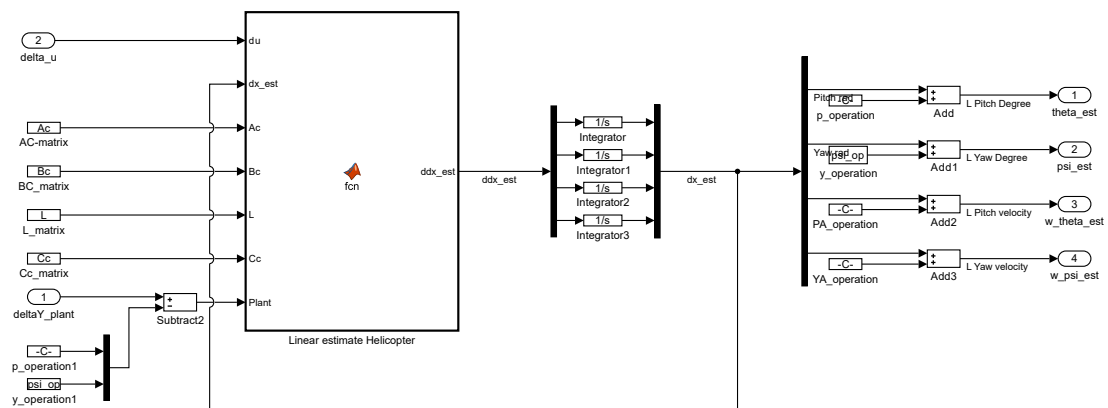
Table 3.33. "y" Parameters

Parameter	Value
Port number	1

Parameter	Value
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
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	SampleTime
Ensure output is virtual	off
Source of initial output value	Dialog
Output when disabled	held
Initial output	0
MustResolveToSignalObject	off

3.4. Estimator

Figure 3.4. Linear_heli_model_estimator_PID/Estimator



3.4.1. Blocks

3.4.1.1. Parameters

3.4.1.1.1. "AC-matrix" (Constant)

Table 3.34. "AC-matrix" Parameters

Parameter	Value
Constant value	Ac
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

3.4.1.1.2. "Add" (Sum)

Table 3.35. "Add" Parameters

Parameter	Value
Icon shape	rectangular
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

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

3.4.1.1.3. "Add1" (Sum)

Table 3.36. "Add1" Parameters

Parameter	Value
Icon shape	rectangular
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

3.4.1.1.4. "Add2" (Sum)

Table 3.37. "Add2" Parameters

Parameter	Value
Icon shape	rectangular
List of signs	++

Parameter	Value
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

3.4.1.1.5. "Add3" (Sum)

Table 3.38. "Add3" Parameters

Parameter	Value
Icon shape	rectangular
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

Parameter	Value
Saturate on integer overflow	off
Sample time (-1 for inherited)	-1

3.4.1.1.6. "BC_matrix" (Constant)

Table 3.39. "BC_matrix" Parameters

Parameter	Value
Constant value	Bc
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

3.4.1.1.7. "Cc_matrix" (Constant)

Table 3.40. "Cc_matrix" Parameters

Parameter	Value
Constant value	Cc
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

3.4.1.1.8. "delta_u" (Inport)**Table 3.41. "delta_u" Parameters**

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.4.1.1.9. "deltaY_plant" (Inport)**Table 3.42. "deltaY_plant" Parameters**

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

3.4.1.1.10. "Demux" (Demux)**Table 3.43. "Demux" Parameters**

Parameter	Value
Number of outputs	4
Display option	bar
Bus selection mode	off

3.4.1.1.11. "Demux1" (Demux)**Table 3.44. "Demux1" Parameters**

Parameter	Value
Number of outputs	4

Parameter	Value
Display option	bar
Bus selection mode	off

3.4.1.1.12. "Integrator" (Integrator)

Table 3.45. "Integrator" Parameters

Parameter	Value
External reset	none
Initial condition source	internal
Initial condition	0
Limit output	off
Upper saturation limit	0.9604
Lower saturation limit	-0.7854
Wrap state	off
Wrapped state upper value	pi
Wrapped state lower value	-pi
Show saturation port	off
Show state port	off
Ignore limit and reset when linearizing	off
Enable zero-crossing detection	on
State Name (e.g., 'position')	"

3.4.1.1.13. "Integrator1" (Integrator)

Table 3.46. "Integrator1" Parameters

Parameter	Value
External reset	none
Initial condition source	internal
Initial condition	0

Parameter	Value
Limit output	off
Upper saturation limit	π -psi_op
Lower saturation limit	0-psi_op
Wrap state	off
Wrapped state upper value	π
Wrapped state lower value	$-\pi$
Show saturation port	off
Show state port	off
Ignore limit and reset when linearizing	off
Enable zero-crossing detection	on
State Name (e.g., 'position')	"

3.4.1.1.14. "Integrator2" (Integrator)

Table 3.47. "Integrator2" Parameters

Parameter	Value
External reset	none
Initial condition source	internal
Initial condition	0
Limit output	off
Upper saturation limit	inf
Lower saturation limit	-inf
Wrap state	off
Wrapped state upper value	π
Wrapped state lower value	$-\pi$
Show saturation port	off
Show state port	off
Ignore limit and reset when linearizing	off

Parameter	Value
Enable zero-crossing detection	on
State Name (e.g., 'position')	"

3.4.1.1.15. "Integrator3" (Integrator)

Table 3.48. "Integrator3" Parameters

Parameter	Value
External reset	none
Initial condition source	internal
Initial condition	0
Limit output	off
Upper saturation limit	inf
Lower saturation limit	-inf
Wrap state	off
Wrapped state upper value	pi
Wrapped state lower value	-pi
Show saturation port	off
Show state port	off
Ignore limit and reset when linearizing	off
Enable zero-crossing detection	on
State Name (e.g., 'position')	"

3.4.1.1.16. "L_matrix" (Constant)

Table 3.49. "L_matrix" Parameters

Parameter	Value
Constant value	L
Interpret vector parameters as 1-D	on

Parameter	Value
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

3.4.1.1.17. "Linear estimate Helicopter" (MATLAB Function)

Table 3.50. Linear estimate Helicopter 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
Input fixed-point math	fimath(...)
Description	

Table 3.51. Linear estimate Helicopter Argument Summary

Name	Scope	Port	Data Type	Size
du	Input	1	double	[2, 1]
ddx_est	Output	1	double	[4, 1]
dx_est	Input	2	double	[4, 1]
Ac	Input	3	double	[4, 4]
Bc	Input	4	double	[4, 2]
L	Input	5	double	[4, 2]
Cc	Input	6	double	[2, 4]
Plant	Input	7	double	[2, 1]

Linear estimate Helicopter Function Script

```

function ddx_est = fcn(du,dx_est,Ac,Bc, L,Cc, Plant)
%delta delta estimate = Ac*delta estimate + Bc *delta u +
%L(delta plant - Cc *delta estimate

ddx_est=Ac*dx_est+Bc*du+L*(Plant-Cc*dx_est);

```

Table 3.52. Linear estimate Helicopter Supporting Functions

Function	Defined By	Path
coder.internal.blas.inline	MATLAB	
coder.internal.blas.threshold	MATLAB	
coder.internal.blas.use_refblas	MATLAB	
coder.internal.blas.xgemm	MATLAB	
coder.internal.isBuiltInNumeric	MATLAB	
coder.internal.refblas.xgemm	MATLAB	
coder.internal.scalarEg	MATLAB	
intmax	MATLAB	
intmin	MATLAB	
isfi	MATLAB	
isfimath	MATLAB	
isnumerictype	MATLAB	

3.4.1.1.18. "Mux1" (Mux)**Table 3.53. "Mux1" Parameters**

Parameter	Value
Number of inputs	4
Display option	bar

3.4.1.1.19. "Mux6" (Mux)**Table 3.54. "Mux6" Parameters**

Parameter	Value
Number of inputs	2
Display option	bar

3.4.1.1.20. "p_operation" (Constant)**Table 3.55. "p_operation" Parameters**

Parameter	Value
Constant value	theta_op
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

3.4.1.1.21. "p_operation1" (Constant)**Table 3.56. "p_operation1" Parameters**

Parameter	Value
Constant value	theta_op
Interpret vector parameters as 1-D	off
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

3.4.1.1.22. "PA_operation" (Constant)**Table 3.57. "PA_operation" Parameters**

Parameter	Value
Constant value	w_theta_op
Interpret vector parameters as 1-D	on

Parameter	Value
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

3.4.1.1.23. "psi_est" (Outport)

Table 3.58. "psi_est" Parameters

Parameter	Value
Port number	2
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
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	[]
MustResolveToSignalObject	off

3.4.1.1.24. "Subtract2" (Sum)**Table 3.59. "Subtract2" Parameters**

Parameter	Value
Icon shape	rectangular
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

3.4.1.1.25. "theta_est" (Outport)**Table 3.60. "theta_est" 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

Parameter	Value
Unit (e.g., m, m/s ² , N*m)	inherit
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

3.4.1.1.26. "w_psi_est" (Outport)

Table 3.61. "w_psi_est" Parameters

Parameter	Value
Port number	4
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
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1
Ensure output is virtual	off

Parameter	Value
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]
MustResolveToSignalObject	off

3.4.1.1.27. "w_theta_est" (Outport)

Table 3.62. "w_theta_est" Parameters

Parameter	Value
Port number	3
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
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	[]
MustResolveToSignalObject	off

3.4.1.1.28. "y_operation" (Constant)**Table 3.63. "y_operation" Parameters**

Parameter	Value
Constant value	psi_op
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

3.4.1.1.29. "y_operation1" (Constant)**Table 3.64. "y_operation1" Parameters**

Parameter	Value
Constant value	psi_op
Interpret vector parameters as 1-D	off
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

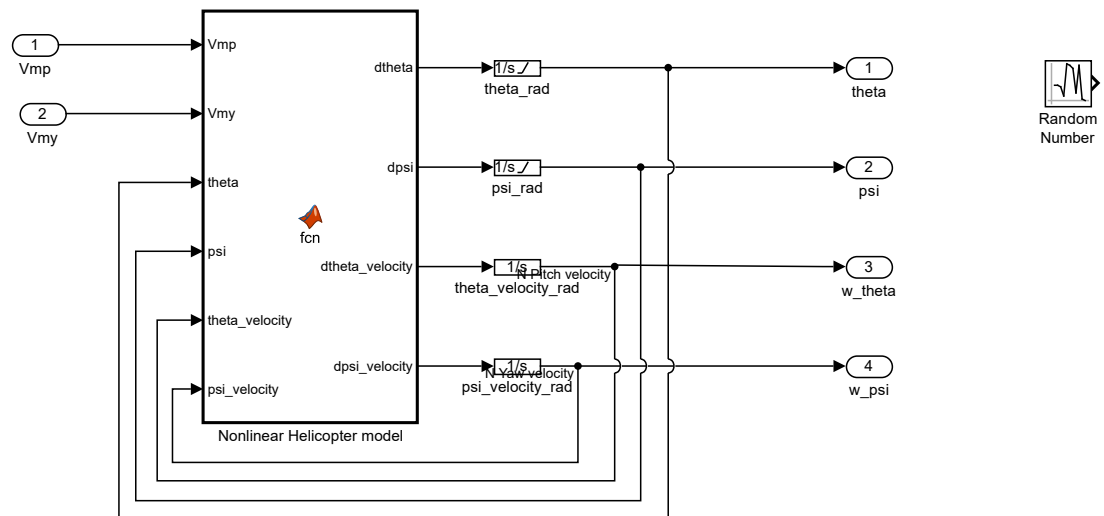
3.4.1.1.30. "YA_operation" (Constant)**Table 3.65. "YA_operation" Parameters**

Parameter	Value
Constant value	w_psi_op

Parameter	Value
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

3.5. Plant

Figure 3.5. Linear_heli_model_estimator_PID/Plant



3.5.1. Blocks

3.5.1.1. Parameters

3.5.1.1.1. "Nonlinear Helicopter model" (MATLAB Function)

Table 3.66. Nonlinear Helicopter model Function Properties

Property	Value
Update Method	INHERITED
Sample Time	

Property	Value
Support variable-size arrays	1
Saturate on integer overflow	1
Treat these inherited Simulink signal types as fi objects	Fixed-point
Input fi math	fimath(...)
Description	

Table 3.67. Nonlinear Helicopter model Argument Summary

Name	Scope	Port	Data Type	Size
Vmp	Input	1	double	1
dtheta	Output	1	double	1
Vmy	Input	2	double	1
theta	Input	3	double	1
psi	Input	4	double	1
theta_velocity	Input	5	double	1
psi_velocity	Input	6	double	1
dpsi	Output	2	double	1
dtheta_velocity	Output	3	double	1
dpsi_velocity	Output	4	double	1

Nonlinear Helicopter model Function Script

```

function [dtheta,dpsi,dtheta_velocity,dpsi_velocity] =
    fcn(Vmp,Vmy,theta,psi,theta_velocity,psi_velocity)

%%Parameters of the system part 1
lcm = 0.015;    %[m]                % Distance between the pivot point and
    center of mass
mheli = 0.479;  %[kg]                % Total moving mass of heli
Jeqp = 0.0172;
Jeqy= 0.0210;   %[kg/m2]            % Moment of inertia pitch and yaw axis
g = 9.81;       %[m/s2]             % Acceleration due to gravity
%%Parameter of the system part 2
Kpp = 0.0556;   %[Nm/V]             % Torque constant on pitch for pitch
    motor
Kyy = 0.21084;  %[Nm/V]             % Torque constant on yaw for yaw
    motor
Kpy = 0.005;    %[Nm/V]             % Torque constant on pitch from yaw
    motor
Kyp = 0.15;     %[Nm/V]             % Torque constan on pitch from pithc
    motor

```

```

Bp = 0.01;      %[N/V]      % Damping friction factor about pitch
By = 0.08;      %[N/V]      % Damping friction fator about yaw

%% 4 ODE
dtheta_dt = theta_velocity;
dpsi_dt = psi_velocity;
dthetaVelocity_dt = ((Kpp*Vmp)-(Kpy*Vmy)-(Bp*theta_velocity
+mheli*psi_velocity^2*sin(theta)*lcm^2*cos(theta)+mheli*g*cos(theta)*lcm))/
(Jeqp+mheli*lcm^2);
dpsiVelocity_dt = ((Kyp*Vmp)-
(Kyy*Vmy)+(2*mheli*psi_velocity*sin(theta)*lcm^2*cos(theta)*theta_velocity)-
(By*psi_velocity))/(Jeqy+mheli*cos(theta)^2*lcm^2);

%% Output
dtheta = dtheta_dt;
dpsi = dpsi_dt;
dtheta_velocity = dthetaVelocity_dt;
dpsi_velocity = dpsiVelocity_dt;

```

Table 3.68. Nonlinear Helicopter model Supporting Functions

Function	Defined By	Path
coder.internal.applyScalarFunction	MATLAB	
coder.internal.applyScalarFunctionInPlace	MATLAB	
coder.internal.div	MATLAB	
coder.internal.error	MATLAB	
coder.internal.isBuiltInNumeric	MATLAB	
coder.internal.scalar.cos	MATLAB	
coder.internal.scalar.floor	MATLAB	
coder.internal.scalar.sin	MATLAB	
coder.internal.scalarEg	MATLAB	
coder.internal.scalexpAlloc	MATLAB	
coder.internal.scalexpAllocNoCheck	MATLAB	
coder.internal.scalexpCompatible	MATLAB	
cos	MATLAB	
floor	MATLAB	
intmax	MATLAB	
intmin	MATLAB	
isfi	MATLAB	
isfimath	MATLAB	
ismatrix	MATLAB	

Function	Defined By	Path
isnan	MATLAB	
isnumericitype	MATLAB	
mpower	MATLAB	
mrdivide	MATLAB	
power	MATLAB	
rdivide	MATLAB	
sin	MATLAB	

3.5.1.1.2. "psi" (Output)

Table 3.69. "psi" Parameters

Parameter	Value
Port number	2
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
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

3.5.1.1.3. "psi_rad" (Integrator)

Table 3.70. "psi_rad" Parameters

Parameter	Value
External reset	none
Initial condition source	internal
Initial condition	psi_op
Limit output	on
Upper saturation limit	pi
Lower saturation limit	0
Wrap state	off
Wrapped state upper value	pi
Wrapped state lower value	-pi
Show saturation port	off
Show state port	off
Ignore limit and reset when linearizing	off
Enable zero-crossing detection	on
State Name (e.g., 'position')	"

3.5.1.1.4. "psi_velocity_rad" (Integrator)

Table 3.71. "psi_velocity_rad" Parameters

Parameter	Value
External reset	none
Initial condition source	internal
Initial condition	w_psi_op
Limit output	off
Upper saturation limit	inf
Lower saturation limit	-inf
Wrap state	off

Parameter	Value
Wrapped state upper value	pi
Wrapped state lower value	-pi
Show saturation port	off
Show state port	off
Ignore limit and reset when linearizing	off
Enable zero-crossing detection	on
State Name (e.g., 'position')	"

3.5.1.1.5. "Random Number" (RandomNumber)

Table 3.72. "Random Number" Parameters

Parameter	Value
Mean	0
Variance	0.0001
Seed	0
Sample time	-1
Interpret vector parameters as 1-D	on

3.5.1.1.6. "theta" (Outport)

Table 3.73. "theta" 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

Parameter	Value
Unit (e.g., m, m/s ² , N*m)	inherit
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

3.5.1.1.7. "theta_rad" (Integrator)

Table 3.74. "theta_rad" Parameters

Parameter	Value
External reset	none
Initial condition source	internal
Initial condition	theta_op
Limit output	on
Upper saturation limit	0.7854
Lower saturation limit	-0.7854
Wrap state	off
Wrapped state upper value	pi
Wrapped state lower value	-pi
Show saturation port	off
Show state port	off
Ignore limit and reset when linearizing	off
Enable zero-crossing detection	on

Parameter	Value
State Name (e.g., 'position')	"

3.5.1.1.8. "theta_velocity_rad" (Integrator)

Table 3.75. "theta_velocity_rad" Parameters

Parameter	Value
External reset	none
Initial condition source	internal
Initial condition	w_theta_op
Limit output	off
Upper saturation limit	inf
Lower saturation limit	-inf
Wrap state	off
Wrapped state upper value	pi
Wrapped state lower value	-pi
Show saturation port	off
Show state port	off
Ignore limit and reset when linearizing	off
Enable zero-crossing detection	on
State Name (e.g., 'position')	"

3.5.1.1.9. "Vmp" (Inport)

Table 3.76. "Vmp" Parameters

Parameter	Value
Port number	1
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1

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

3.5.1.1.10. "Vmy" (Inport)

Table 3.77. "Vmy" Parameters

Parameter	Value
Port number	2
Port dimensions (-1 for inherited)	-1
Sample time (-1 for inherited)	-1
Minimum	[]
Maximum	[]
Data type	Inherit: auto

3.5.1.1.11. "w_psi" (Outport)

Table 3.78. "w_psi" Parameters

Parameter	Value
Port number	4
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
Port dimensions (-1 for inherited)	-1
Variable-size signal	Inherit
Sample time (-1 for inherited)	-1

Parameter	Value
Ensure outport is virtual	off
Source of initial output value	Dialog
Output when disabled	held
Initial output	[]
MustResolveToSignalObject	off

3.5.1.1.12. "w_theta" (Outport)

Table 3.79. "w_theta" Parameters

Parameter	Value
Port number	3
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
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	[]
MustResolveToSignalObject	off

Chapter 4. System Design Variables

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4.1. Design Variable Summary

Table 4.1. Design Variables

Variable Name	Parent Blocks	Size	Bytes	Class	Value
Ac	AC-matrix [45] AC-matrix [45]	4x4	128	double	[0 0 1 0 ; 0 0 0 1 ; -0.70717 0 -0.57778 0 ; 0 0 0 -3.7907]
Bc	BC_matrix [48] BC_matrix [48]	4x2	64	double	[0 0 ; 0 0 ; 3.2124 -0.28889 ; 7.1075 -9.9903]
Cc	Cc_matrix [48] Cc_matrix [48]	2x4	64	double	[1 0 0 0 ; 0 1 0 0]
L	L_matrix [52] L_matrix [52]	4x2	64	double	[25.1553 2.25114e-1- 5 ; 2.25114e-15 26.570- 7 ; 16.3941 1.32658e-1- 5 ; 1.29136e-15 3.0019- 6]
P	Discrete PID Controller [2] Discrete PID Controller1 [8]	4x4	128	double	[2.51553 2.25114e-- 16 1.63941 1.29136e- -16 ; 2.25114e-16 2.65707 1.32658e-16 0.30019- 6 ; 1.63941 1.32658e-16 43.9659 5.63951e-1- 6 ; 1.29136e-16 0.3001- 96 5.63951e-16 9.11- 436]
Vmp_op	Vmp_op [23] Vmp_op [23]	1x1	8	double	1.3338
Vmy_op	Vmy_op [24]	1x1	8	double	0.9489

Variable Name	Parent Blocks	Size	Bytes	Class	Value
	Vmy_op [24]				
psi_op	Integrator1 [50] Integrator1 [50] y_operation [59] y_operation [59] y_operation1 [60] y_operation1 [60] psi_rad [64] psi_rad [64]	1x1	8	double	1.5708
theta_op	p_operation [54] p_operation [54] p_operation1 [55] p_operation1 [55] theta_rad [67] theta_rad [67]	1x1	8	double	-0.1745
w_psi_op	YA_operation [60] YA_operation [60] psi_velocity_rad [65] psi_velocity_rad [65]	1x1	8	double	0
w_theta_op	PA_operation [55] PA_operation [55] theta_velocity_rad [68] theta_velocity_rad [68]	1x1	8	double	0

Table 4.2. Functions used in Design Variable Expressions

Function Name	Parent Blocks	Calling character vector
pi	Integrator [50] Integrator [50] Integrator1 [50] Integrator1 [50] Integrator1 [50] Integrator2 [51] Integrator2 [51] Integrator3 [52] Integrator3 [52] psi_rad [64] psi_rad [64] psi_rad [64] psi_velocity_rad [65] psi_velocity_rad [65] theta_rad [67] theta_rad [67] theta_velocity_rad [68] theta_velocity_rad [68] R2D1 [17] R2D2 [18] R2D3 [18]	pi -pi pi-psi_op pi -pi pi -pi pi -pi pi pi -pi pi -pi pi -pi pi -pi 180/pi 180/pi 180/pi

Function Name	Parent Blocks	Calling character vector
	R2D4 [19]	180/pi

4.2. Design Variable Details

Table 4.3. Ac

0	0	1	0
0	0	0	1
-0.7072	0	-0.5778	0
0	0	0	-3.7907

Used by Blocks:

- Linear_heli_model_estimator_PID/Estimator/AC-matrix [45]

Resolved in: base workspace

Table 4.4. Bc

0	0
0	0
3.2124	-0.2889
7.1075	-9.9903

Used by Blocks:

- Linear_heli_model_estimator_PID/Estimator/BC_matrix [48]

Resolved in: base workspace

Table 4.5. Cc

1	0	0	0
0	1	0	0

Used by Blocks:

- Linear_heli_model_estimator_PID/Estimator/Cc_matrix [48]

Resolved in: base workspace

Table 4.6. L

25.1553	2.2511e-15
---------	------------

2.2511e-15	26.5707
16.3941	1.3266e-15
1.2914e-15	3.0020

Used by Blocks:

- Linear_heli_model_estimator_PID/Estimator/L_matrix [52]

Resolved in: base workspace

Vmp_op. 1.3338

Used by Blocks:

- Linear_heli_model_estimator_PID/Vmp_op [23]

Resolved in: base workspace

Vmy_op. 0.9489

Used by Blocks:

- Linear_heli_model_estimator_PID/Vmy_op [24]

Resolved in: base workspace

psi_op. 1.5708

Used by Blocks:

- Linear_heli_model_estimator_PID/Estimator/y_operation [59]
- Linear_heli_model_estimator_PID/Estimator/y_operation1 [60]
- Linear_heli_model_estimator_PID/Plant/psi_rad [64]

Resolved in: base workspace

simTimePerRealTime. 5

Used by Blocks:

- Linear_heli_model_estimator_PID/Real-Time Pacer [19]

Resolved in: mask workspace (Linear_heli_model_estimator_PID/Real-Time Pacer)

theta_op. -0.1745

Used by Blocks:

- Linear_heli_model_estimator_PID/Estimator/p_operation [54]

- Linear_heli_model_estimator_PID/Estimator/p_operation1 [55]
- Linear_heli_model_estimator_PID/Plant/theta_rad [67]

Resolved in: base workspace

w_psi_op. 0

Used by Blocks:

- Linear_heli_model_estimator_PID/Estimator/YA_operation [60]
- Linear_heli_model_estimator_PID/Plant/psi_velocity_rad [65]

Resolved in: base workspace

w_theta_op. 0

Used by Blocks:

- Linear_heli_model_estimator_PID/Estimator/PA_operation [55]
- Linear_heli_model_estimator_PID/Plant/theta_velocity_rad [68]

Resolved in: base workspace

Chapter 5. Requirements Traceability

Linear_heli_model_estimator_PID does not contain requirements traceability links.

Chapter 6. System Model Configuration

Source: Model
Source Name: Linear_heli_model_estimator_PID

Table 6.1. Linear_heli_model_estimator_PID Configuration Set

Property	Value
Description	
Components	[Linear_heli_model_estimator_PID Configuration Set.Components(1) [77], Linear_heli_model_estimator_PID Configuration Set.Components(2) [78], Linear_heli_model_estimator_PID Configuration Set.Components(3) [79], Linear_heli_model_estimator_PID Configuration Set.Components(4) [81], Linear_heli_model_estimator_PID Configuration Set.Components(5) [83], Linear_heli_model_estimator_PID Configuration Set.Components(6) [85], Linear_heli_model_estimator_PID Configuration Set.Components(7) [85], Linear_heli_model_estimator_PID Configuration Set.Components(8) [86], Linear_heli_model_estimator_PID Configuration Set.Components(9) [88]]
Name	Configuration
SimulationMode	normal
ConfigType	Model

Table 6.2. Linear_heli_model_estimator_PID Configuration Set.Components [77](1)

Property	Value
Name	Solver
Description	
Components	
StartTime	0.0
StopTime	inf
AbsTol	auto
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
EnableConcurrentExecution	off
ConcurrentTasks	off
Solver	ode4
SolverName	ode4
SolverType	Fixed-step
SolverJacobianMethodControl	auto
ShapePreserveControl	DisableAll
ZeroCrossControl	UseLocalSettings
ZeroCrossAlgorithm	Nonadaptive
SolverResetMethod	Fast
PositivePriorityOrder	off
AutoInsertRateTranBlk	off
SampleTimeConstraint	Unconstrained
InsertRTBMode	Whenever possible
SampleTimeProperty	

Table 6.3. Linear_heli_model_estimator_PID Configuration Set.Components [77](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	logsout
DSMLoggingName	dsmout
OutputOption	RefineOutputTimes
OutputTimes	[]
ReturnWorkspaceOutputsName	out
Refine	1
LoggingToFile	off
DatasetSignalFormat	timeseries
LoggingFileName	out.mat
LoggingIntervals	[-inf, inf]

Table 6.4. Linear_heli_model_estimator_PID Configuration Set.Components [77](3)

Property	Value
Name	Optimization
Description	
Components	
BlockReduction	on
BooleanDataType	on
ConditionallyExecuteInputs	on
DefaultParameterBehavior	Tunable
InlineParams	off
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
EvaledLifeSpan	Inf
MaxStackSize	Inherit from target
BufferReusableBoundary	on
SimCompilerOptimization	off
AccelVerboseBuild	off
OptimizeBlockOrder	off
OptimizeDataStoreBuffers	on

BusAssignmentInplaceUpdate	on
----------------------------	----

Table 6.5. Linear_heli_model_estimator_PID Configuration Set.Components [77](4)

Property	Value
Name	Diagnostics
Description	
Components	
RTPrefix	error
ConsistencyChecking	none
ArrayBoundsChecking	none
SignalInfNanChecking	none
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
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
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

Table 6.6. Linear_heli_model_estimator_PID Configuration Set.Components [77](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
TargetEndianess	Unspecified
TargetWordSize	32
TargetTypeEmulationWarnSuppressLevel	0
TargetPreprocMaxBitsSint	32
TargetPreprocMaxBitsUint	32
TargetHWDeviceType	Specified
TargetUnknown	off
ProdEqTarget	on

UseEmbeddedCoderFeatures	on
UseSimulinkCoderFeatures	on

Table 6.7. Linear_heli_model_estimator_PID Configuration Set.Components [77](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. Linear_heli_model_estimator_PID Configuration Set.Components [77](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. Linear_heli_model_estimator_PID Configuration Set.Components [77](8)

Property	Value
Name	Code Generation
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	
CustomInitializer	
CustomTerminator	
Toolchain	Automatically locate an installed toolchain
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	Linear_heli_model_estimator_PID Configuration Set.Components(8).CodeCoverageSettings [89]

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	[Linear_heli_model_estimator_PID Configuration Set.Components(8).Components(1)-[90], Linear_heli_model_estimator_PID Configuration Set.Components(8).Components(2) [91]]

Table 6.10. Linear_heli_model_estimator_PID Configuration Set.Components [77](9)

Property	Value
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. Linear_heli_model_estimator_PID Configuration Set.Components(8) [86].CodeCoverageSettings

Property	Value
TopModelCoverage	off

ReferencedModelCoverage	off
CoverageTool	None

Table 6.12. Linear_heli_model_estimator_PID Configuration Set.Components(8).Components [88](1)

Property	Value
Name	Code Appearance
Description	
Components	
ForceParamTrailComments	off
GenerateComments	on
CommentStyle	Auto
IgnoreCustomStorageClasses	on
IgnoreTestpoints	off
IncHierarchyInIds	off
MaxIdLength	31
PreserveName	off
PreserveNameWithParent	off
ShowEliminatedStatement	off
OperatorAnnotations	off
IncAutoGenComments	off
SimulinkDataObjDesc	off
SFDataObjDesc	off
MATLABFcnDesc	off
IncDataTypeInIds	off
PrefixModelToSubsysFcnNames	on
MangleLength	1
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
MATLABSourceComments	off
EnableCustomComments	off
InternalIdentifier	Shortened
InlinedPrmAccess	Literals
ReqsInCode	off
UseSimReservedNames	off
ReservedNameArray	

Table 6.13. Linear_heli_model_estimator_PID Configuration Set.Components(8).Components [88](2)

Property	Value
Name	Target
Description	
Components	
IsERTTarget	off
TargetFcnLib	ansi_tfl_table_tmw.mat
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

GenerateFullHeader	on
InferredTypesCompatibility	off
ExistingSharedCode	
GenerateSampleERTMain	off
GenerateTestInterfaces	off
ModelReferenceCompliant	on
ParMdlRefBuildCompliant	on
CompOptLevelCompliant	on
ConcurrentExecutionCompliant	on
IncludeMdlTerminateFcn	on
CombineOutputUpdateFcns	on
CombineSignalStateStructs	off
SuppressErrorStatus	off
ERTFirstTimeCompliant	off
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

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

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).

Chapter 8. About this Report

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8.1. Report Overview

This report describes the design of the `Linear_heli_model_estimator_PID` 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 Traceability. 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.

8.2. 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.

8.3. 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.

8.4. 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.