Project Quadrocopter

Automotive Systems Master

Software Based Automotive Systems

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Subsystem\_Interfaces



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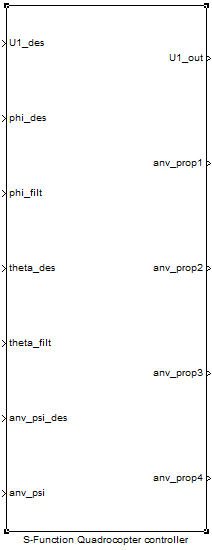
# Introduction

This document gives an overview of the various interfaces between the subsystems of Copter system as implemented in the MATLAB/Simulink®.

Following subsystems are implemented in Simulink®’s S-Function (C-Code).

* Quadrocopter Controller
* Sensor Filter

# Subsystem Quadrocopter Controller



## Inputs

|  |  |  |  |
| --- | --- | --- | --- |
| **Signal** | **Type** | **Resolution** | **Unit** |
| U1\_des | int16 | 0.001 | N |
| phi\_des | int16 | 0.001 | rad |
| phi\_filt | int16 | 0.001 | rad |
| theta\_des | int16 | 0.001 | rad |
| theta\_filt | int16 | 0.001 | rad |
| anv\_psi\_des | int16 | 0.001 | rad/s |
| anv\_psi | int16 | 0.001 | rad/s |

## Outputs

|  |  |  |  |
| --- | --- | --- | --- |
| **Signal** | **Type** | **Resolution** | **Unit** |
| U1\_out | int16 | 0.001 | N |
| anv\_prop1 | int16 | 1 | rpm |
| anv\_prop2 | int16 | 1 | rpm |
| anv\_prop3 | int16 | 1 | rpm |
| anv\_prop4 | int16 | 1 | rpm |

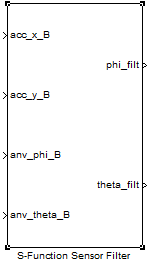
## Parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Signal** | **Type** | **Resolution** | **Unit** | **Default Value** |
| Kp\_phi | int16 | 0.01 | 1/s2 | 20.00 |
| Ki\_phi | int16 | 0.01 | 1/s3 | 5.00 |
| Kd\_phi | int16 | 0.01 | 1/s | 3.00 |
| Kp\_theta | int16 | 0.01 | 1/s2 | 20.00 |
| Ki\_theta | int16 | 0.01 | 1/s3 | 5.00 |
| Kd\_theta | int16 | 0.01 | 1/s | 3.00 |
| Kp\_anv\_psi | int16 | 0.01 | 1/s | 20 |
| Ki\_anv\_psi | int16 | 0.01 | 1/s2 | 2 |
| Kd\_anv\_psi | int16 | 0.01 | - | 2 |
| I\_x | int16 | 0.001 | Nms2 | 0.009 |
| I\_y | int16 | 0.001 | Nms2 | 0.009 |
| I\_z | int16 | 0.001 | Nms2 | 0.016 |
| l\_boom | int16 | 0.001 | m | 0.166 |

## Constants

|  |  |
| --- | --- |
| **Signal** | **Value** |
| S\_FUNCTION\_NAME | sfun\_Copter\_Controller\_discrete |
| S\_FUNCTION\_LEVEL | 2 |
| NUMINPORTS | 7 |
| NUMOUTPORTS | 5 |
| NUMPARAMS | 1 |
| THRUST2RPM\_DATAPOINTS | 10 |

# Subsystem Sensor Filter



## Inputs

|  |  |  |  |
| --- | --- | --- | --- |
| **Signal** | **Type** | **Resolution** | **Unit** |
| acc\_x\_B | int16 | 0.1 | m/s2 |
| acc\_y\_B | int16 | 0.1 | m/s2 |
| anv\_phi\_B | int16 | 0.01 | rad/s |
| anv\_theta\_B | int16 | 0.01 | rad/s |

## Outputs

|  |  |  |  |
| --- | --- | --- | --- |
| **Signal** | **Type** | **Resolution** | **Unit** |
| phi\_filt | int16 | 0.0001 | rad |
| theta\_filt | int16 | 0.0001 | rad |

## Parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Signal** | **Type** | **Resolution** | **Unit** | **Default Value** |
| LPFP | int16 | 0.01 | - | 0.05 |
| HPFP | int16 | 0.01 | - | 0.95 |
| LPFR | int16 | 0.01 | - | 0.05 |
| HPFR | int16 | 0.01 | - | 0.95 |

## Constants

|  |  |
| --- | --- |
| **Signal** | **Value** |
| S\_FUNCTION\_NAME | sfun\_Sensor\_Filter\_discrete |
| S\_FUNCTION\_LEVEL | 2 |
| NUMINPORTS | 4 |
| NUMOUTPORTS | 2 |
| NUMPARAMS | 1 |