

Calibration results

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Normalized Residuals

Reprojection error (cam0): mean 0.759818891700697, median 0.7485594293417814, std: 0.34936441014915154
Reprojection error (cam1): mean 1.081017461764228, median 1.0883886486249161, std: 0.3167089064487482
Reprojection error (cam2): mean 0.5271391328155146, median 0.49360546230897506, std: 0.2812204166128198
Gyroscope error (imu0): mean 0.9676467780501892, median 0.8805515087691299, std: 0.5853289440716868
Accelerometer error (imu0): mean 1.173754262296464, median 1.0862639653557657, std: 0.5768189394554586

Residuals

Reprojection error (cam0) [px]: mean 0.759818891700697, median 0.7485594293417814, std: 0.34936441014915154
Reprojection error (cam1) [px]: mean 1.081017461764228, median 1.0883886486249161, std: 0.3167089064487482
Reprojection error (cam2) [px]: mean 0.5271391328155146, median 0.49360546230897506, std: 0.2812204166128198
Gyroscope error (imu0) [rad/s]: mean 0.0011822050334408137, median 0.0010757979559115269, std: 0.0007151151014985902
Accelerometer error (imu0) [m/s^2]: mean 0.032207816957414974, median 0.029807083209362213, std: 0.01582791169865778

Transformation (cam0):

T_ci: (imu0 to cam0):

```
[[-0.99999619 -0.00120974 -0.00248116 0.09387637]
[-0.00123066 0.99996357 0.0084471 0.01321383]
[0.00247085 0.00845012 -0.99996124 -0.00971372]
[ 0.      0.      0.      1.      ]]
```

T_ic: (cam0 to imu0):

```
[[-0.99999619 -0.00123066 0.00247085 0.09391627]
[-0.00120974 0.99996357 0.00845012 -0.0130177 ]
[-0.00248116 0.0084471 -0.99996124 -0.00959204]
[ 0.      0.      0.      1.      ]]
```

timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
0.00910467165359604

Transformation (cam1):

T_ci: (imu0 to cam1):

```
[[ -0.99996844 -0.00084209 -0.00790018 -0.02618946 ]
 [ -0.00090995  0.99996269  0.00859007  0.01310269 ]
 [  0.00789265  0.00859699 -0.9999319  -0.00828166 ]
 [  0.          0.          0.          1.          ]]
```

T_ic: (cam1 to imu0):

```
[[ -0.99996844 -0.00090995  0.00789265 -0.02611134 ]
 [ -0.00084209  0.99996269  0.00859699 -0.01305306 ]
 [ -0.00790018  0.00859007 -0.9999319  -0.00860055 ]
 [  0.          0.          0.          1.          ]]
```

timeshift cam1 to imu0: [s] (t_imu = t_cam + shift)
0.008399359390217116

Transformation (cam2):

T_ci: (imu0 to cam2):

```
[[ -0.99999936 -0.00000592  0.0011271  0.06280778 ]
 [ -0.0000019  0.99999366  0.00356024  0.01923787 ]
 [ -0.00112711  0.00356023 -0.99999303 -0.00589119 ]
 [  0.          0.          0.          1.          ]]
```

T_ic: (cam2 to imu0):

```
[[ -0.99999936 -0.0000019  -0.00112711  0.06280113 ]
 [ -0.00000592  0.99999366  0.00356023 -0.0192164 ]
 [  0.0011271  0.00356024 -0.99999303 -0.00603043 ]
 [  0.          0.          0.          1.          ]]
```

timeshift cam2 to imu0: [s] (t_imu = t_cam + shift)
0.009119818181705874

Baselines:

Baseline (cam0 to cam1):

[[0.99998525 0.00032184 0.00542199 -0.12001603]
[-0.00032107 0.99999994 -0.00014218 -0.00008238]
[-0.00542203 0.00014044 0.99998529 0.00193906]
[0. 0. 0. 1.]]

baseline norm: 0.12003171938634694 [m]

Baseline (cam1 to cam2):

[[0.9999589 0.00091371 -0.00901972 0.08890949]
[-0.0008683 0.99998694 0.00503692 0.00615432]
[0.0090242 -0.00502888 0.99994664 0.00269226]
[0. 0. 0. 1.]]

baseline norm: 0.08916288880898014 [m]

Gravity vector in target coords: [m/s^2]

[-0.01075546 -9.28599482 -3.15255569]

Calibration configuration

=====

cam0

Camera model: pinhole

Focal length: [1060.3976965420115, 1059.9377777854759]

Principal point: [669.0410687042238, 338.0955078969839]

Distortion model: radtan

Distortion coefficients: [-0.39542241174697385, 0.1591019280356693, -0.00034525284843336024, 0.0009465391307443078]

Type: aprilgrid

Tags:

Rows: 5

Cols: 7
Size: 0.04 [m]
Spacing 0.01 [m]

cam1

Camera model: pinhole
Focal length: [1055.696578079414, 1056.0327896352933]
Principal point: [666.2914210045061, 331.25697121349526]
Distortion model: radtan
Distortion coefficients: [-0.39361678054112026, 0.15293568698596516, -0.0005106321308083494,
0.001630476234212862]
Type: aprilgrid
Tags:
Rows: 5
Cols: 7
Size: 0.04 [m]
Spacing 0.01 [m]

cam2

Camera model: pinhole
Focal length: [1268.4271589183275, 1267.7698267477979]
Principal point: [644.7235579555121, 369.3053072152152]
Distortion model: radtan
Distortion coefficients: [-0.41736733429239814, 0.18973966738299014, -0.0001707595182044016,
0.0006983044021555349]
Type: aprilgrid
Tags:
Rows: 5
Cols: 7
Size: 0.04 [m]
Spacing 0.01 [m]

IMU configuration

=====

IMU0:

Model: calibrated

Update rate: 400.0

Accelerometer:

Noise density: 0.001372

Noise density (discrete): 0.02744

Random walk: 5e-05

Gyroscope:

Noise density: 6.10866e-05

Noise density (discrete): 0.0012217320000000001

Random walk: 4e-06

T_ib (imu0 to imu0)

[[1. 0. 0. 0.]

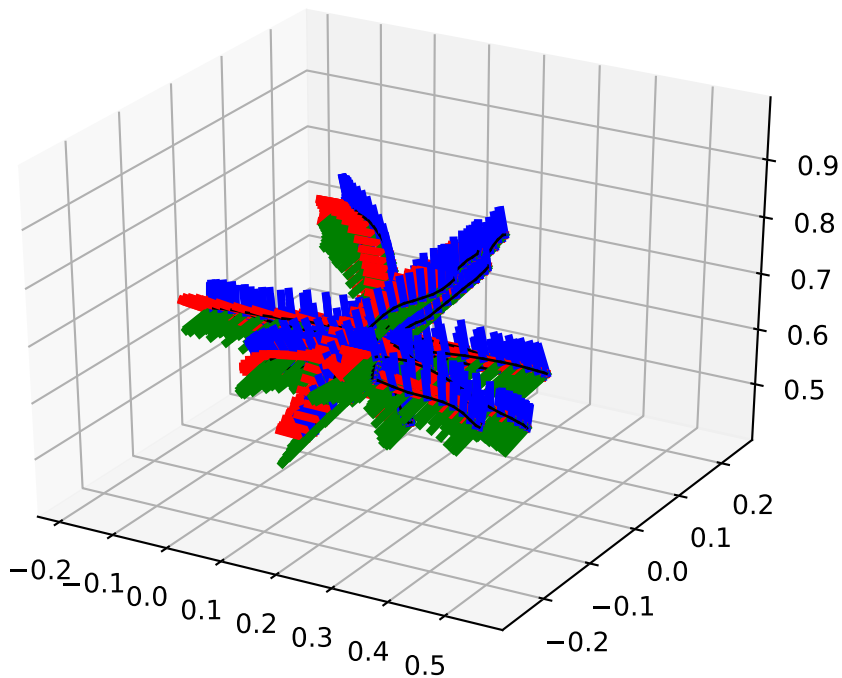
[0. 1. 0. 0.]

[0. 0. 1. 0.]

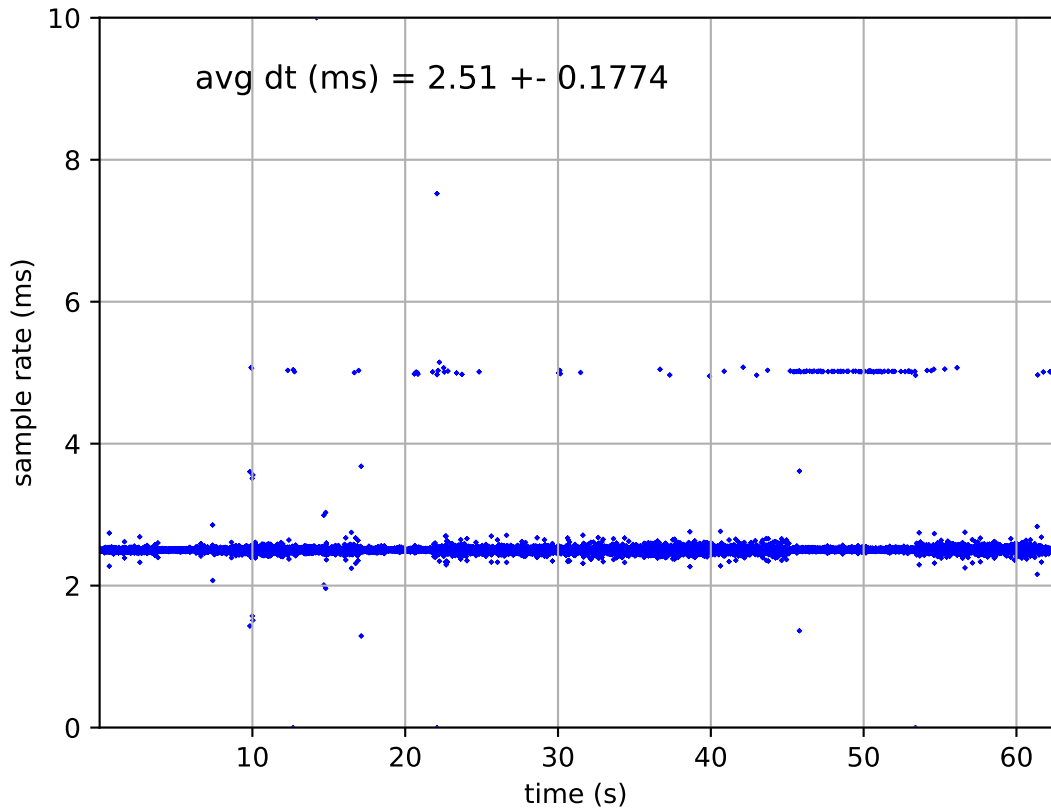
[0. 0. 0. 1.]]

time offset with respect to IMU0: 0.0 [s]

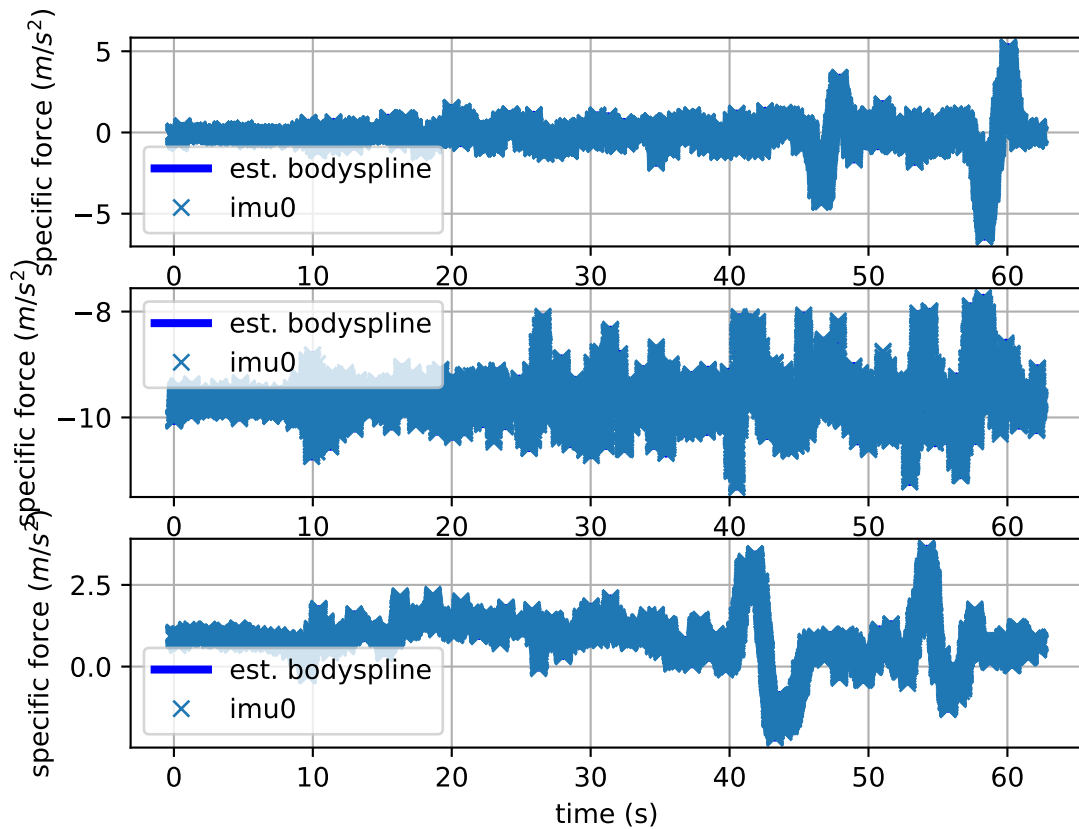
imu0: estimated poses



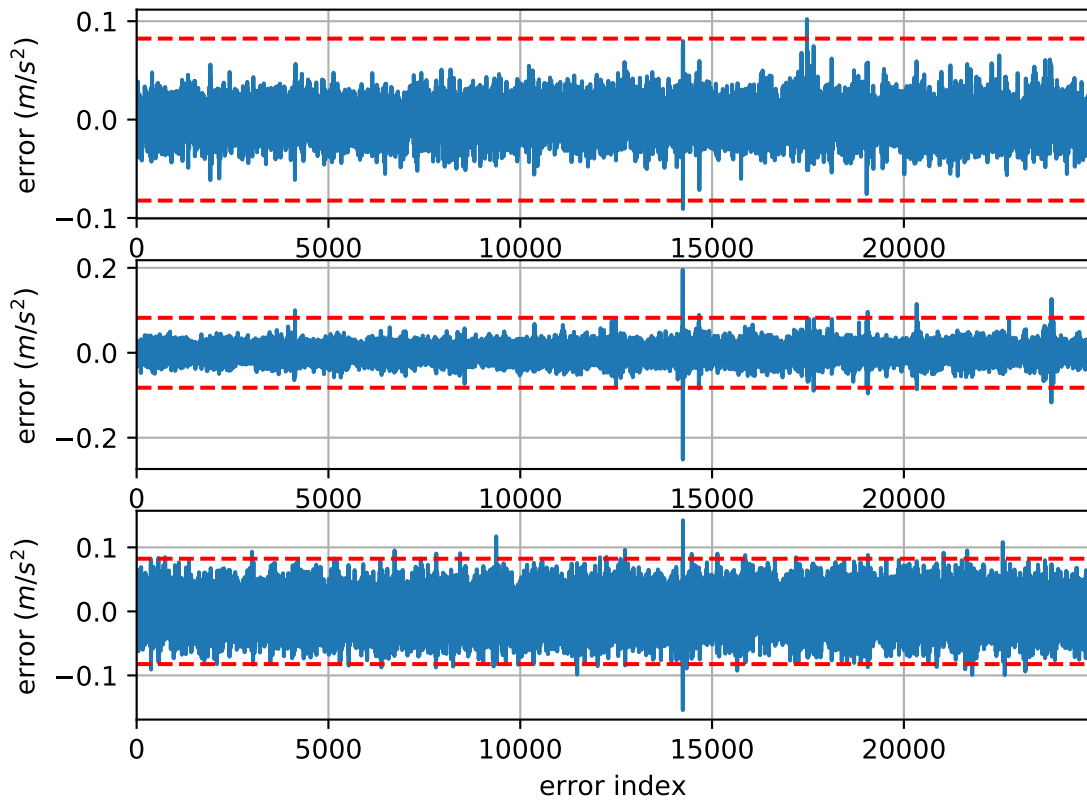
imu0: sample inertial rate



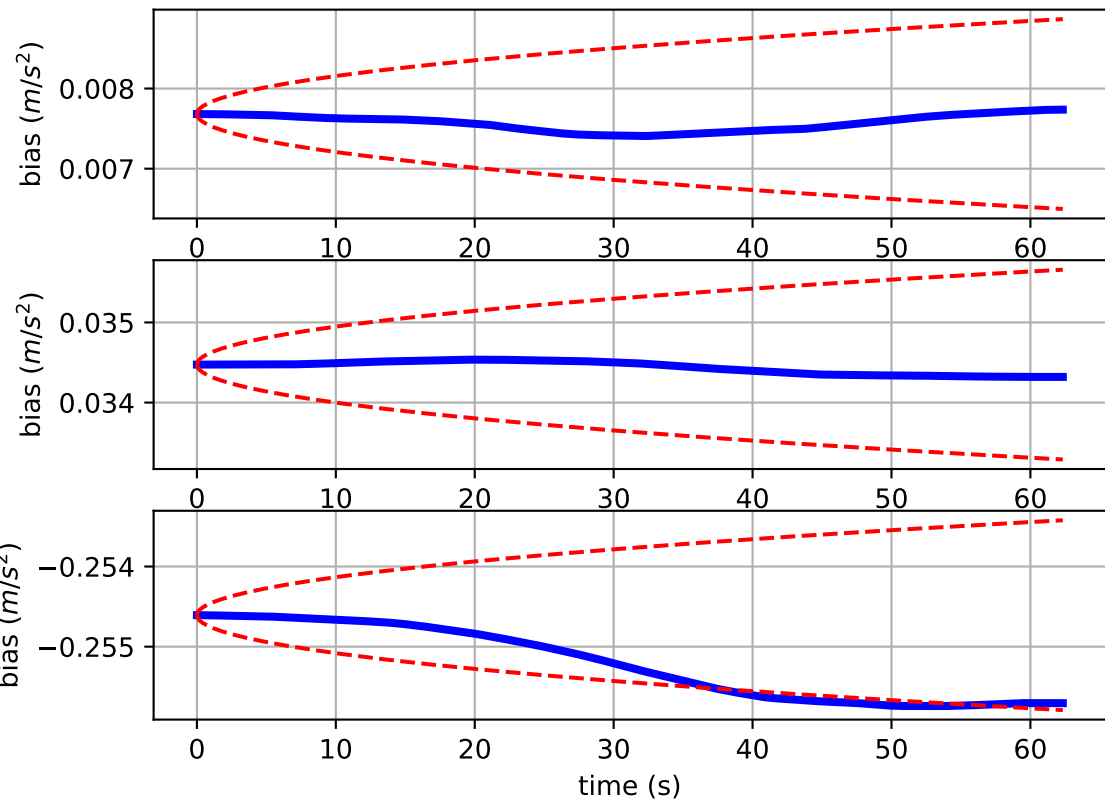
Comparison of predicted and measured specific force (imu0 frame)



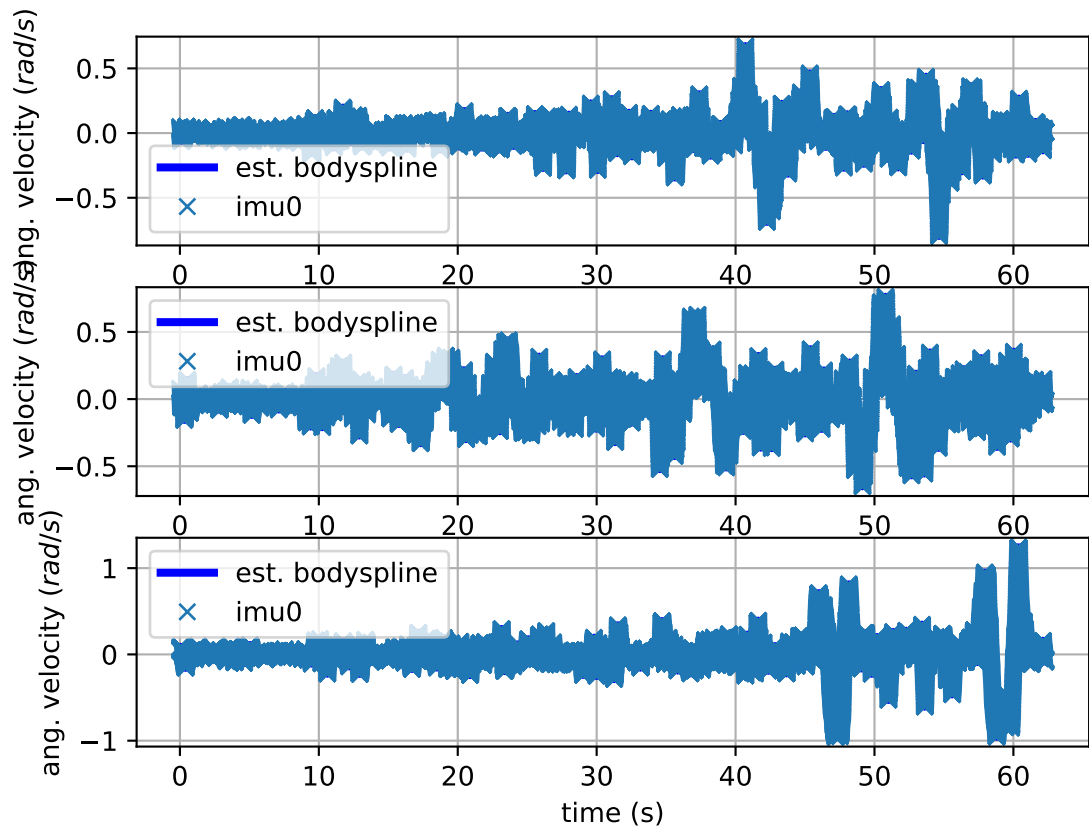
imu0: acceleration error



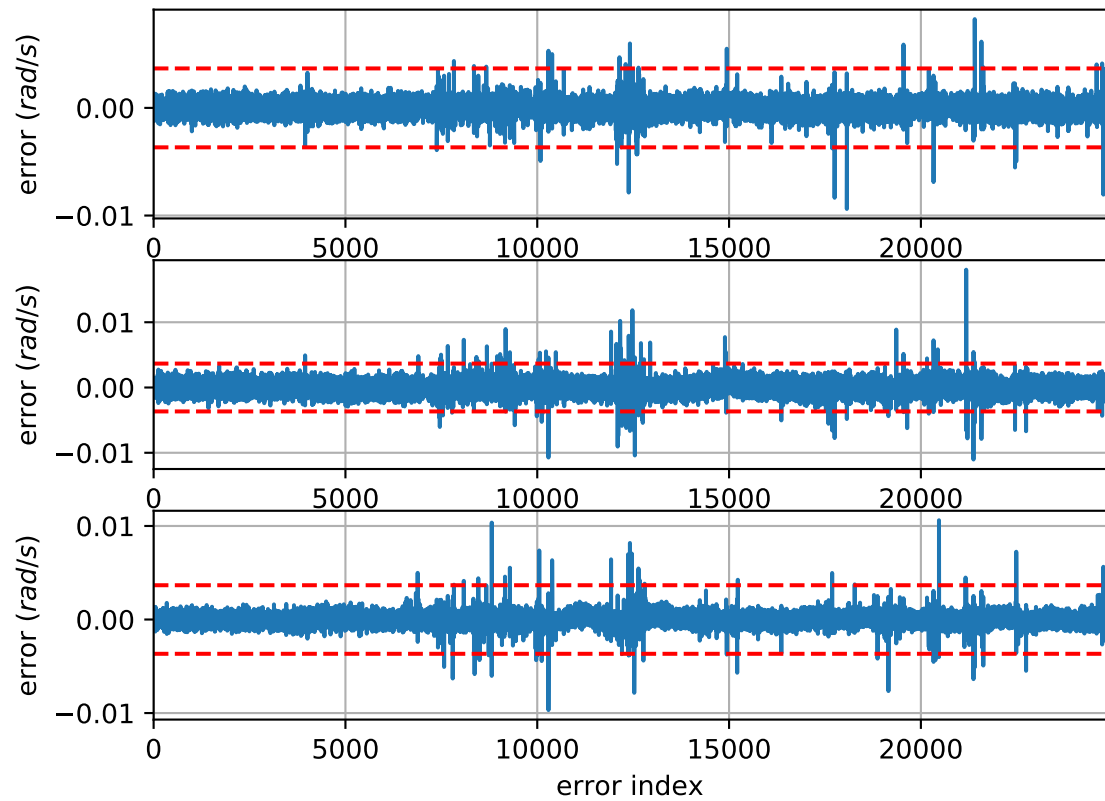
imu0: estimated accelerometer bias (imu frame)



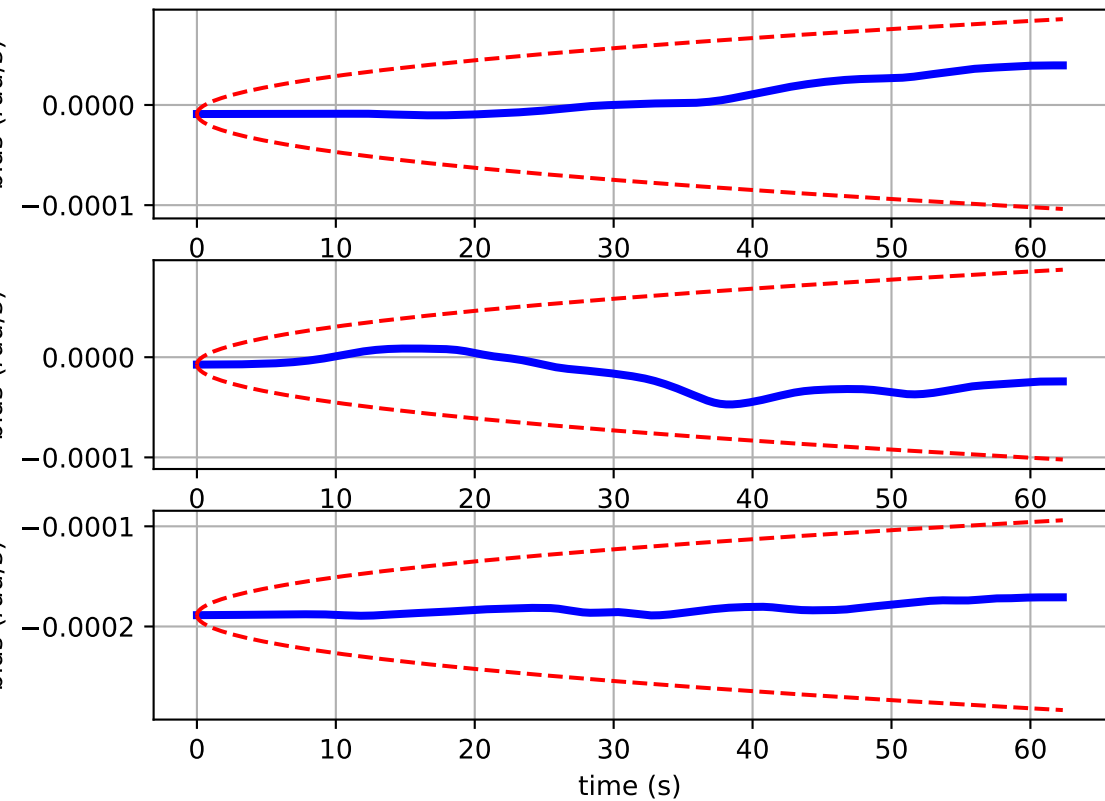
Comparison of predicted and measured angular velocities (body frame)



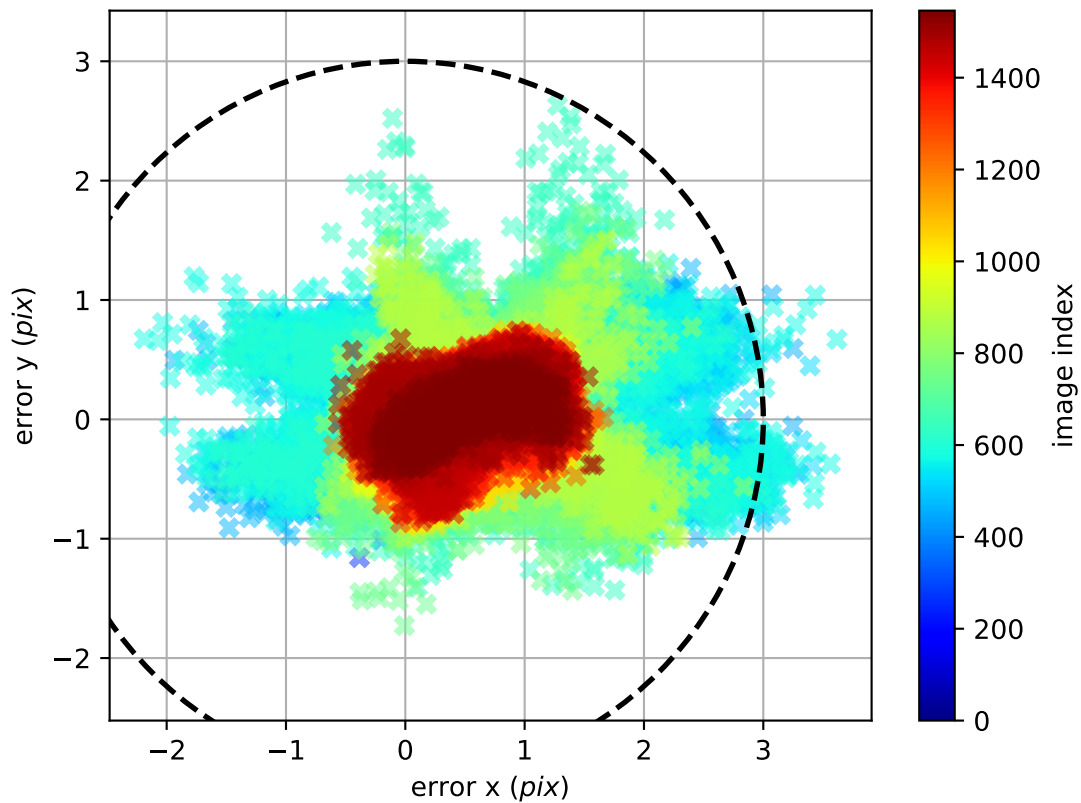
imu0: angular velocities error



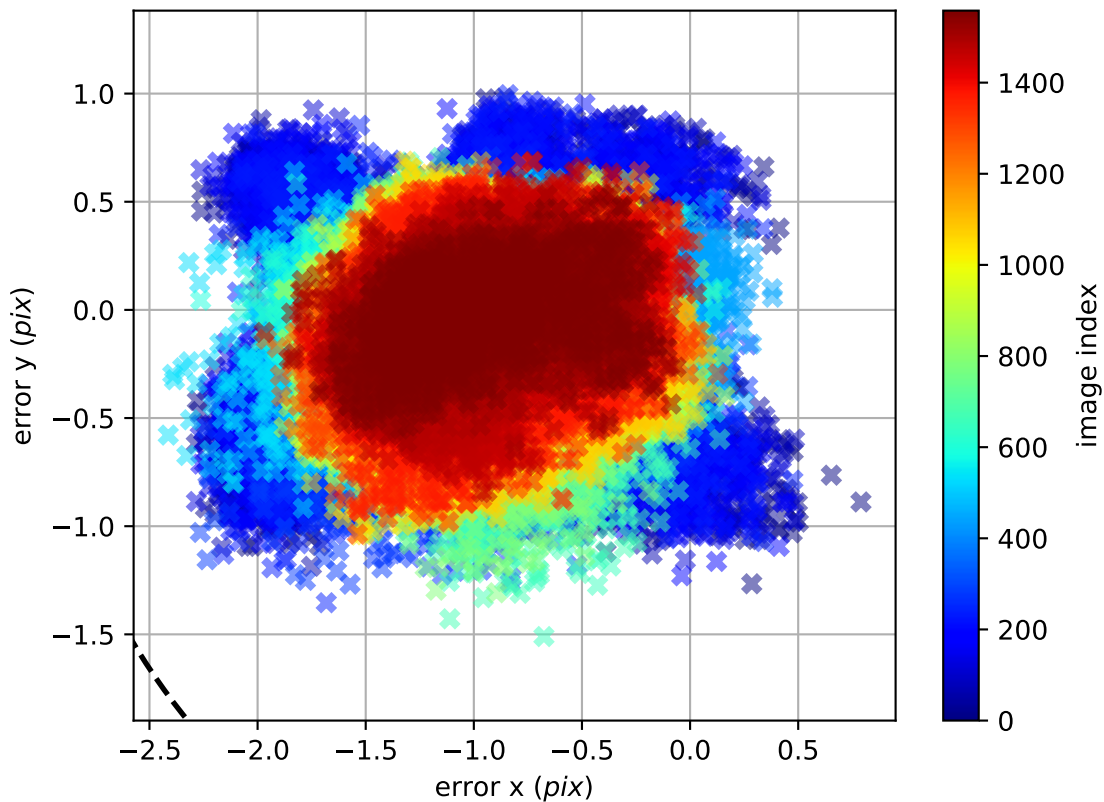
imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors



cam2: reprojection errors

