

Calibration results

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Normalized Residuals

Reprojection error (cam0): mean 0.3699295052799454, median 0.2893273712983413, std: 0.3567728072605116
Reprojection error (cam1): mean 0.43353275619934106, median 0.35850672424009783, std: 0.3637695683218651
Reprojection error (cam2): mean 0.3958598628610412, median 0.2988891326688559, std: 0.40301157513804753
Gyroscope error (imu0): mean 1.2313344826308088, median 1.0366014203624738, std: 0.910181192438437
Accelerometer error (imu0): mean 2.565490154875579, median 2.3287184623725747, std: 1.445673314691386

Residuals

Reprojection error (cam0) [px]: mean 0.3699295052799454, median 0.2893273712983413, std: 0.3567728072605116
Reprojection error (cam1) [px]: mean 0.43353275619934106, median 0.35850672424009783, std: 0.3637695683218651
Reprojection error (cam2) [px]: mean 0.3958598628610412, median 0.2988891326688559, std: 0.40301157513804753
Gyroscope error (imu0) [rad/s]: mean 0.0015043607401335035, median 0.001266449126502286, std: 0.0011119974886001965
Accelerometer error (imu0) [m/s²]: mean 0.0703970498497859, median 0.06390003460750346, std: 0.039669275755131635

Transformation (cam0):

T_ci: (imu0 to cam0):

```
[[ -0.99999892  0.00107406 -0.00100371  0.0974924 ]  
 [ 0.00107486  0.99999911 -0.00079176  0.02722145 ]  
 [ 0.00100286 -0.00079283 -0.99999918  0.00902286 ]  
 [ 0.         0.         0.         1.         ]]
```

T_ic: (cam0 to imu0):

```
[[ -0.99999892  0.00107486  0.00100286  0.09745398 ]  
 [ 0.00107406  0.99999911 -0.00079283 -0.02731899 ]  
 [ -0.00100371 -0.00079176 -0.99999918  0.00914226 ]  
 [ 0.         0.         0.         1.         ]]
```

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

0.006778014001085943

Transformation (cam1):

T_ci: (imu0 to cam1):

```
[[ -0.99999403  0.00186581 -0.00290995 -0.02236968]
 [  0.00186669  0.99999821 -0.00029998  0.02704377]
 [  0.00290938 -0.00030541 -0.99999572  0.01020724]
 [  0.          0.          0.          1.          ]]
```

T_ic: (cam1 to imu0):

```
[[ -0.99999403  0.00186669  0.00290938 -0.02244972]
 [  0.00186581  0.99999821 -0.00030541 -0.02699886]
 [ -0.00290995 -0.00029998 -0.99999572  0.01015022]
 [  0.          0.          0.          1.          ]]
```

timeshift cam1 to imu0: [s] (t_imu = t_cam + shift)
0.006783629629904928

Transformation (cam2):

T_ci: (imu0 to cam2):

```
[[ -0.99999552  0.00228079  0.00193964  0.06640846]
 [  0.00227365  0.99999066 -0.00367592  0.03332067]
 [ -0.001948   -0.00367149 -0.99999136  0.01237618]
 [  0.          0.          0.          1.          ]]
```

T_ic: (cam2 to imu0):

```
[[ -0.99999552  0.00227365 -0.001948   0.06635651]
 [  0.00228079  0.99999066 -0.00367149 -0.03342638]
 [  0.00193964 -0.00367592 -0.99999136  0.01236975]
 [  0.          0.          0.          1.          ]]
```

timeshift cam2 to imu0: [s] (t_imu = t_cam + shift)
0.008260943273252986

Baselines:

Baseline (cam0 to cam1):

```
[[ 0.99999787 0.00079327 0.00190561 -0.11990065]
[-0.00079233 0.99999957 -0.00049098 -0.000096 ]
[-0.001906 0.00048947 0.99999806 0.0013569 ]
[ 0. 0. 0. 1. ]]
```

baseline norm: 0.11990836977878411 [m]

Baseline (cam1 to cam2):

```
[[ 0.99998815 0.00041352 -0.00484969 0.08881619]
[-0.00039714 0.99999422 0.00337711 0.0062337 ]
[ 0.00485106 -0.00337514 0.99998254 0.0023689 ]
[ 0. 0. 0. 1. ]]
```

baseline norm: 0.08906618799888644 [m]

Gravity vector in target coords: [m/s²]

[-0.02456828 -9.77273853 -0.81326565]

Calibration configuration

=====

cam0

Camera model: pinhole

Focal length: [1059.798441786791, 1058.7112853994076]

Principal point: [673.3870682823868, 331.65536460528125]

Distortion model: radtan

Distortion coefficients: [-0.4002742426392474, 0.17056618041313354, 0.00048741925230120315, 0.0007060954021436913]

Type: aprilgrid

Tags:

Rows: 5

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

cam1

Camera model: pinhole
Focal length: [1055.3158626684692, 1054.641474987198]
Principal point: [670.8052470781481, 324.5193403310099]
Distortion model: radtan
Distortion coefficients: [-0.40030215796888774, 0.16639937529942397, 0.00036765555387976463,
0.0013303868471007867]
Type: aprilgrid
Tags:
Rows: 5
Cols: 7
Size: 0.04 [m]
Spacing 0.01 [m]

cam2

Camera model: pinhole
Focal length: [1266.4626100231476, 1264.854376051191]
Principal point: [649.0974421698934, 363.35085318485955]
Distortion model: radtan
Distortion coefficients: [-0.42058761598918115, 0.19684519573567003, 0.0008715049415326623,
0.0002894328952163947]
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.]

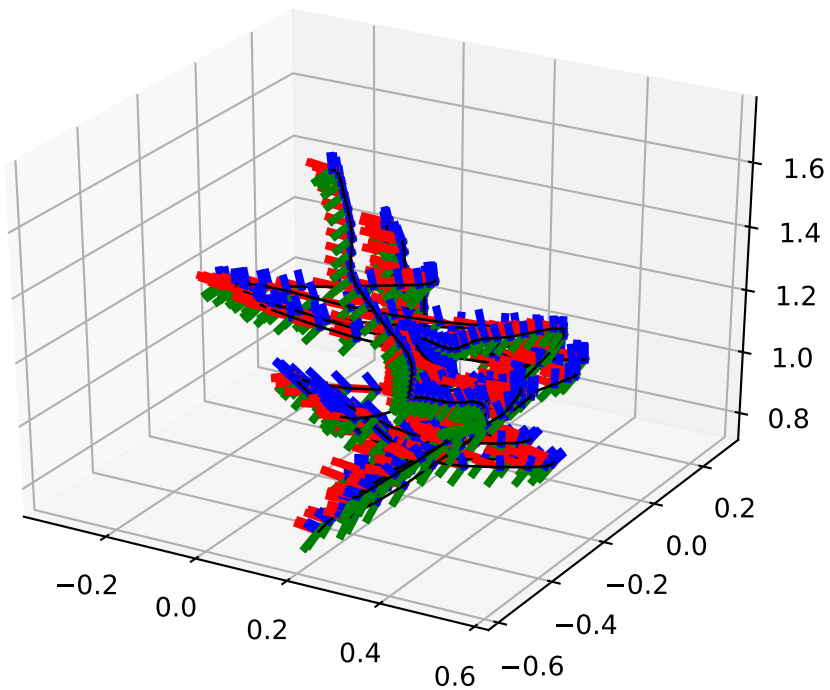
[0. 1. 0. 0.]

[0. 0. 1. 0.]

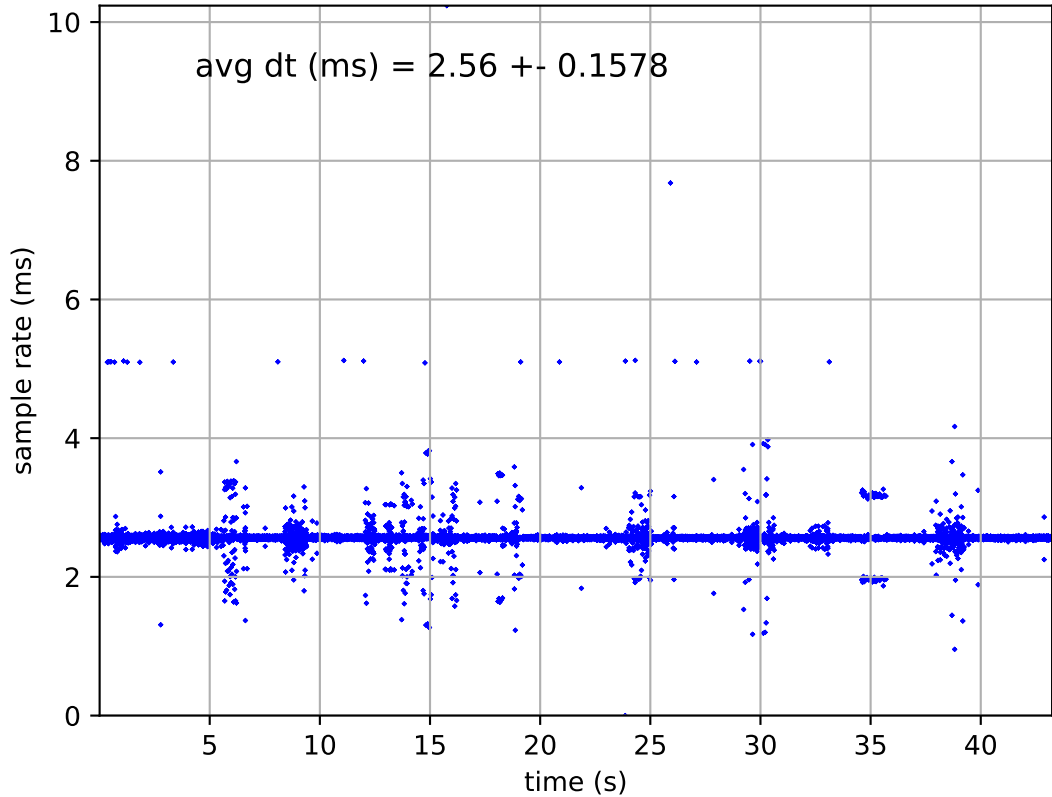
[0. 0. 0. 1.]]

time offset with respect to IMU0: 0.0 [s]

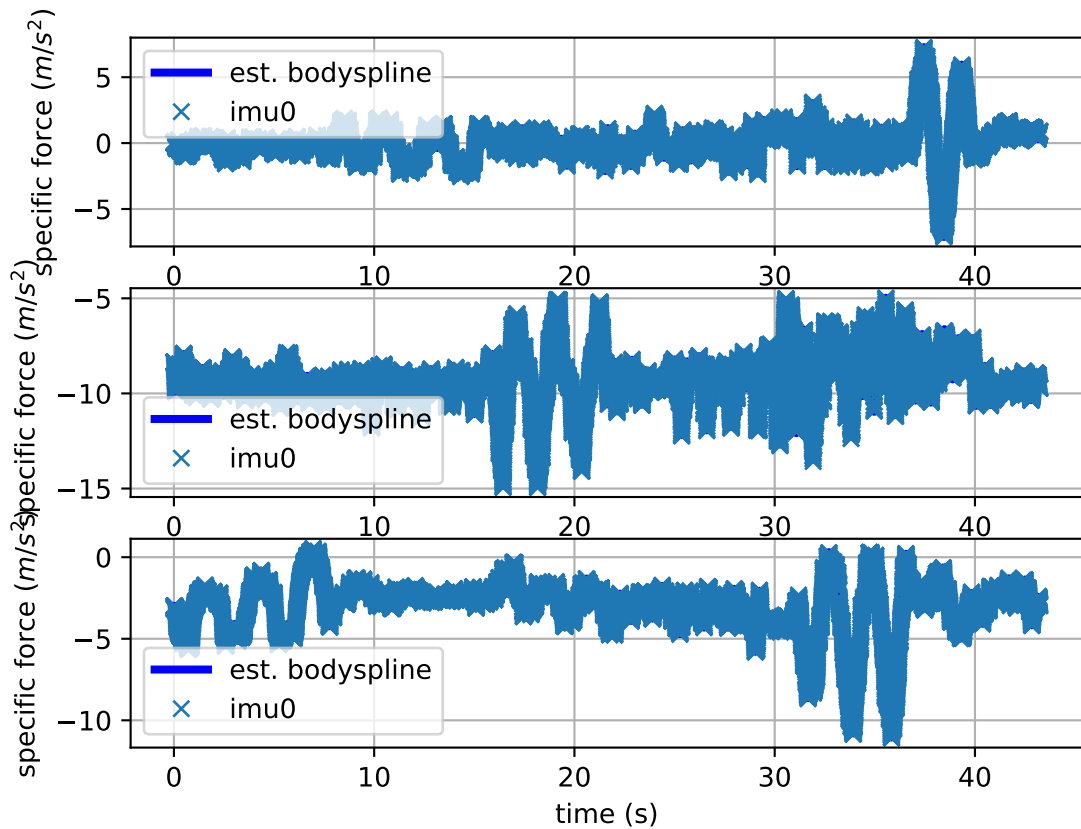
imu0: estimated poses



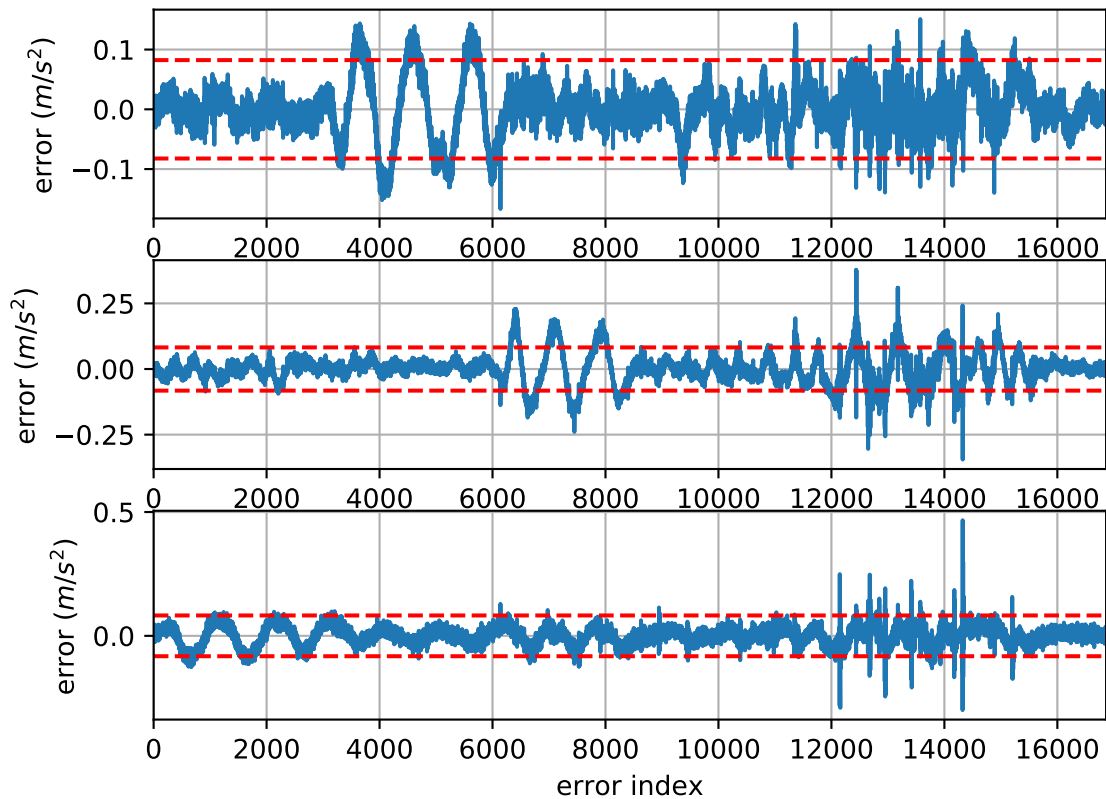
imu0: sample inertial rate



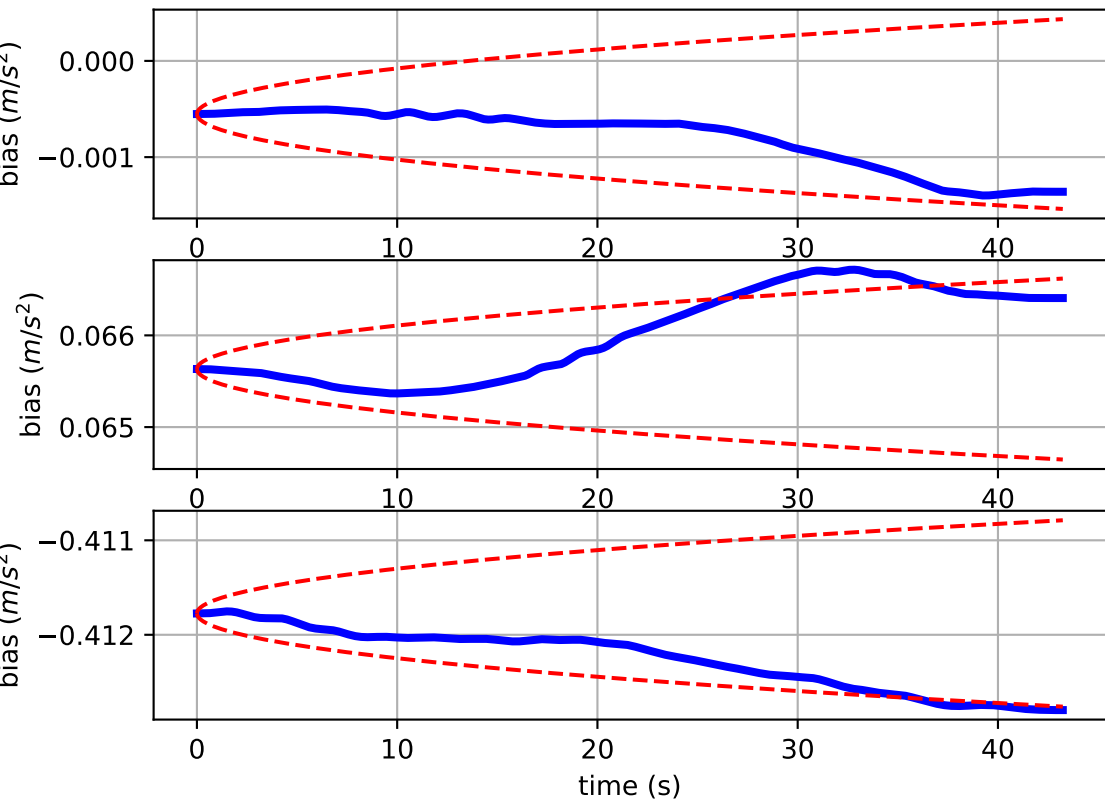
Comparison of predicted and measured specific force (imu0 frame)



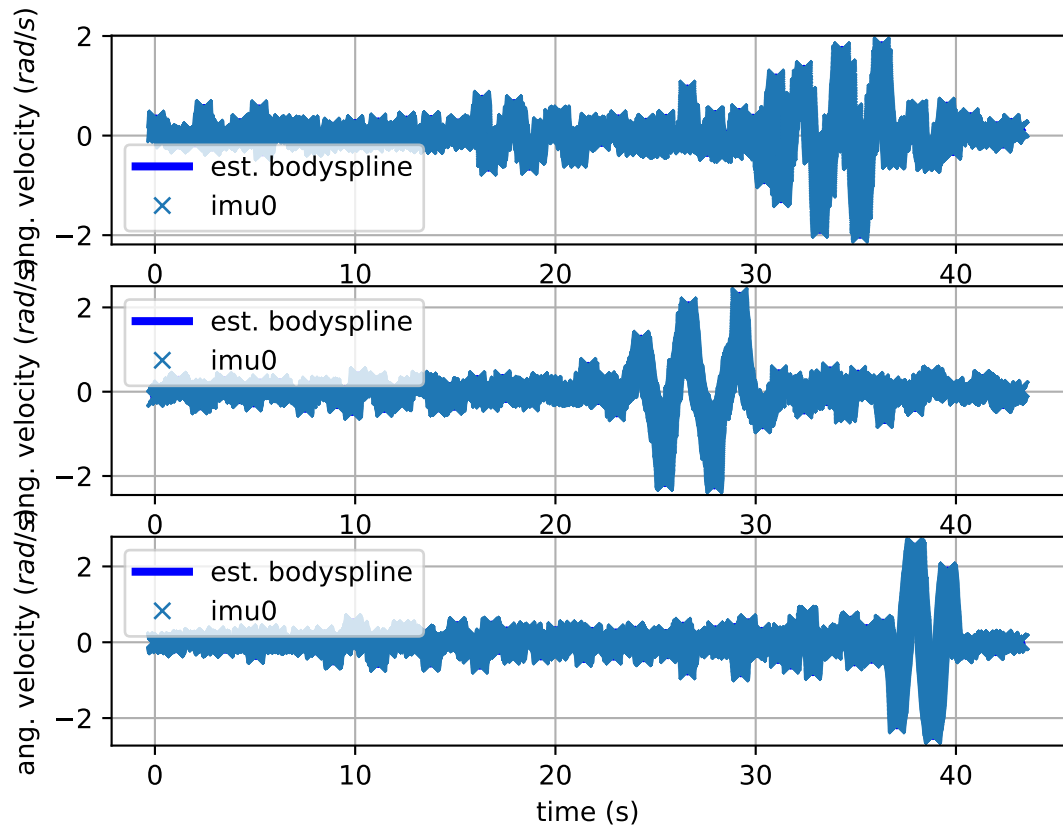
imu0: acceleration error



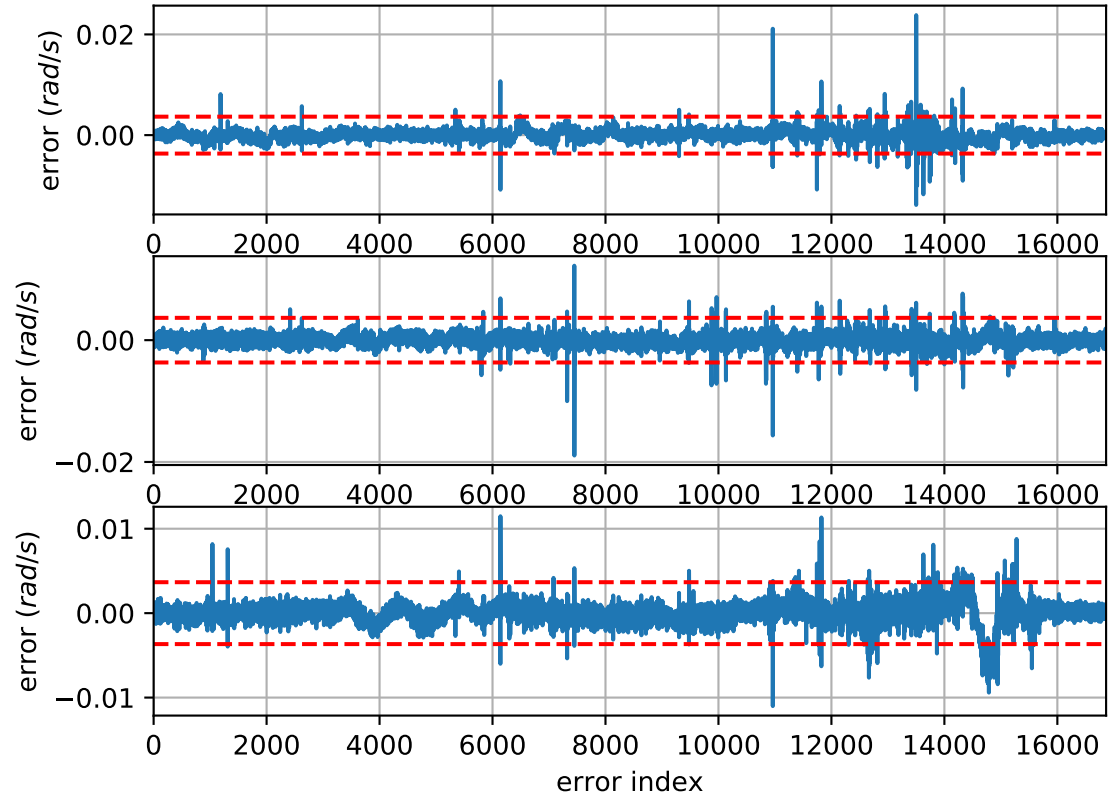
imu0: estimated accelerometer bias (imu frame)



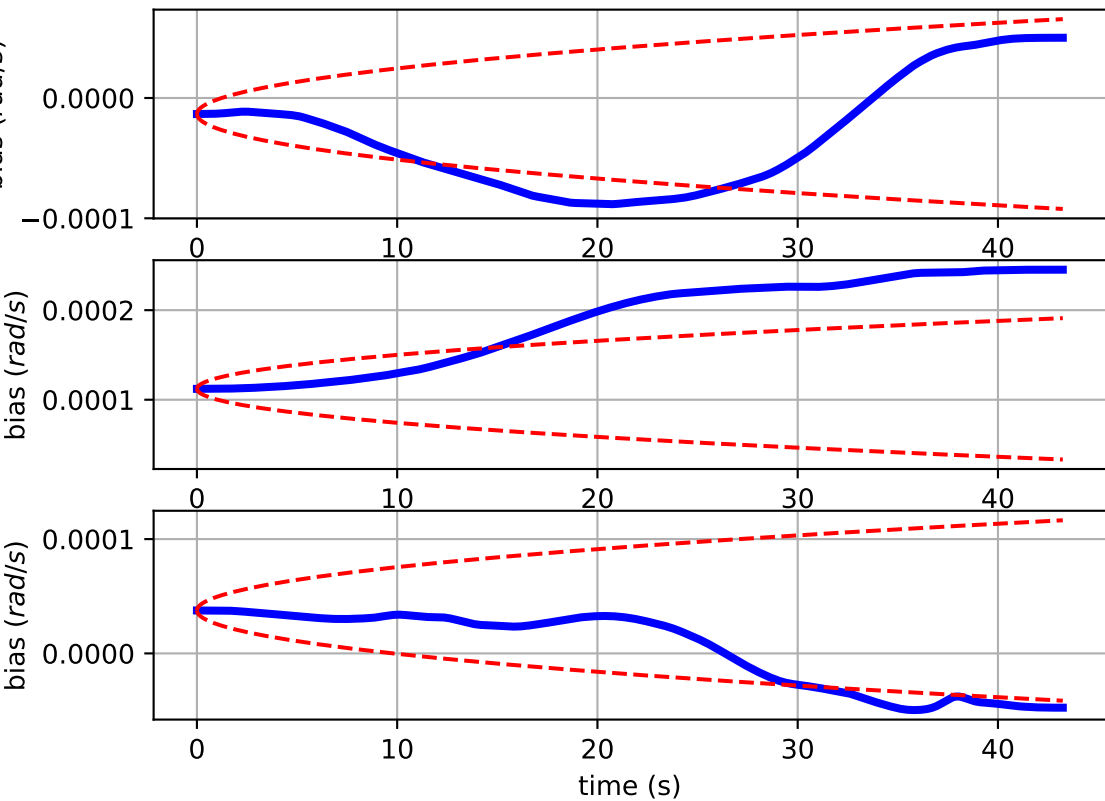
Comparison of predicted and measured angular velocities (body frame)



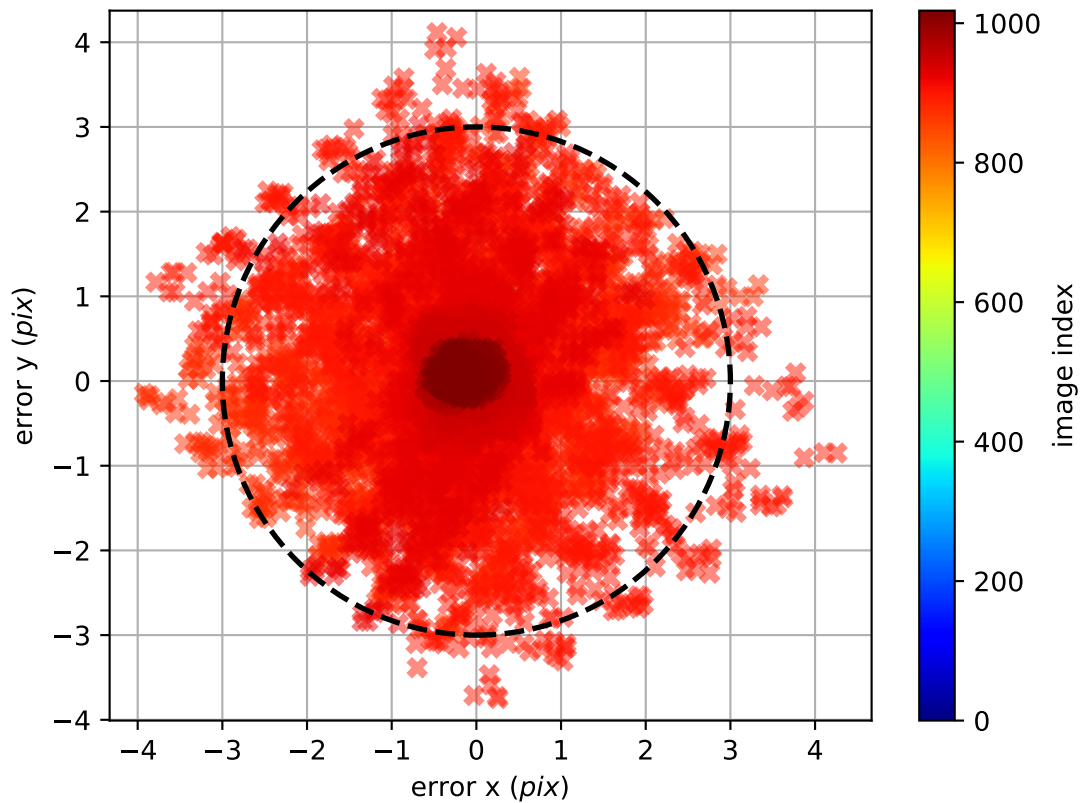
imu0: angular velocities error



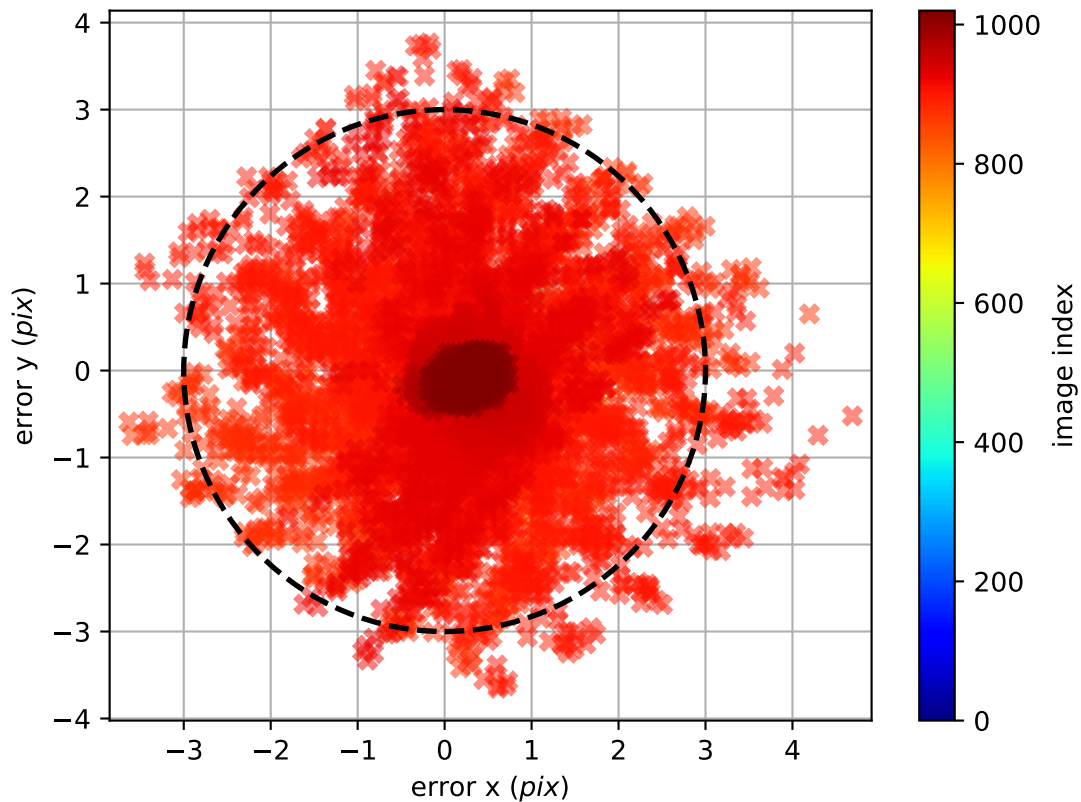
imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors



cam2: reprojection errors

