

Calibration results

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Normalized Residuals

Reprojection error (cam0): mean 0.5095851119307363, median 0.4368678040539837, std: 0.391828191997513
Reprojection error (cam1): mean 0.6552457897860872, median 0.5951690838623537, std: 0.38242659417026403
Reprojection error (cam2): mean 0.448987759100309, median 0.32989149834381526, std: 0.46929741053329077
Gyroscope error (imu0): mean 1.1152177269029029, median 0.9242825151567593, std: 0.8196692481387199
Accelerometer error (imu0): mean 1.9323299273020051, median 1.6136407012757965, std: 1.2397450771637668

Residuals

Reprojection error (cam0) [px]: mean 0.5095851119307363, median 0.4368678040539837, std: 0.391828191997513
Reprojection error (cam1) [px]: mean 0.6552457897860872, median 0.5951690838623537, std: 0.38242659417026403
Reprojection error (cam2) [px]: mean 0.448987759100309, median 0.32989149834381526, std: 0.46929741053329077
Gyroscope error (imu0) [rad/s]: mean 0.0013624971839245375, median 0.001129225525807498, std: 0.0010014161498670146
Accelerometer error (imu0) [m/s²]: mean 0.05302313320516703, median 0.04427830084300785, std: 0.03401860491737376

Transformation (cam0):

T_ci: (imu0 to cam0):

```
[[-0.99999335 -0.00199094 -0.00305512 0.09225701]
[-0.00200968 0.9999791 0.00614495 0.03113638]
[0.00304282 0.00615105 -0.99997645 0.00754182]
[0. 0. 0. 1.  ]]
```

T_ic: (cam0 to imu0):

```
[[-0.99999335 -0.00200968 0.00304282 0.09229603]
[-0.00199094 0.9999791 0.00615105 -0.03099844]
[-0.00305512 0.00614495 -0.99997645 0.00763216]
[0. 0. 0. 1.  ]]
```

timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
0.007043057866577577

Transformation (cam1):

T_ci: (imu0 to cam1):

```
[[ -0.99998702 -0.00118596 -0.0049558 -0.02760477 ]  
 [ -0.00121885 0.99997722 0.00663834 0.03096356 ]  
 [ 0.00494782 0.00664429 -0.99996569 0.0087381 ]  
 [ 0. 0. 0. 1. ]]
```

T_ic: (cam1 to imu0):

```
[[ -0.99998702 -0.00121885 0.00494782 -0.0276099 ]  
 [ -0.00118596 0.99997722 0.00664429 -0.03105366 ]  
 [ -0.0049558 0.00663834 -0.99996569 0.00839545 ]  
 [ 0. 0. 0. 1. ]]
```

timeshift cam1 to imu0: [s] (t_imu = t_cam + shift)
0.006990233960309804

Transformation (cam2):

T_ci: (imu0 to cam2):

```
[[ -0.99999967 -0.00080466 -0.00010347 0.06118218 ]  
 [ -0.00080499 0.99999435 0.00326327 0.03723756 ]  
 [ 0.00010084 0.00326335 -0.99999467 0.01086843 ]  
 [ 0. 0. 0. 1. ]]
```

T_ic: (cam2 to imu0):

```
[[ -0.99999967 -0.00080499 0.00010084 0.06121104 ]  
 [ -0.00080466 0.99999435 0.00326335 -0.03722359 ]  
 [ -0.00010347 0.00326327 -0.99999467 0.01075319 ]  
 [ 0. 0. 0. 1. ]]
```

timeshift cam2 to imu0: [s] (t_imu = t_cam + shift)
0.008647652194336636

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]

[-0.02690666 -9.77325702 -0.80693628]

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.]

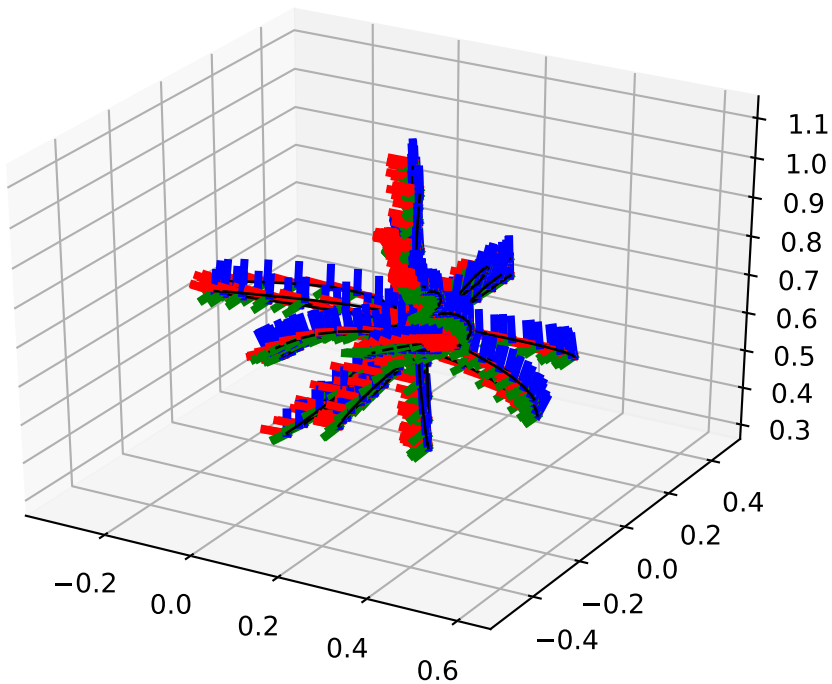
[0. 1. 0. 0.]

[0. 0. 1. 0.]

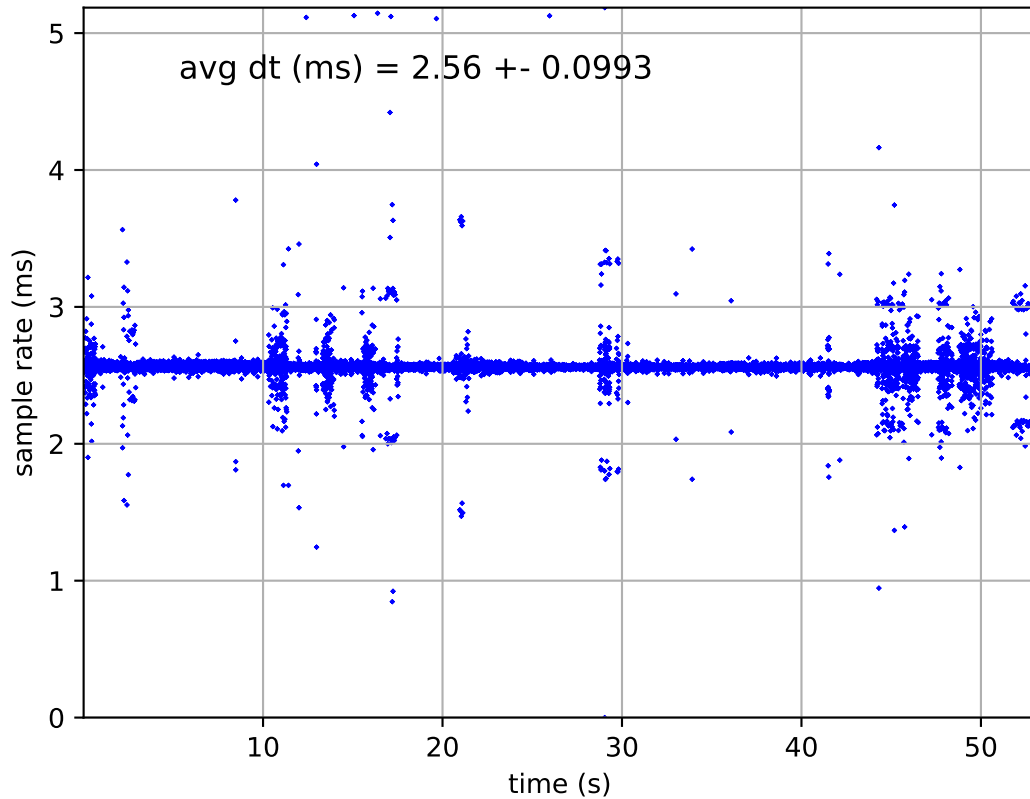
[0. 0. 0. 1.]]

time offset with respect to IMU0: 0.0 [s]

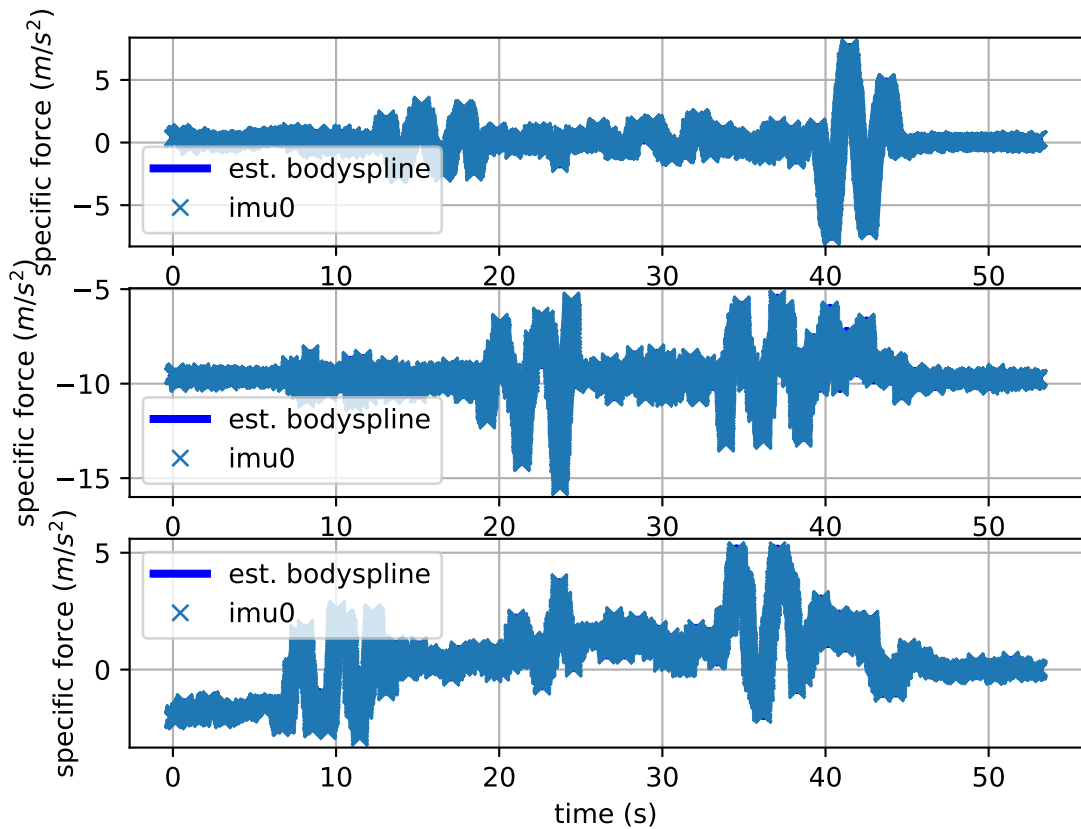
imu0: estimated poses



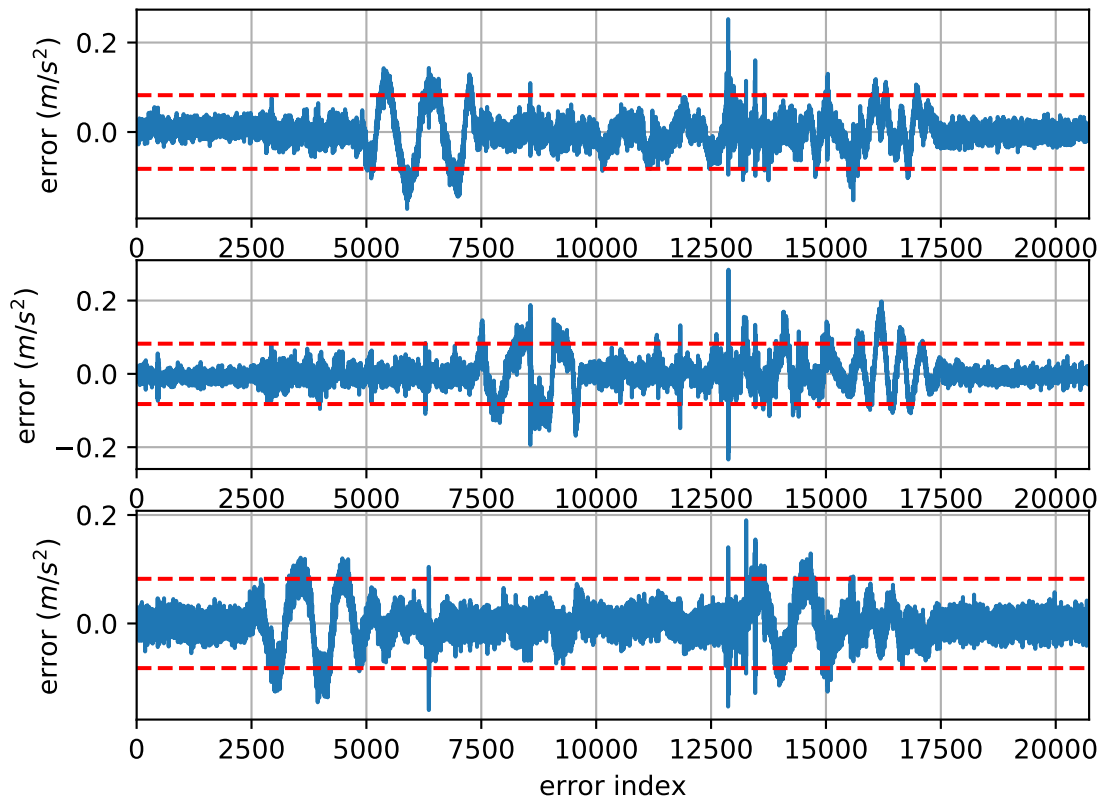
imu0: sample inertial rate



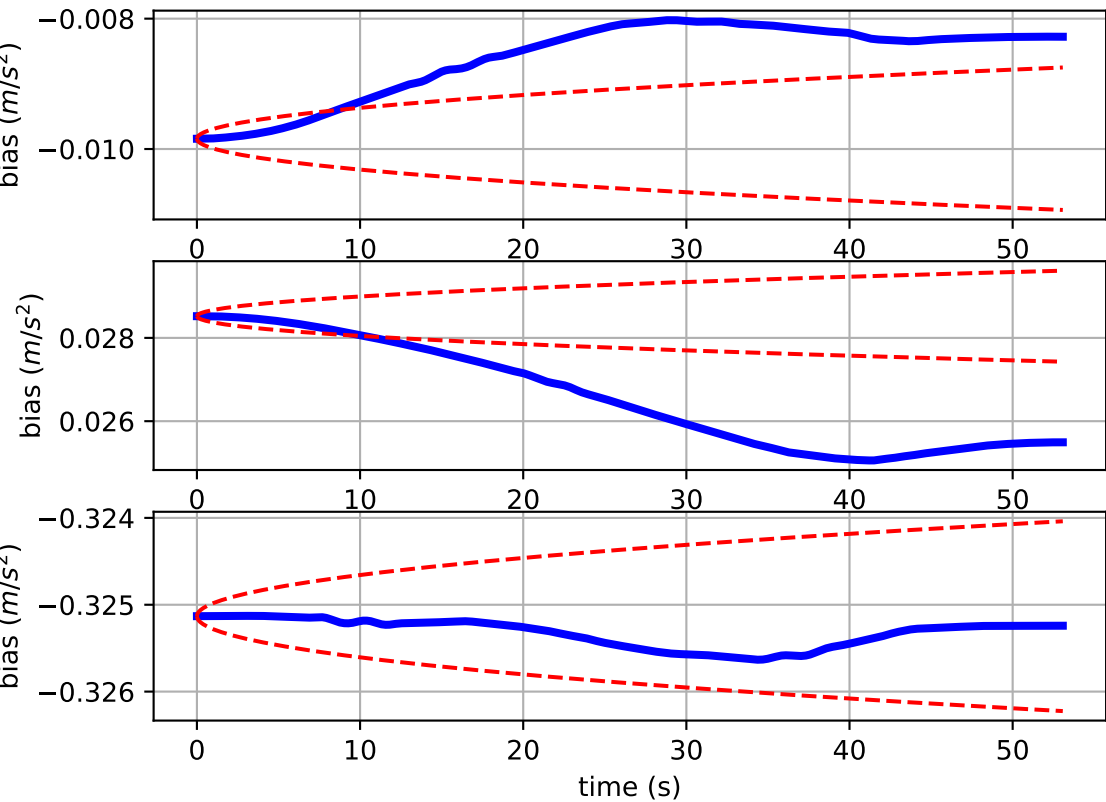
Comparison of predicted and measured specific force (imu0 frame)



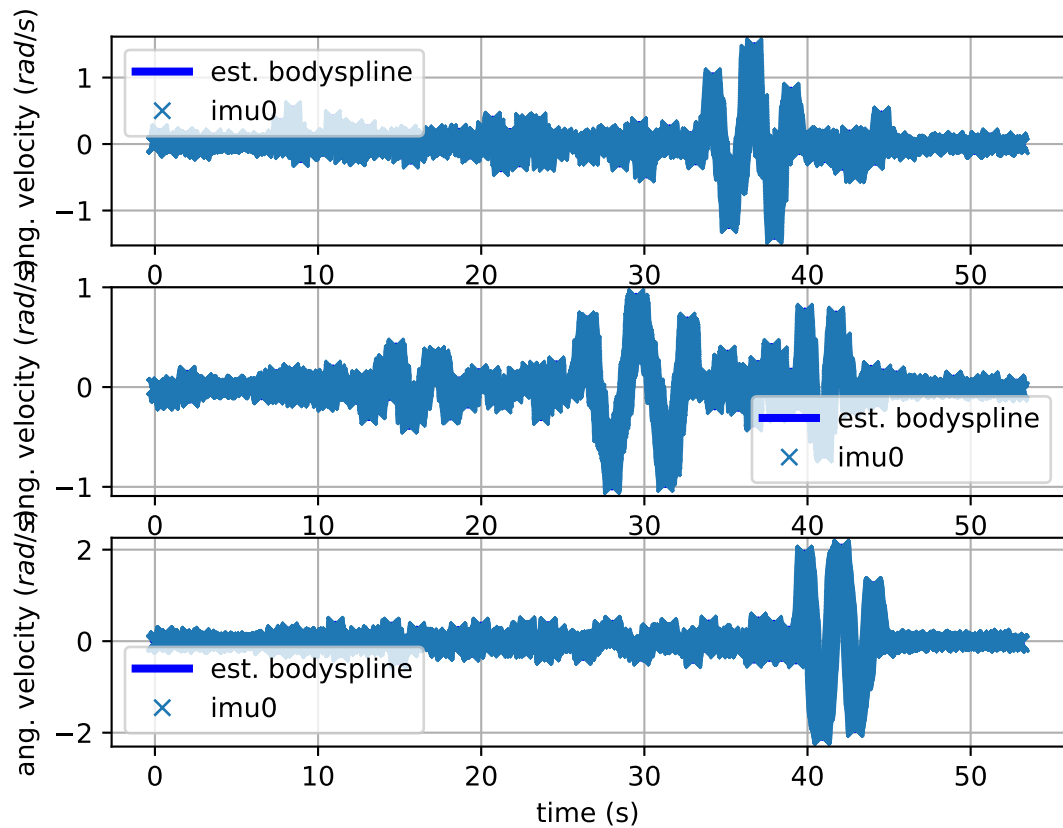
imu0: acceleration error



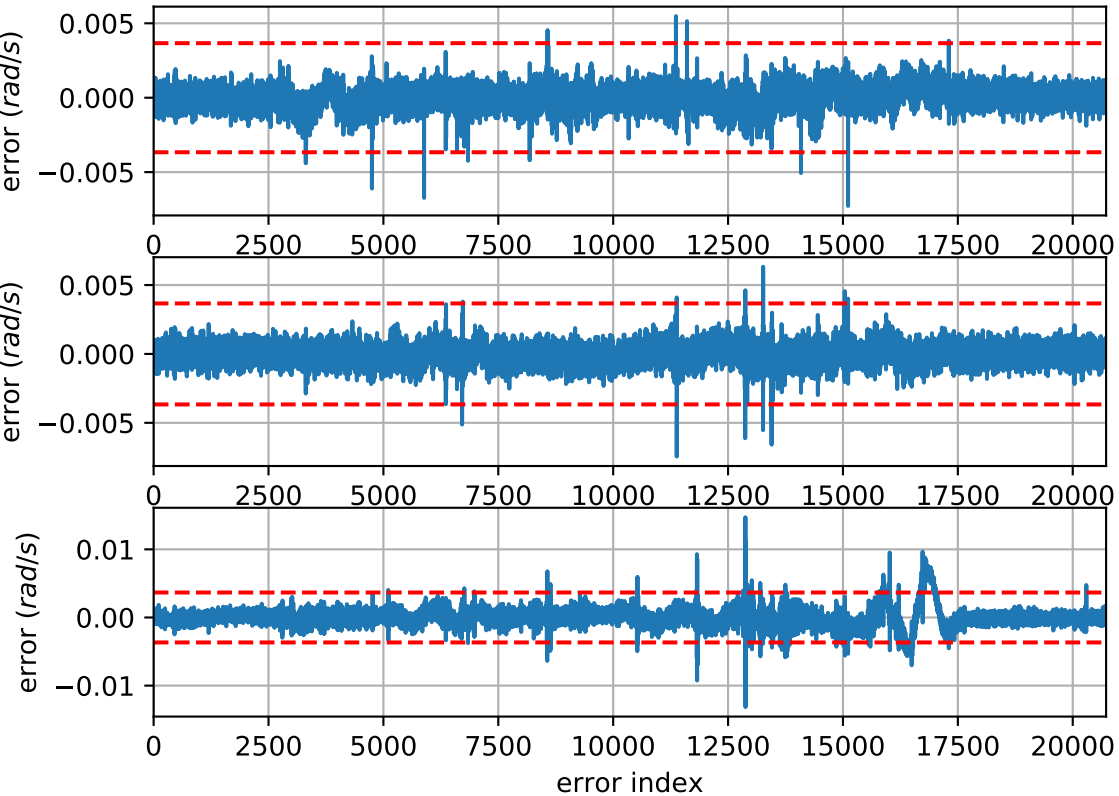
imu0: estimated accelerometer bias (imu frame)



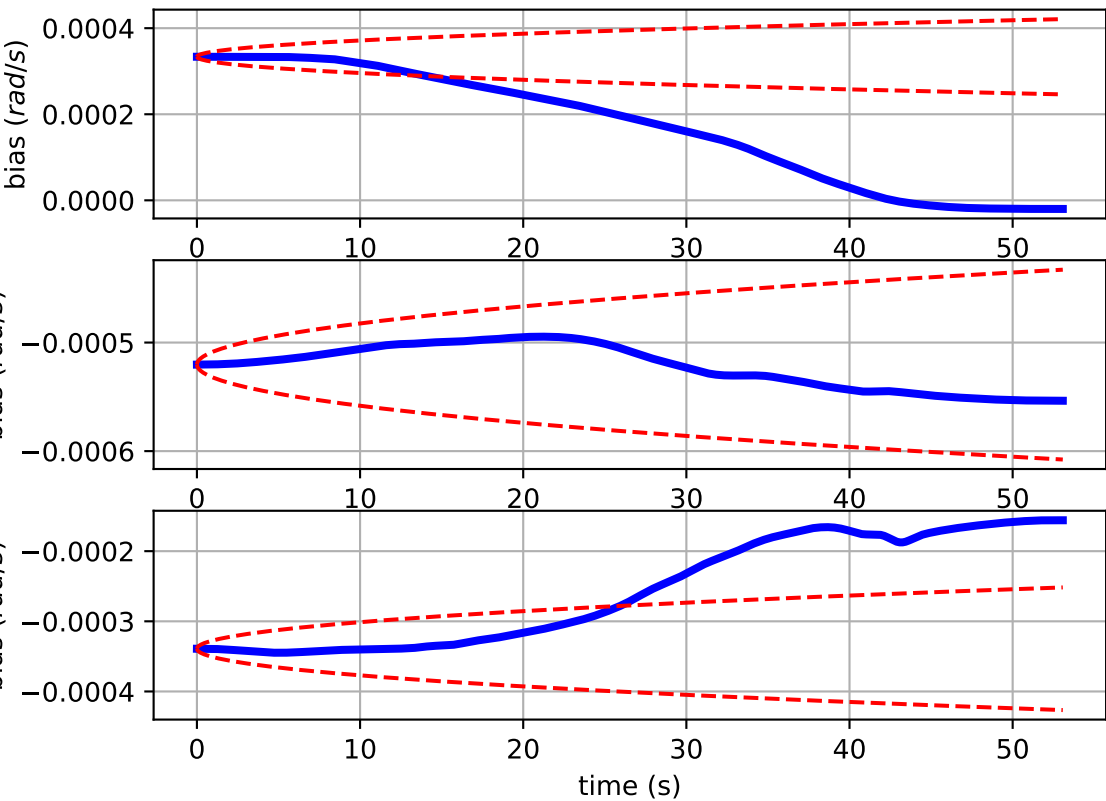
Comparison of predicted and measured angular velocities (body frame)



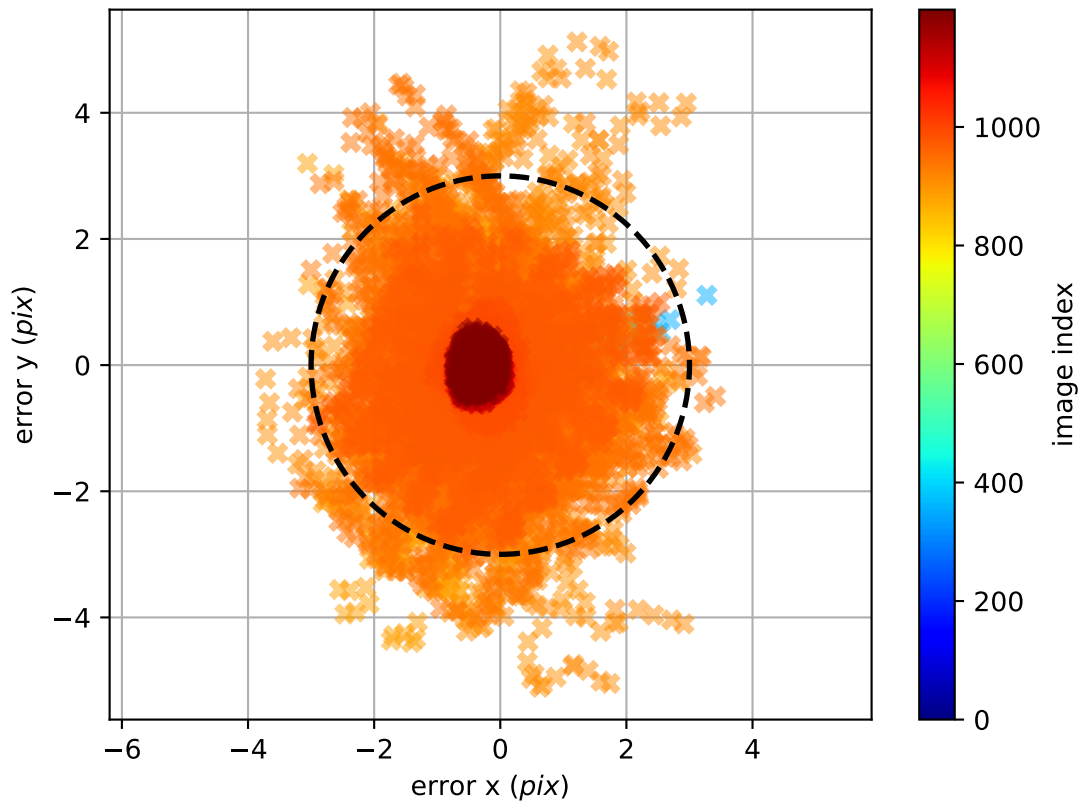
imu0: angular velocities error



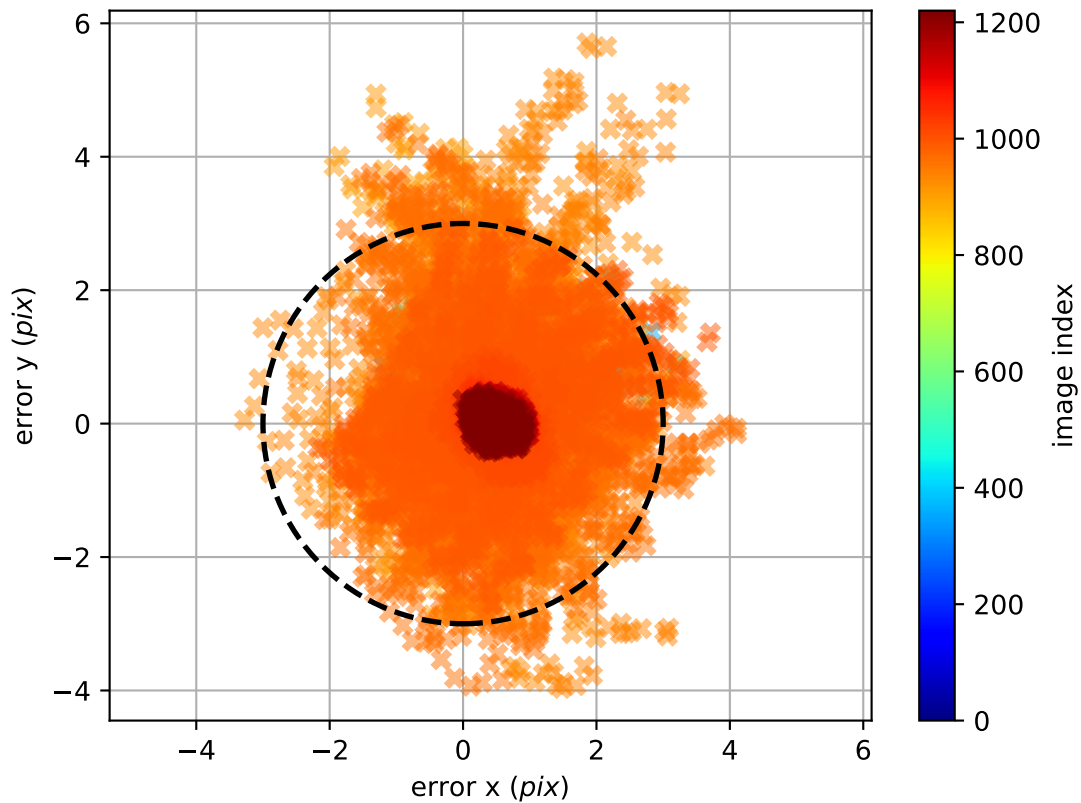
imu0: estimated gyro bias (imu frame)



cam0: reprojection errors



cam1: reprojection errors



cam2: reprojection errors

