Calibration results
==========
Normalized Residuals
---
Reprojection error (cam0):  mean 0.2937300239728814, median 0.2179581836111716, std: 0.2688970247453861
Gyroscope error (imu0):  mean 0.44831239133252787, median 0.3672094736449572, std: 0.3863764762410191
Accelerometer error (imu0):  mean 0.47897050675161423, median 0.3280395264729513, std: 0.6143883772213801

Residuals
---
Reprojection error (cam0) [px]:  mean 0.2937300239728814, median 0.2179581836111716, std: 0.2688970247453861
Gyroscope error (imu0) [rad/s]:  mean 0.0019329560697462958, median 0.0015832704932393468, std: 0.0016659114702080617
Accelerometer error (imu0) [m/s^2]: mean 0.12974867100997528, median 0.08886286733450022, std: 0.16643211701924018

Transformation (cam0):
---
T_ci:  (imu0 to cam0):
[[-0.9999418  -0.00191234  0.01061795 -0.06289659]
[-0.01060988 -0.00417937 -0.99993498 -0.04578067]
[ 0.00195659 -0.99998944  0.00415883 -0.07540599]
[ 0.         0.         0.         1.        ]]

T_ic:  (cam0 to imu0):
[[-0.9999418  -0.01060988  0.00195659 -0.06323112]
[-0.00191234 -0.00417937 -0.99998944 -0.07571681]
[ 0.01061795 -0.99993498  0.00415883 -0.04479626]
[ 0.         0.         0.         1.        ]]

timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
-0.0054646639581357155


Gravity vector in target coords: [m/s^2]
[-0.02959989 -9.73388276 -1.19124854]

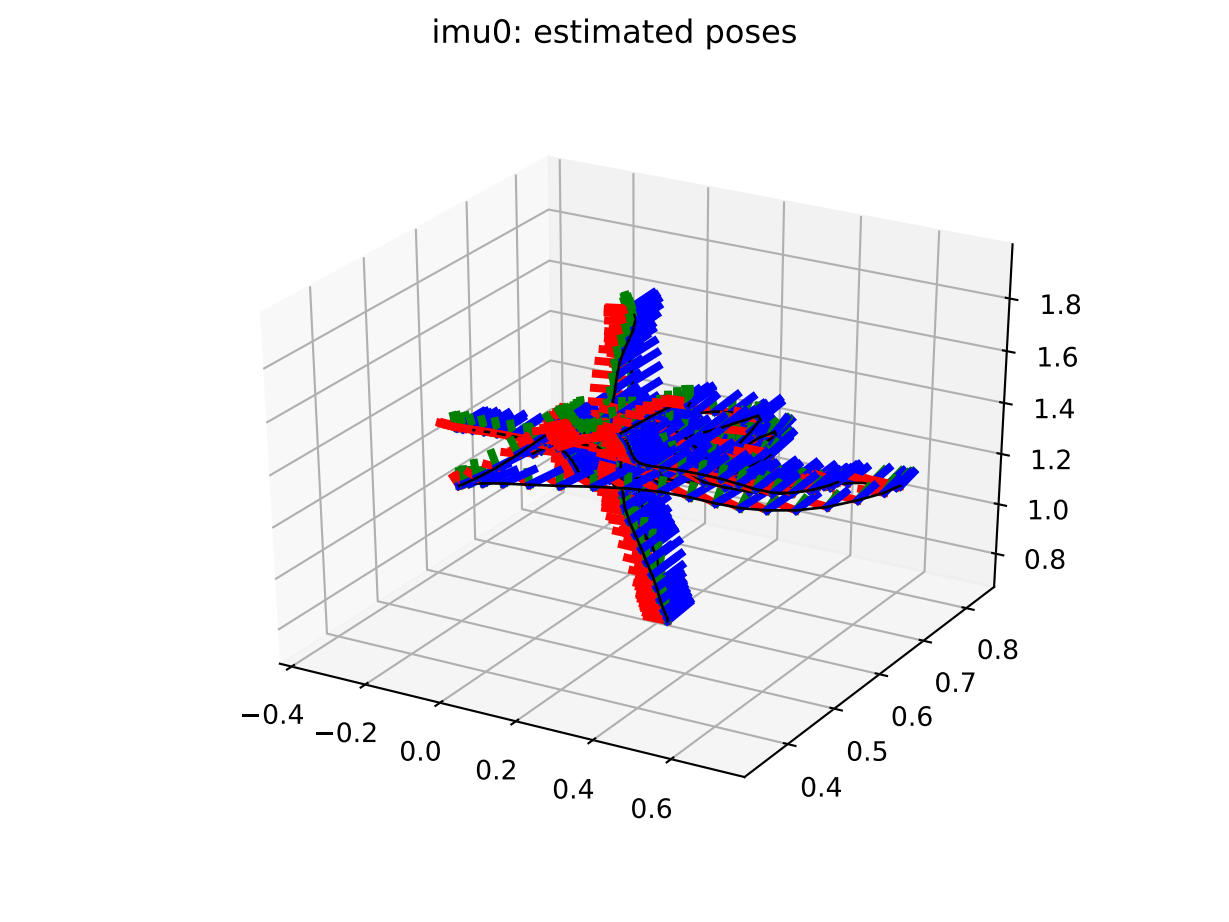
Calibration configuration
==========

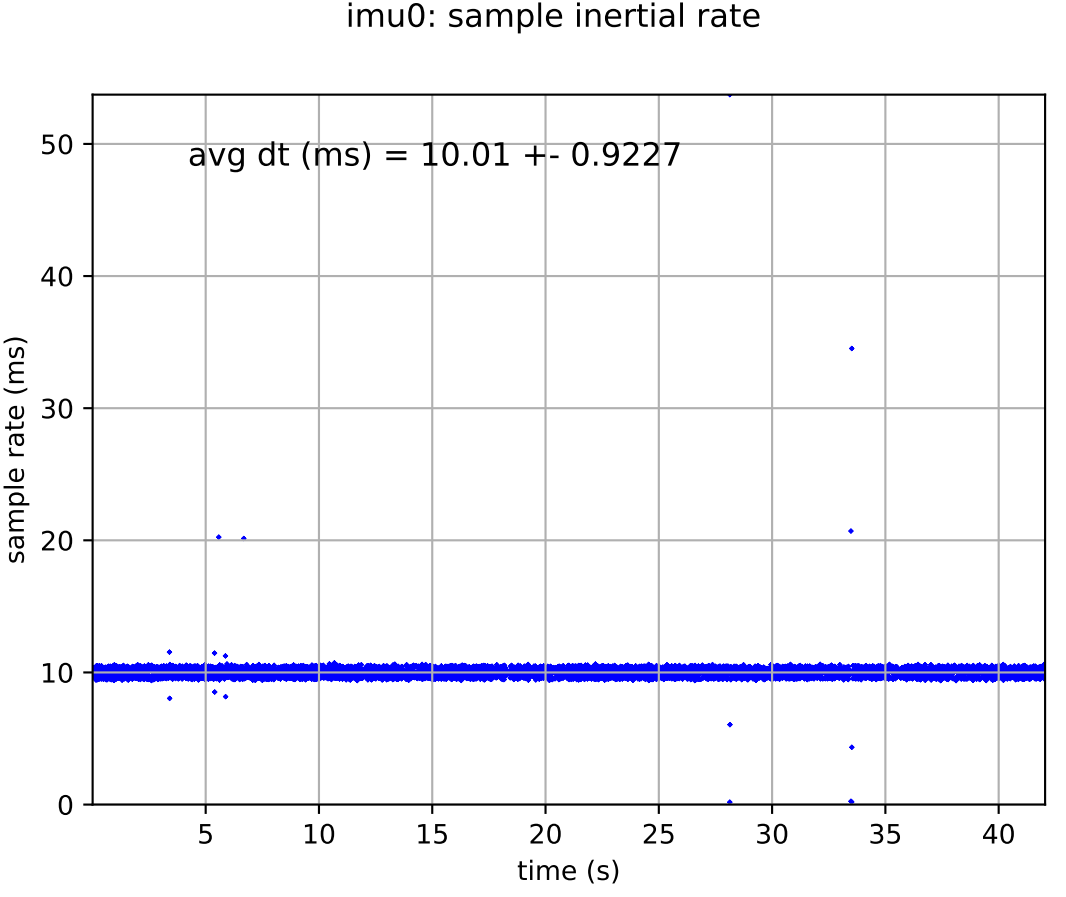
cam0
---
Camera model: pinhole
Focal length: [392.0610931840354, 391.5972114468574]
Principal point: [314.7995459642098, 247.4778451842139]
Distortion model: radtan
Distortion coefficients: [-0.34584910320911305, 0.11686045400536463, -0.0011599065806312257, -0.00048623648288034104]
Type: aprilgrid
Tags:
Rows: 6
Cols: 6
Size: 0.088 [m]
Spacing 0.026399999999999996 [m]

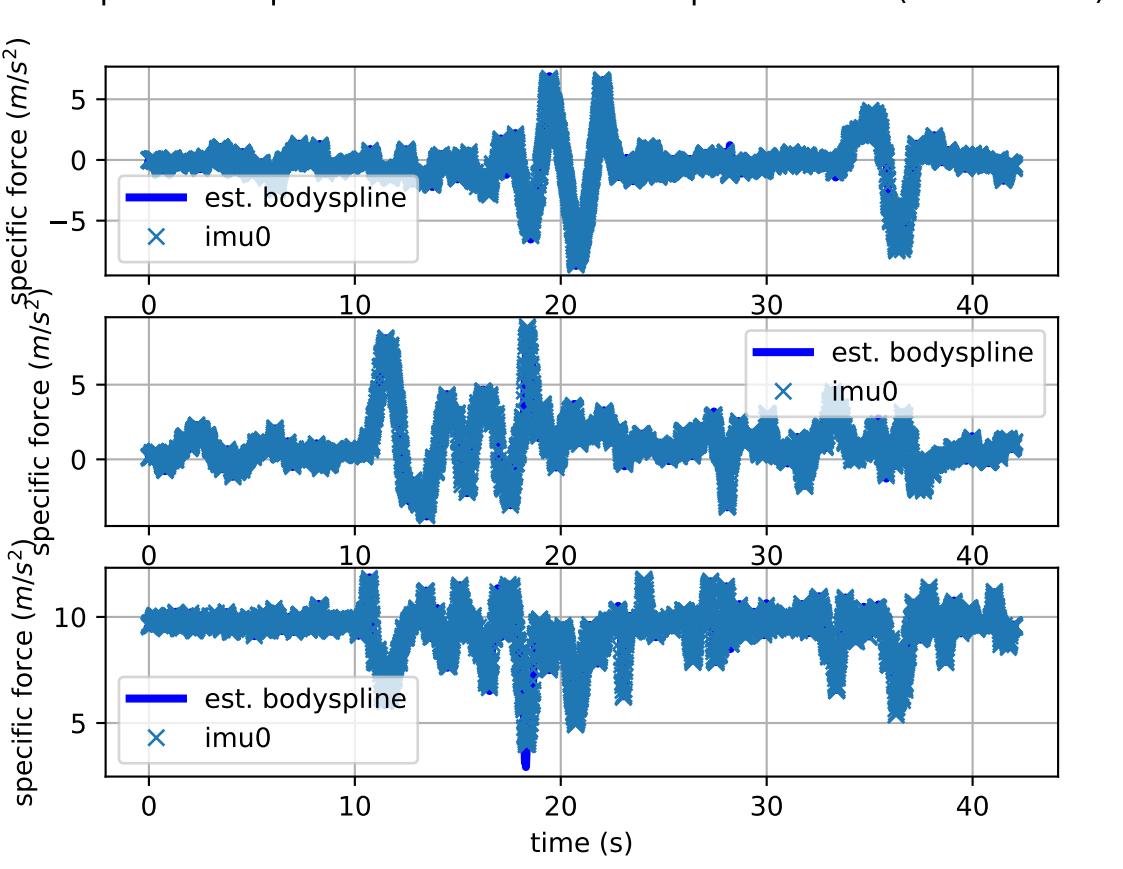
IMU configuration
==========

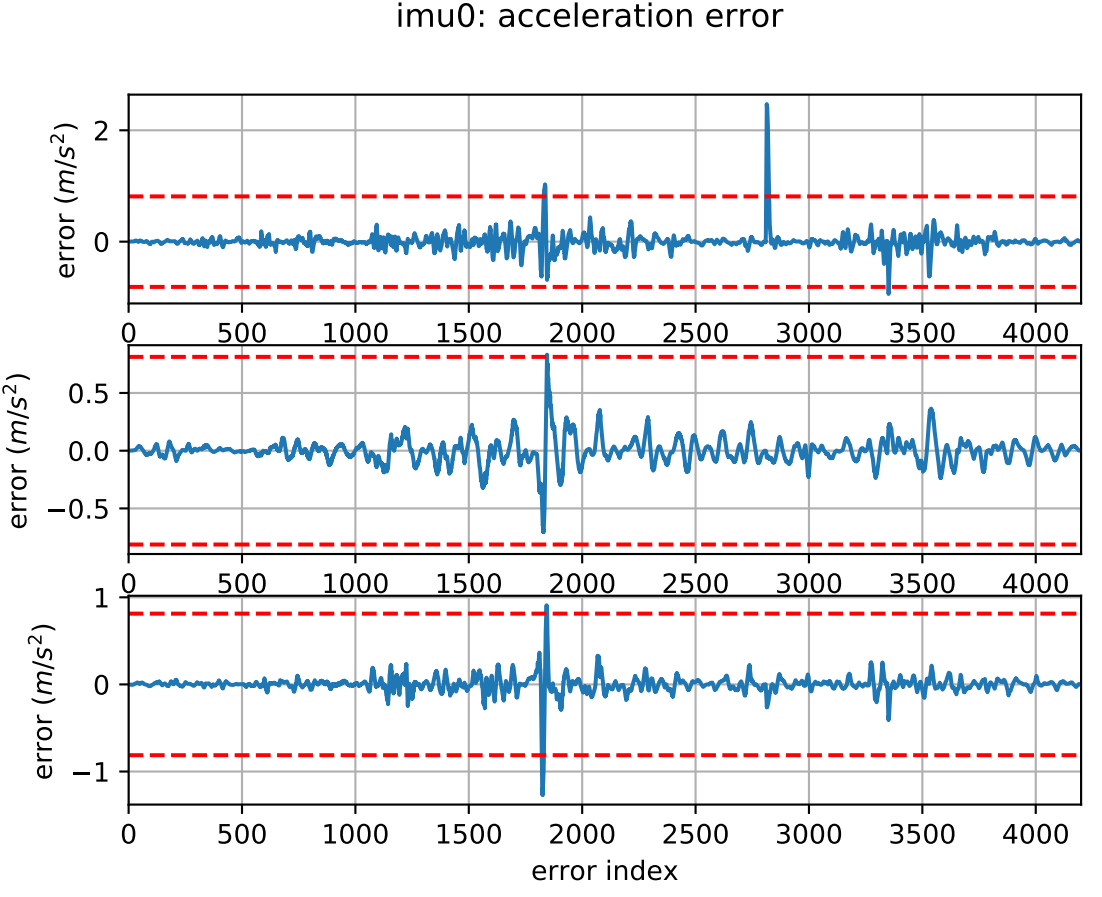
IMU0:
---
Model: calibrated
Update rate: 100
Accelerometer:
Noise density: 0.027089073164427782
Noise density (discrete): 0.2708907316442778
Random walk: 0.0026405437265548015
Gyroscope:
Noise density: 0.0004311627577370619
Noise density (discrete): 0.004311627577370618
Random walk: 5.5971879319209416e-05

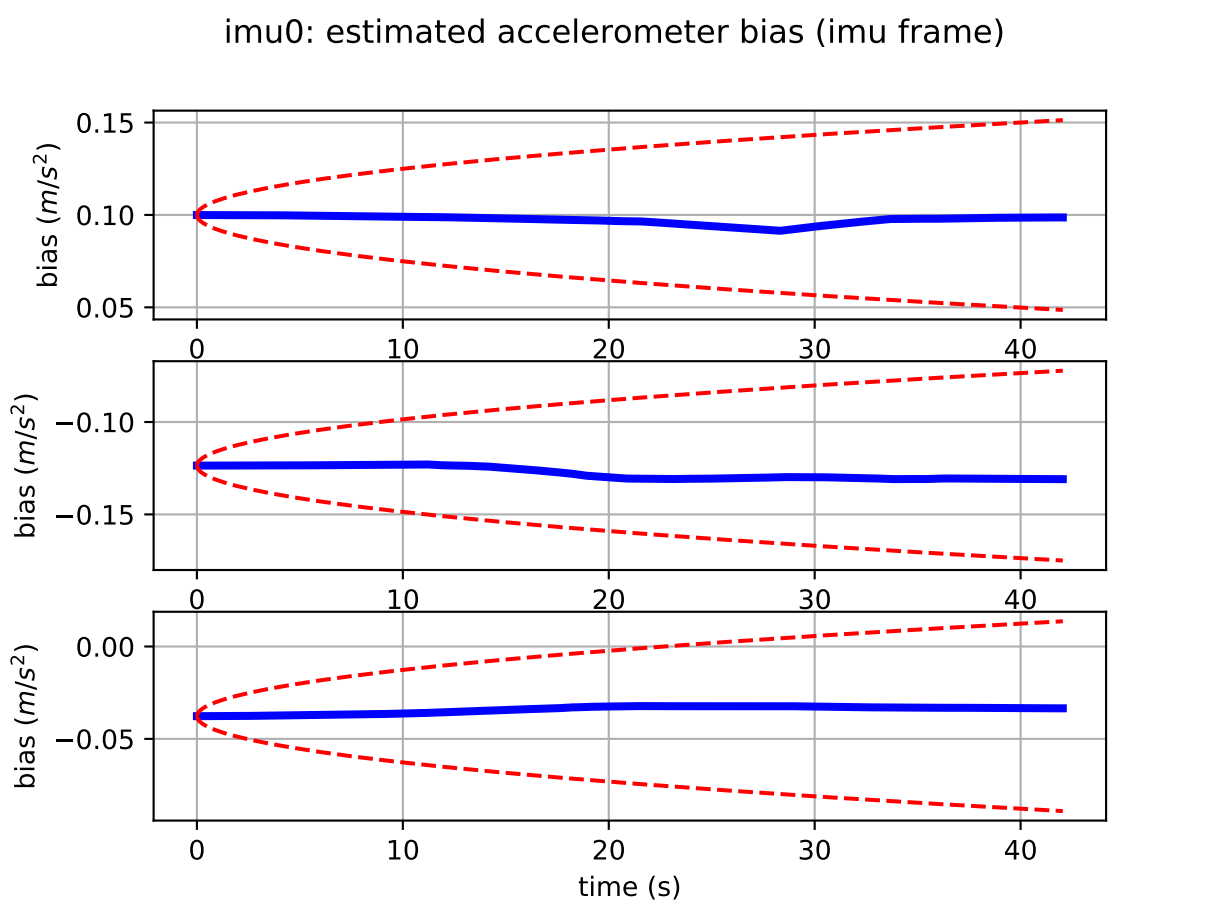
T_ib (imu0 to imu0)
[[1. 0. 0. 0.]
[0. 1. 0. 0.]
[0. 0. 1. 0.]
[0. 0. 0. 1.]]
time offset with respect to IMU0: 0.0 [s]

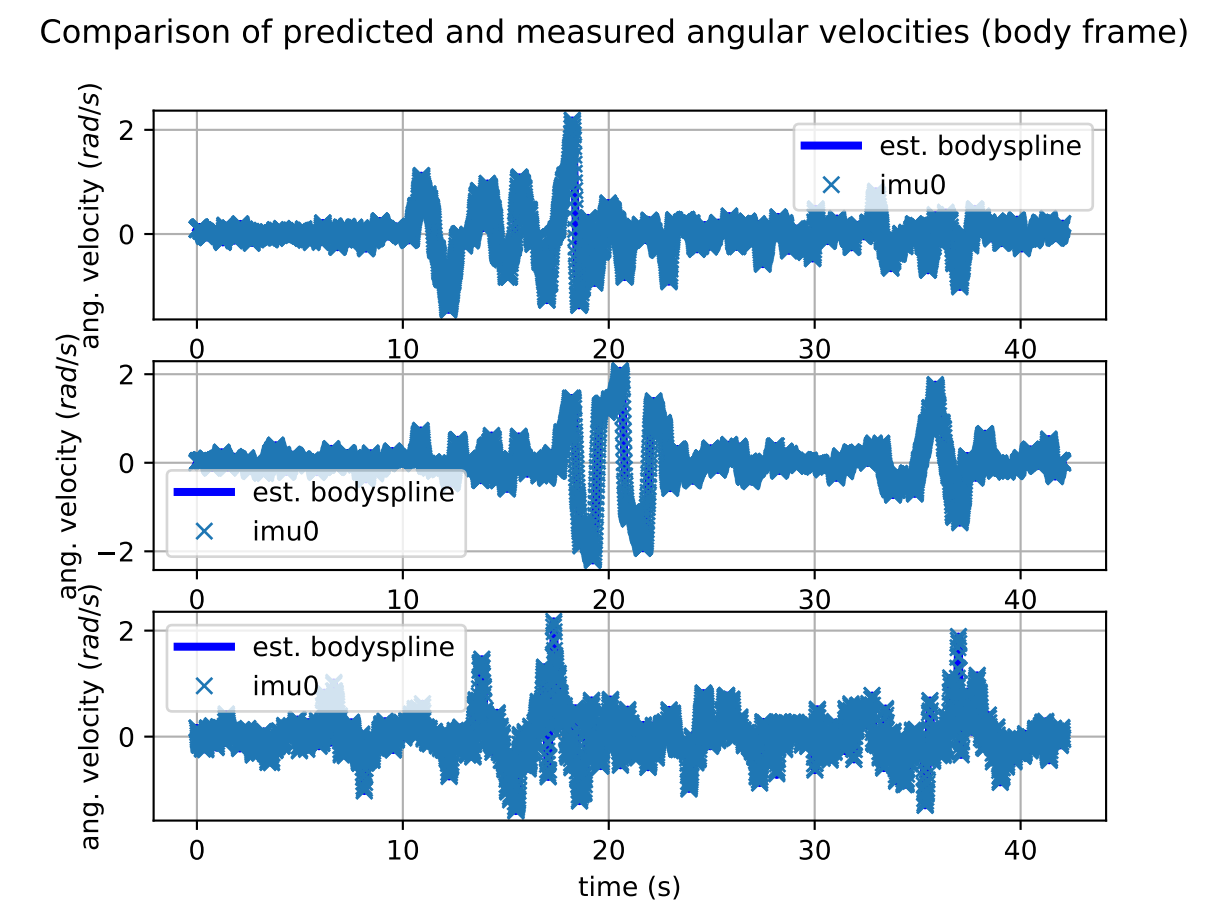

imu0: estimated poses
1.8
1.6
1.4
1.2
1.0
0.8
0.8
0.7
0.6
0.5
0.4
−0.4
−0.2
0.0
0.2
0.4
0.6

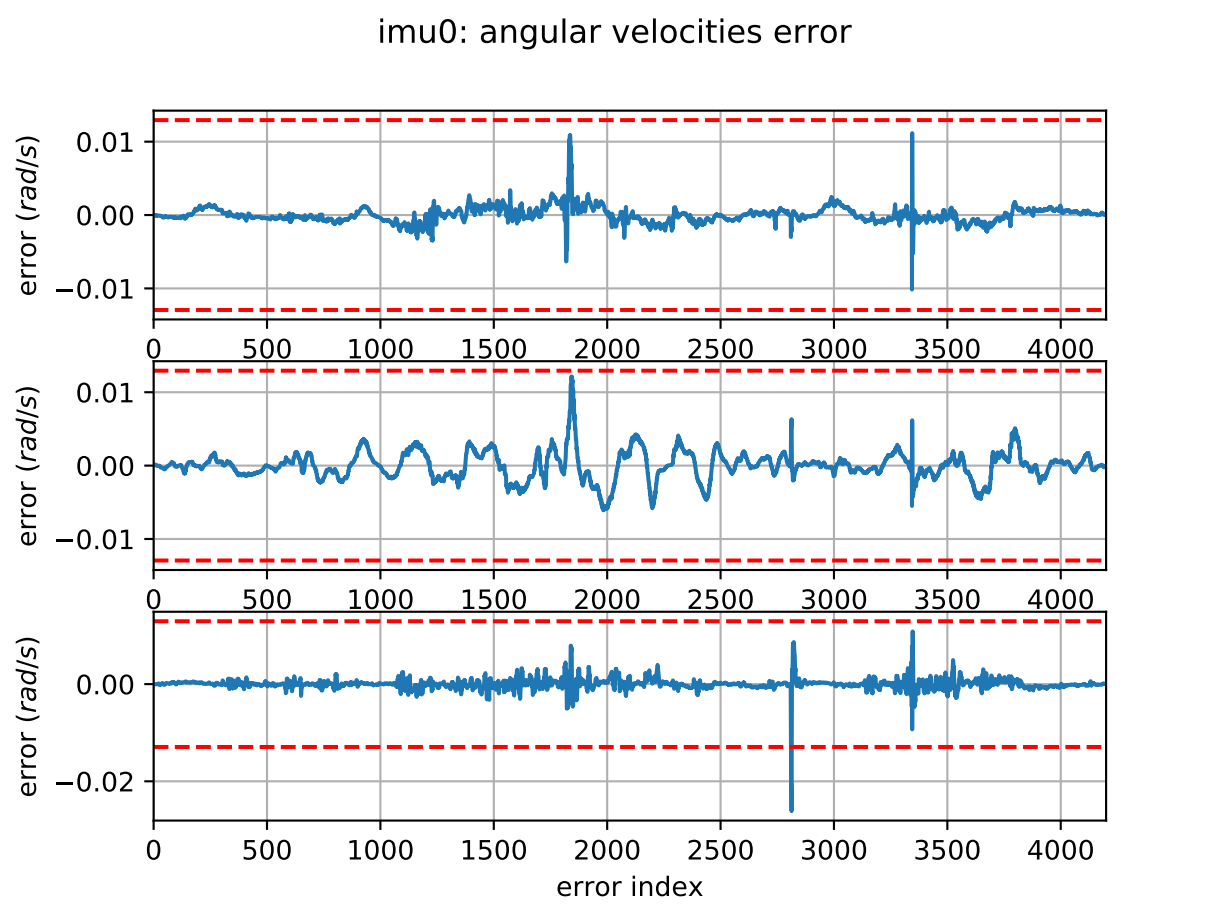

imu0: sample inertial rate
avg dt (ms) = 10.01 +- 0.9227
sample rate (ms)
time (s)
0
10
20
30
40
50
5
10
15
20
25
30
35
40

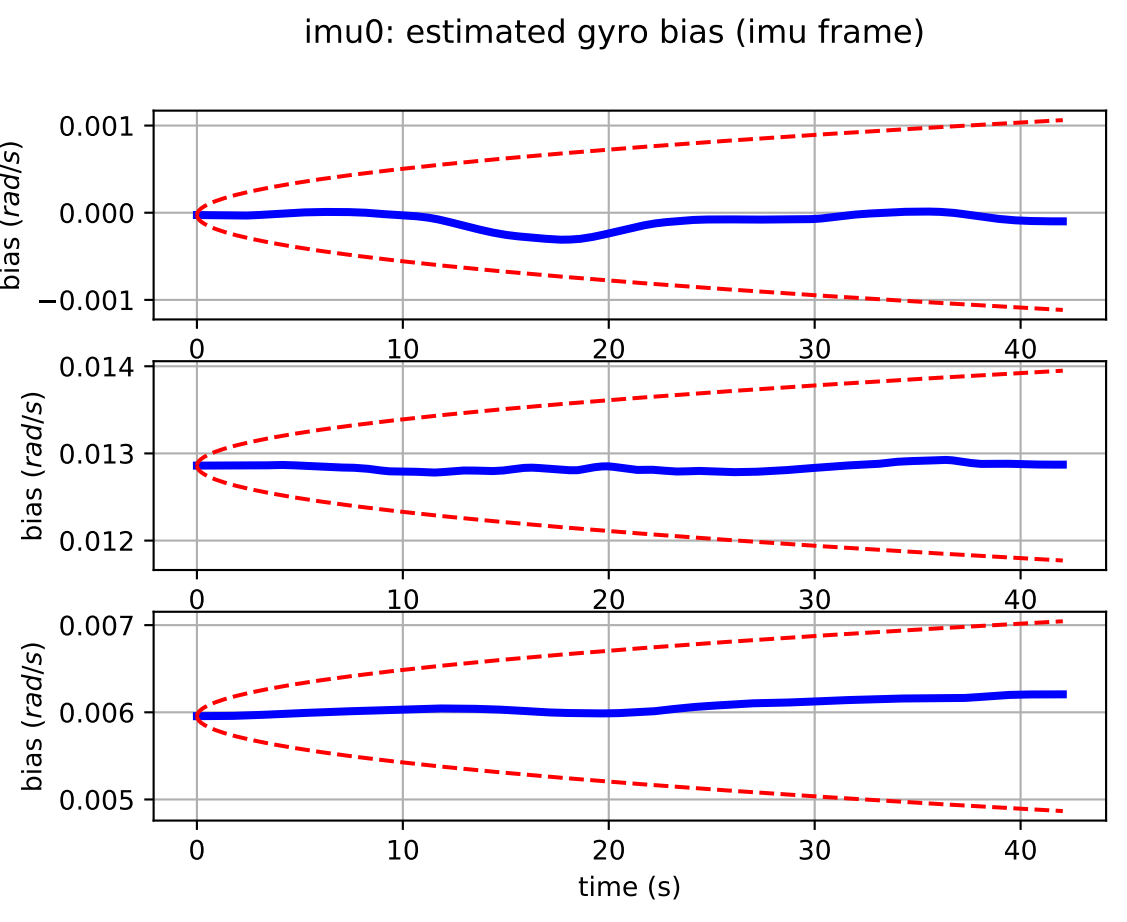

Comparison of predicted and measured specific force (imu0 frame)
specific force ($m/s^2$)
specific force ($m/s^2$)
specific force ($m/s^2$)
est. bodyspline
imu0
est. bodyspline
imu0
est. bodyspline
imu0
time (s)

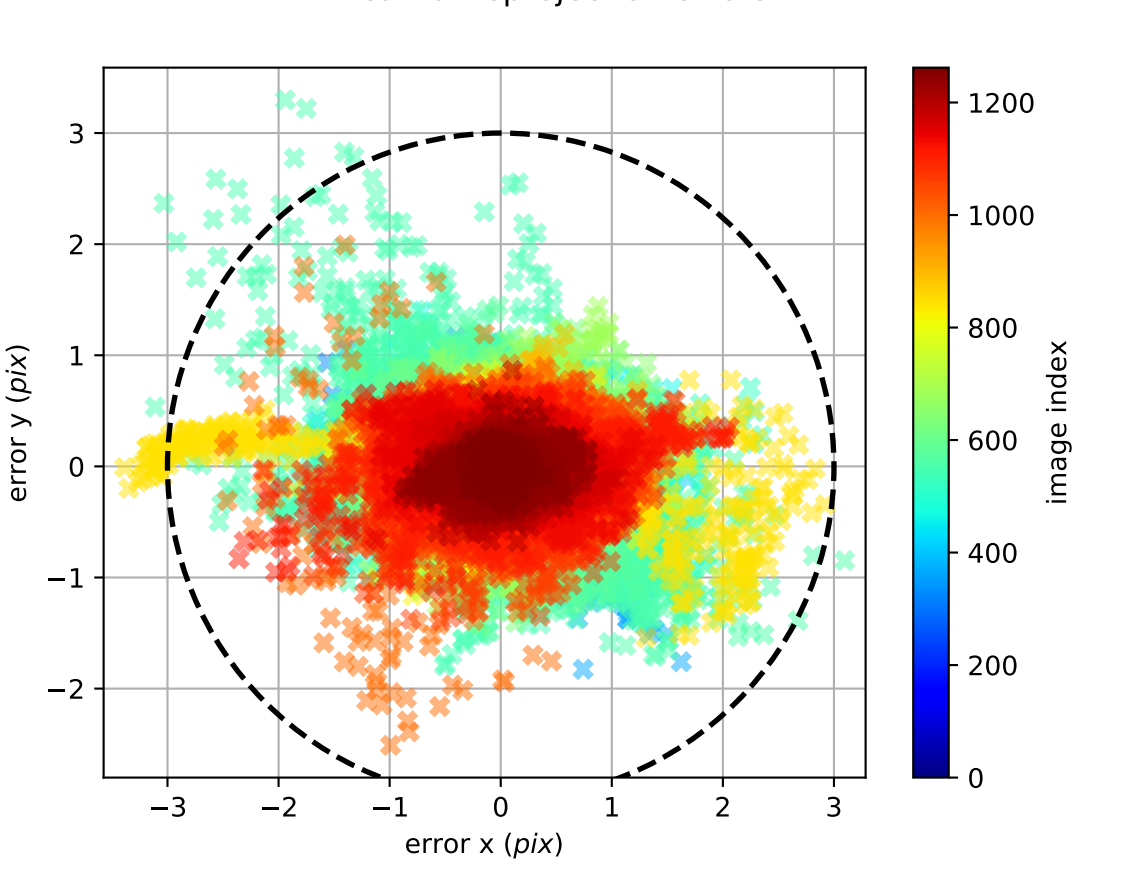

imu0: acceleration error
error ($m/s^2$)
2
0
0
500
1000
1500
2000
2500
3000
3500
4000
error ($m/s^2$)
0.5
0.0
−0.5
0
500
1000
1500
2000
2500
3000
3500
4000
error ($m/s^2$)
1
0
−1
0
500
1000
1500
2000
2500
3000
3500
4000
error index


imu0: estimated accelerometer bias (imu frame)
bias ($m/s^2$)
0.15
0.10
0.05
0
10
20
30
40
bias ($m/s^2$)
−0.10
−0.15
0
10
20
30
40
bias ($m/s^2$)
0.00
−0.05
0
10
20
30
40
time (s)


Comparison of predicted and measured angular velocities (body frame)
ang. velocity (rad/s)
est. bodyspline
imu0
2
0
−2
0
10
20
30
40
time (s)


imu0: angular velocities error
error (rad/s)
0.01
0.00
−0.01
0
500
1000
1500
2000
2500
3000
3500
4000
error (rad/s)
0.01
0.00
−0.01
0
500
1000
1500
2000
2500
3000
3500
4000
error (rad/s)
0.00
−0.02
0
500
1000
1500
2000
2500
3000
3500
4000
error index


imu0: estimated gyro bias (imu frame)
bias (rad/s)
0.001
0.000
−0.001
0
10
20
30
40
bias (rad/s)
0.014
0.013
0.012
0
10
20
30
40
bias (rad/s)
0.007
0.006
0.005
0
10
20
30
40
time (s)


cam0: reprojection errors
error x (pix)
error y (pix)
image index
−3
−2
−1
0
1
2
3
0
200
400
600
800
1000
1200