Calibration results
==========
Normalized Residuals

Reprojection error (cam0): mean 0.12086716079890128, median 0.10886269761564488, std: 0.08031008888054947
Reprojection error (cam1): mean 0.13086088196675594, median 0.11907771800421525, std: 0.08648121662999494
Gyroscope error (imu0): mean 0.06120346110211338, median 0.055401383814520054, std: 0.036969208704497894
Accelerometer error (imu0): mean 0.06113051960512422, median 0.05275290394536812, std: 0.03844506885738438

Residuals

Reprojection error (cam0) [px]: mean 0.12086716079890128, median 0.10886269761564488, std: 0.08031008888054947
Reprojection error (cam1) [px]: mean 0.13086088196675594, median 0.11907771800421525, std: 0.08648121662999494
Gyroscope error (imu0) [rad/s]: mean 0.001822538140388418, median 0.0016497618470268799, std: 0.0011008820689325412
Accelerometer error (imu0) [m/s^2]: mean 0.010474618497516557, median 0.009039127215557788, std: 0.006587502151022128

Transformation (cam0):

T_ci: (imu0 to cam0):
[[0.99999784 -0.00206263 0.00024455 0.00687069]
 [0.00205911 0.99990486 0.01363919 0.00577439]
 [-0.00027266 -0.01363866 0.99990695 -0.0283505]
 [0.   0.   0.   1.   ]]

T_ic: (cam0 to imu0):
[[0.99999784 0.00205911 -0.00027266 -0.0068903]
 [-0.00206263 0.99990486 -0.01363866 -0.00614633]
 [0.00024455 0.01363919 0.99990695 0.02826742]
 [0.   0.   0.   1.   ]]

timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
0.006317982659668221

Transformation (cam1):

T_ci: (imu0 to cam1):
[[0.99999711 -0.00136308 0.00198091 -0.04378957]
 [0.00134497 0.99995757 0.00911343 0.00587099]
 [-0.00199325 -0.00911074 0.99995651 -0.02911598]
 [0.   0.   0.   1.   ]]

T_ic: (cam1 to imu0):
[[0.99999711 0.00134497 -0.00199325 0.04372351]
 [-0.00136308 0.99995757 -0.00911074 -0.00619569]
 [0.00198091 0.00911343 0.99995651 0.02914795]
 [0.   0.   0.   1.   ]]

timeshift cam1 to imu0: [s] (t_imu = t_cam + shift)
0.006345345683594467

Baselines:

Baseline (cam0 to cam1):
[[0.99999825 0.00072317 0.00172665 -0.05061547]
 [-0.00071535 0.9999895 -0.00452586 -0.00002674]
 [-0.00172991 0.00452462 0.99998827 -0.00078005]
 [0.   0.   0.   1.   ]]
baseline norm: 0.050621490035511675 [m]

Gravity vector in target coords: [m/s^2]
[9.80431313 0.10433367 -0.18160793]

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

cam0

  Camera model: pinhole
  Focal length: [385.9663579533714, 386.66632586105874]
  Principal point: [326.31560591362586, 228.94820856640544]
  Distortion model: radtan
  Distortion coefficients: [-0.006216881543788755, -0.008965831146637354, -0.006699760163435405,
0.004722332098436569]
  Type: checkerboard
  Rows
    Count: 8
    Distance: 0.0248 [m]
  Cols
    Count: 6
    Distance: 0.0248 [m]

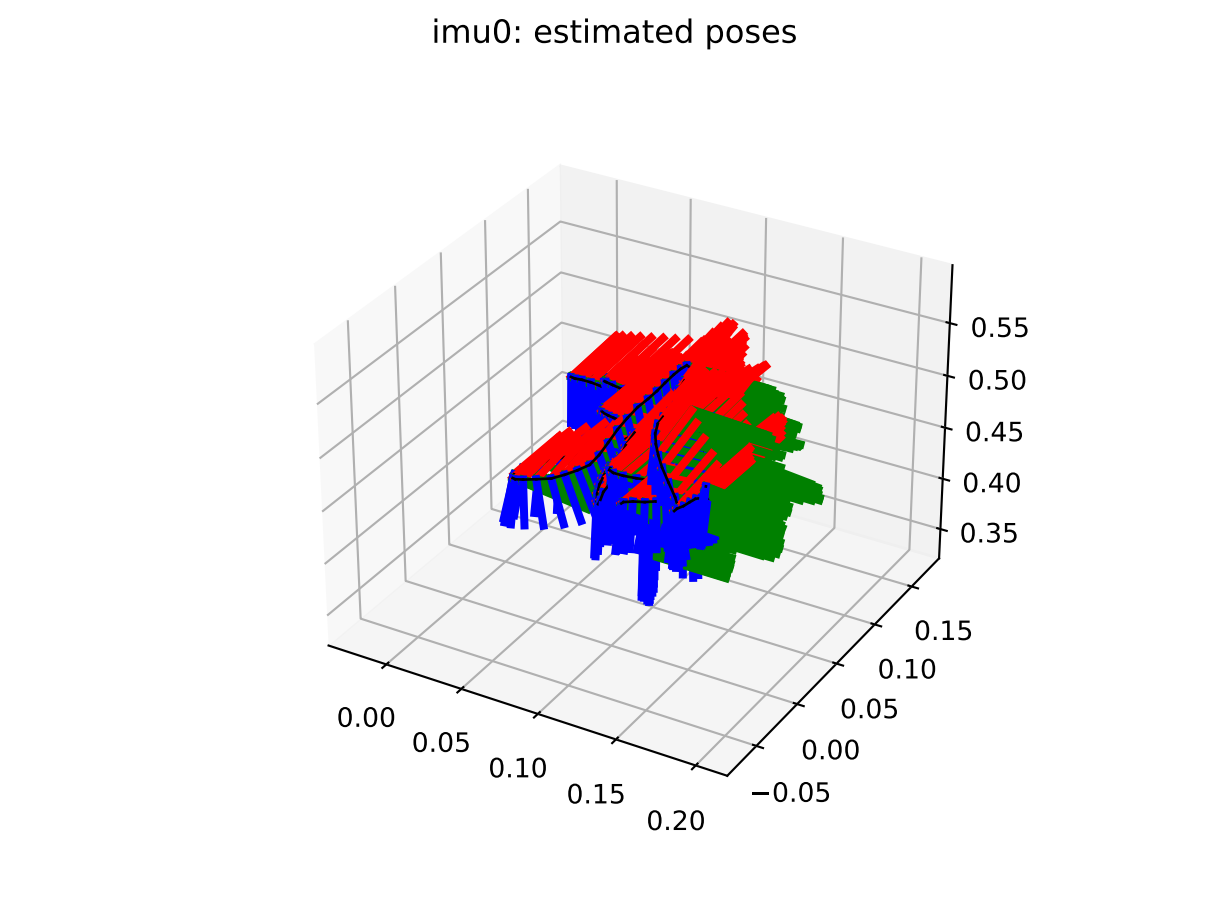
cam1

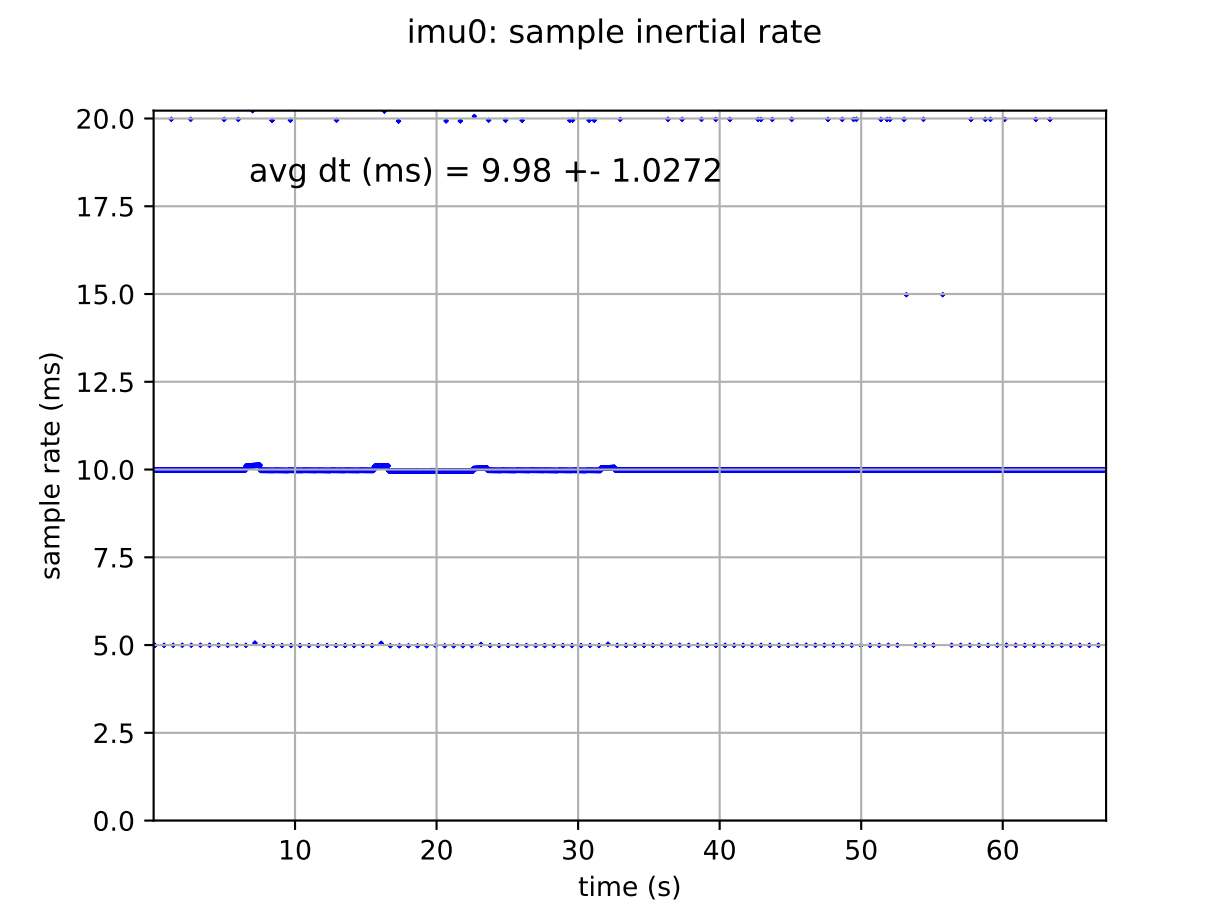
  Camera model: pinhole
  Focal length: [386.5092116377738, 386.6137952578704]
  Principal point: [324.9424812770913, 231.01404187987941]
  Distortion model: radtan
  Distortion coefficients: [0.0008912292688776762, -0.049744871536725306, -0.003605966286580121,
0.0028794430597202047]
  Type: checkerboard
  Rows
    Count: 8
    Distance: 0.0248 [m]
  Cols
    Count: 6
    Distance: 0.0248 [m]

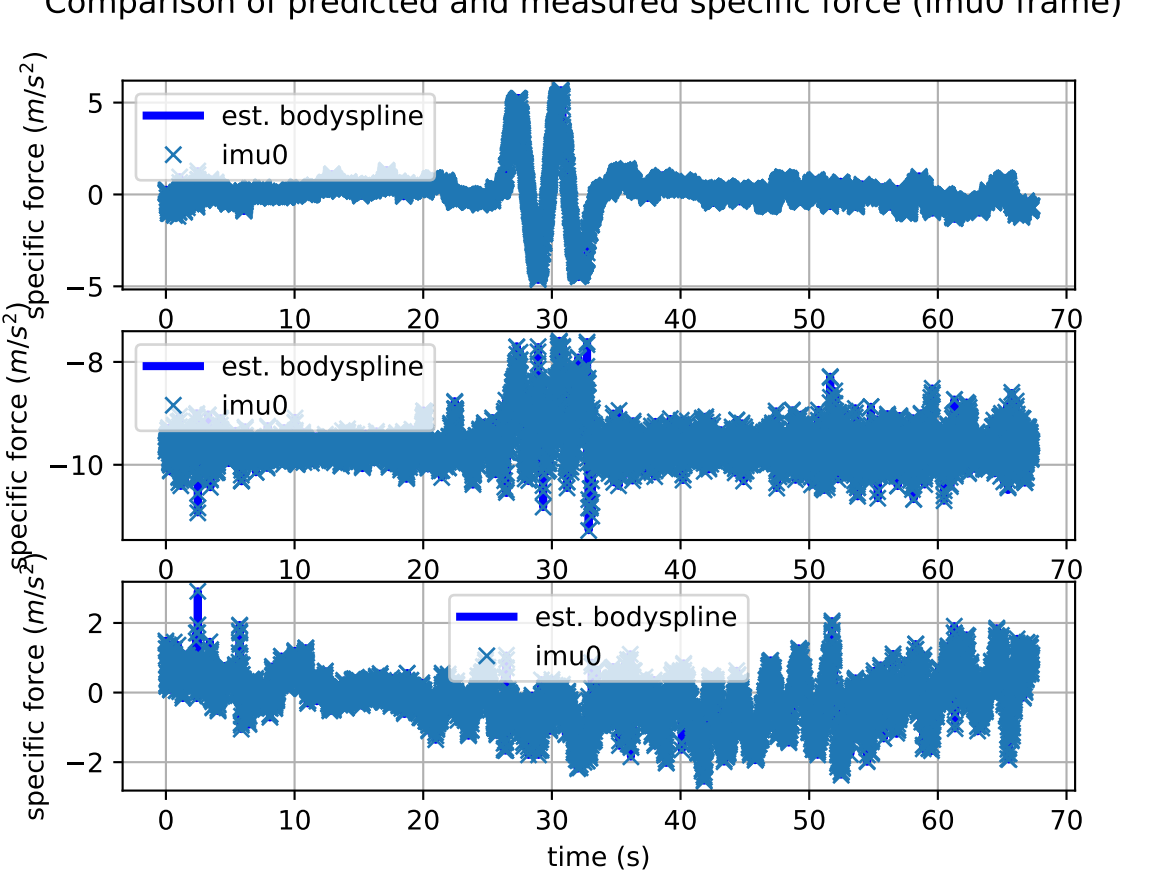
IMU configuration
==================

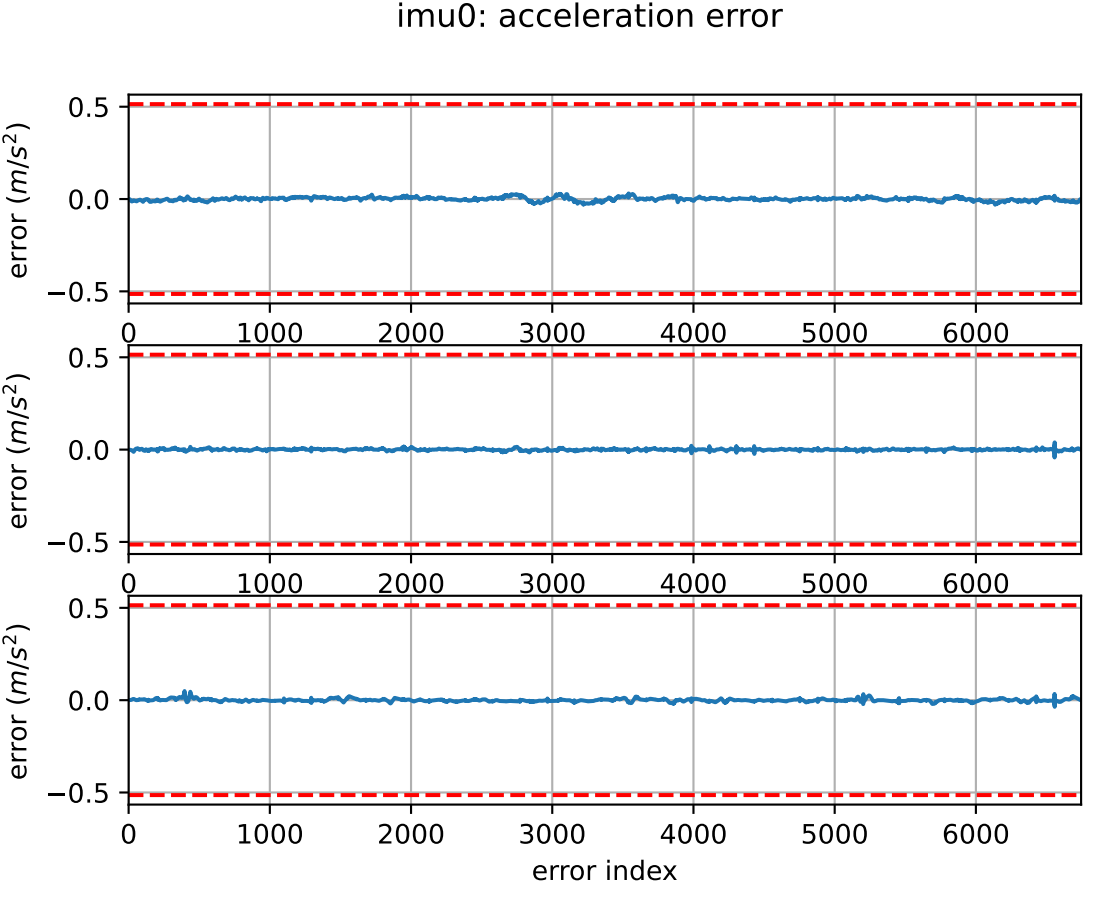
IMU0:

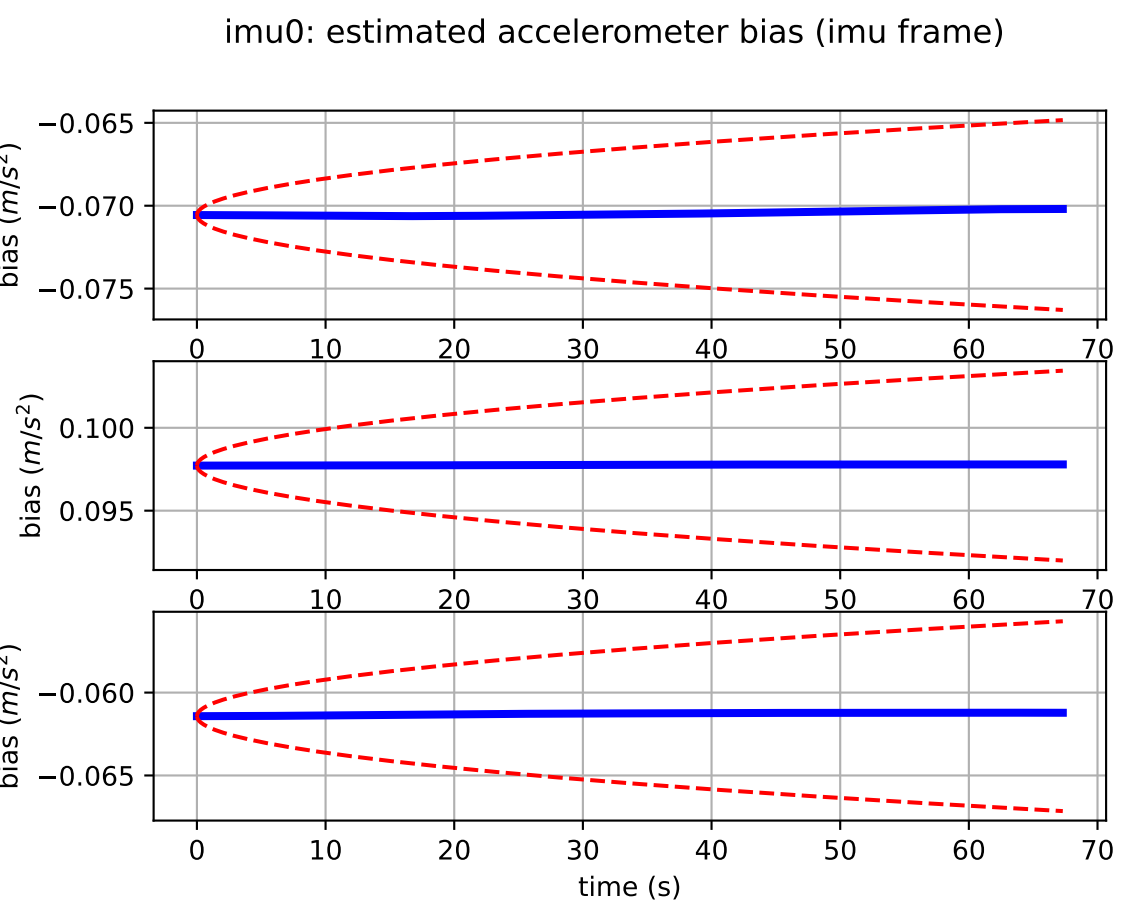
Model: calibrated
Update rate: 200.0
Accelerometer:
  Noise density: 0.01211616360825951
  Noise density (discrete): 0.17134842898731933
  Random walk: 0.00023267111948367786
Gyroscope:
  Noise density: 0.002105647384695487
  Noise density (discrete): 0.029778350890117954
  Random walk: 1.6015774431543977e-05
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]

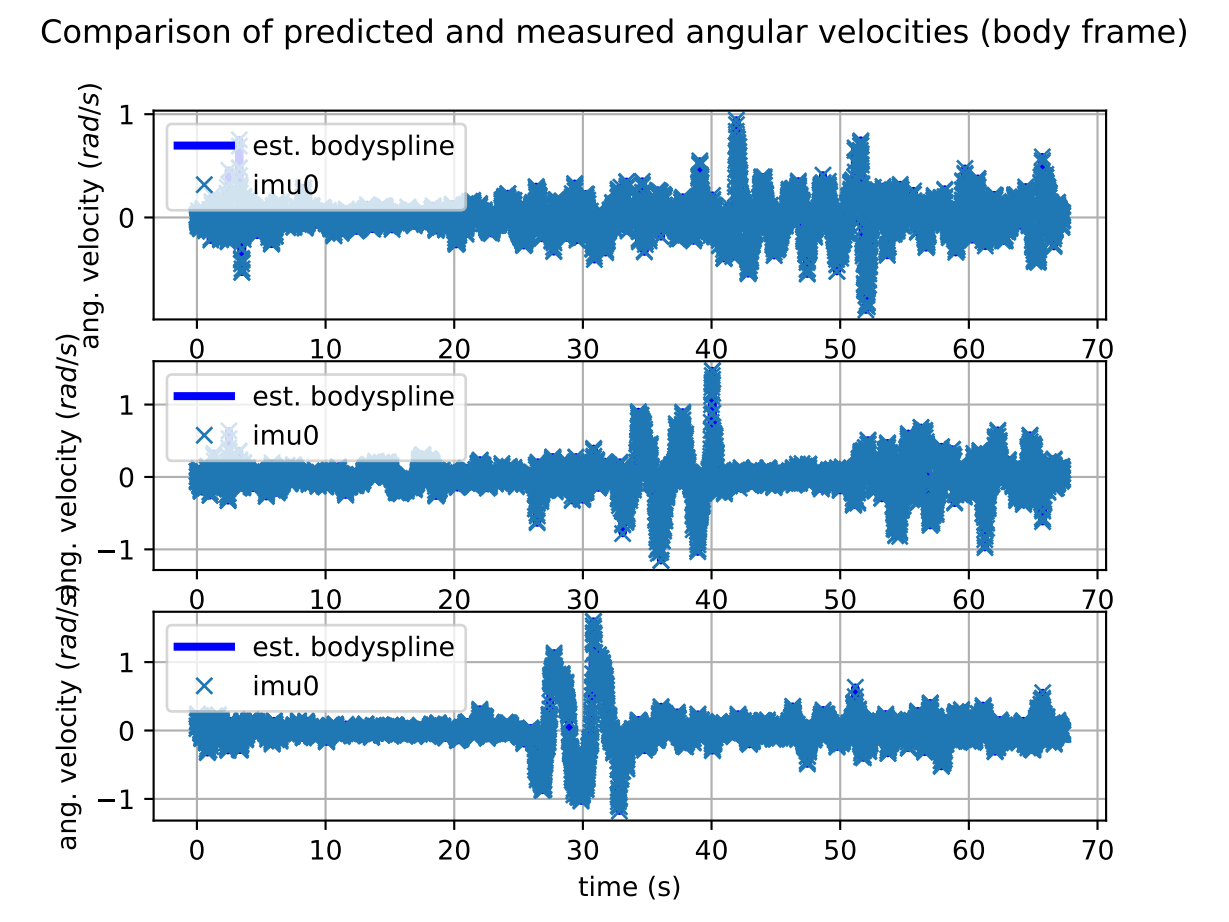

imu0: estimated poses
0.55
0.50
0.45
0.40
0.35
0.15
0.10
0.05
0.00
−0.05
0.00
0.05
0.10
0.15
0.20

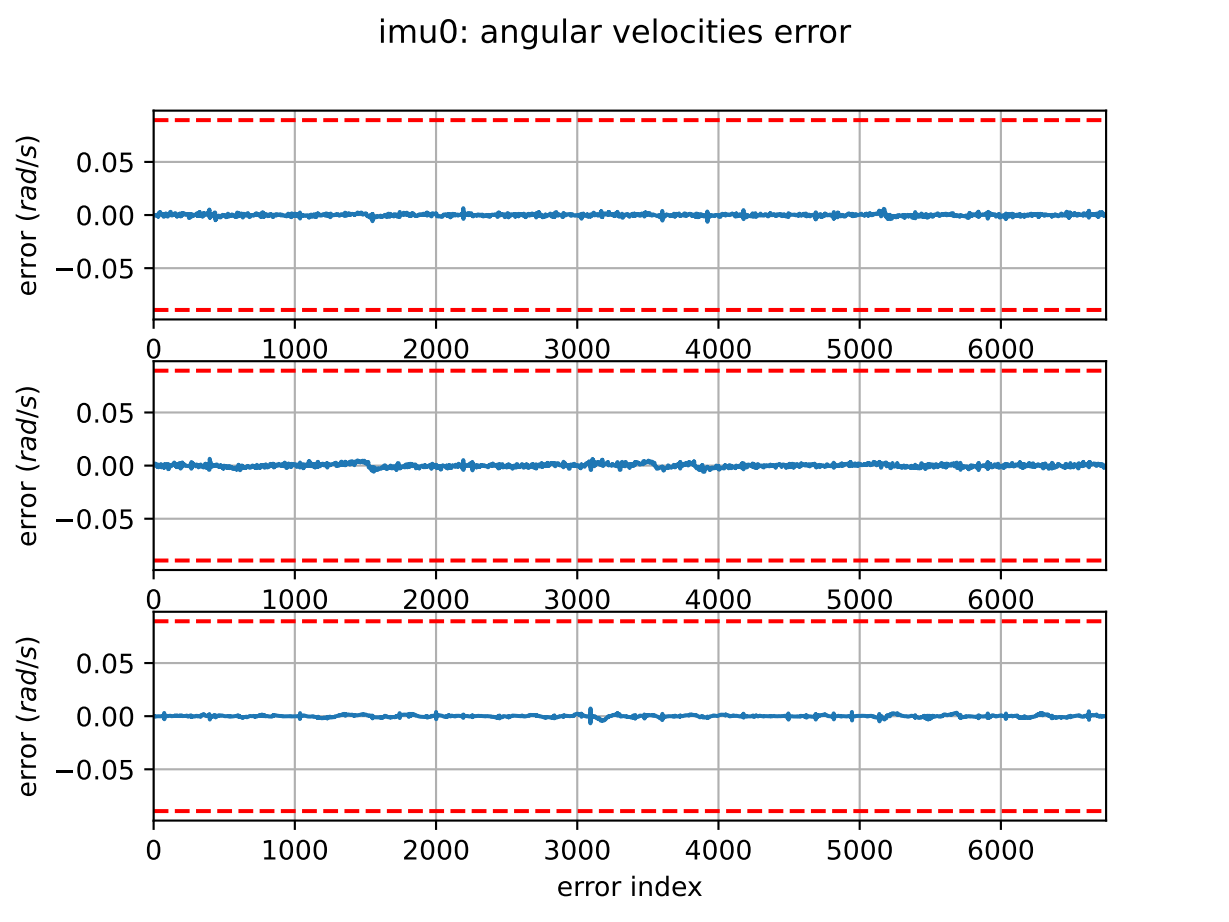

imu0: sample inertial rate
avg dt (ms) = 9.98 +- 1.0272
sample rate (ms)
time (s)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
10
20
30
40
50
60

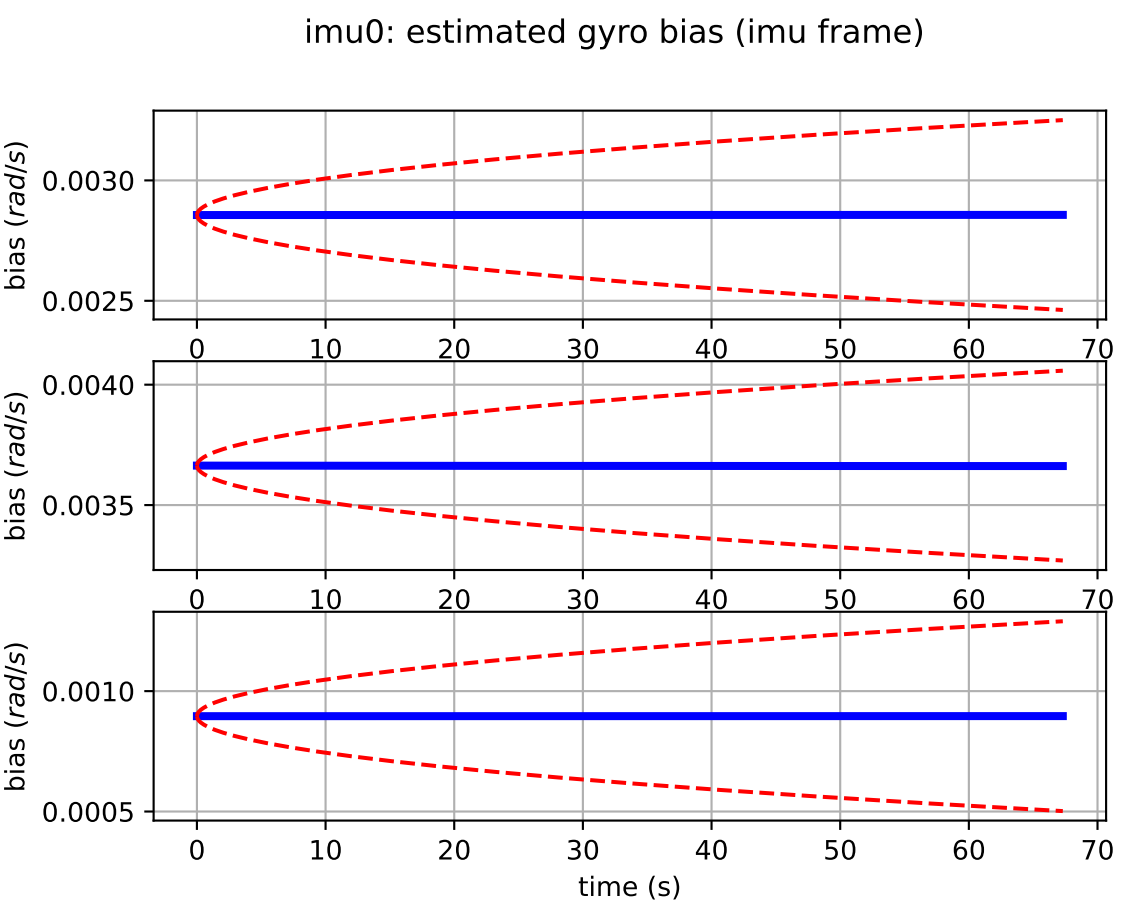

Comparison of predicted and measured specific force (imu0 frame)
specific force (m/s^2)
est. bodyspline
imu0
5
0
−5
0
10
20
30
40
50
60
70
specific force (m/s^2)
est. bodyspline
imu0
−8
−10
0
10
20
30
40
50
60
70
specific force (m/s^2)
est. bodyspline
imu0
2
0
−2
0
10
20
30
40
50
60
70
time (s)

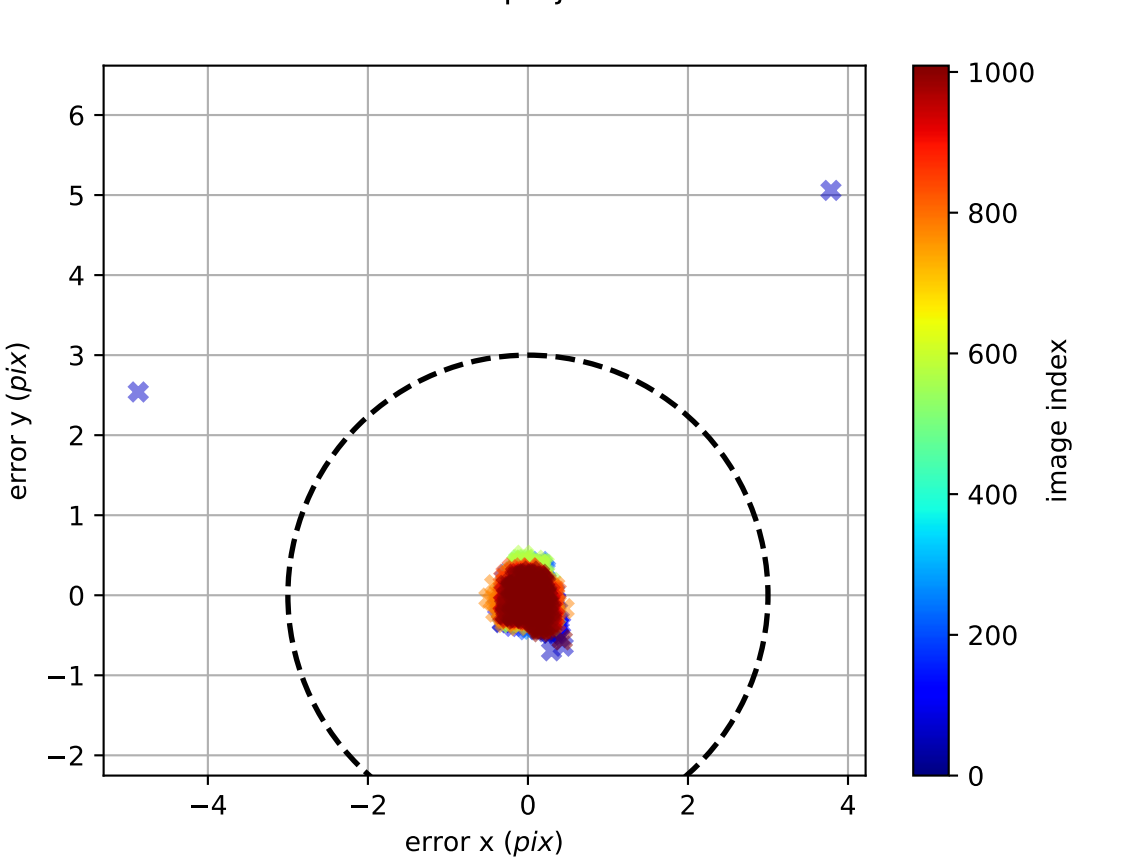

imu0: acceleration error
error (m/s^2)
0.5
0.0
−0.5
0
1000
2000
3000
4000
5000
6000
error index

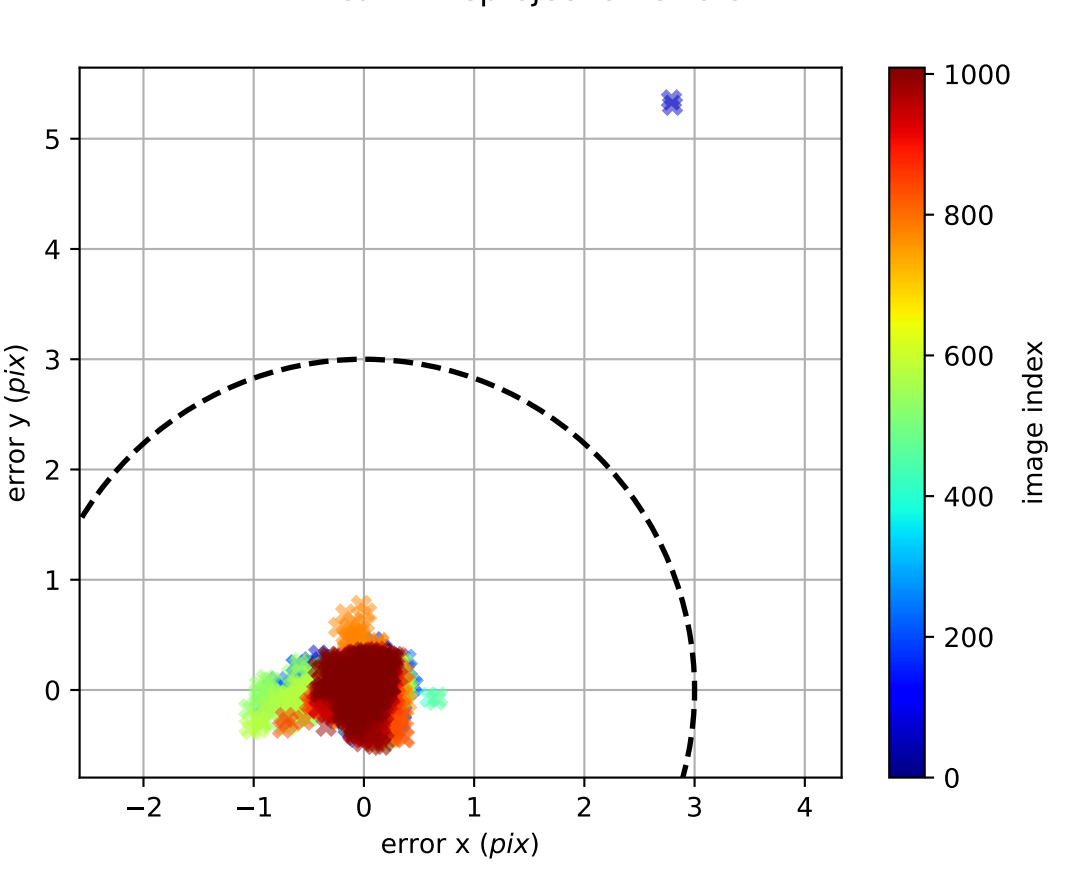

imu0: estimated accelerometer bias (imu frame)
bias (m/s^2)
−0.065
−0.070
−0.075
0
10
20
30
40
50
60
70
bias (m/s^2)
0.100
0.095
bias (m/s^2)
−0.060
−0.065
time (s)


Comparison of predicted and measured angular velocities (body frame)
ang. velocity (rad/s)
est. bodyspline
imu0
time (s)


imu0: angular velocities error
error (rad/s)
0.05
0.00
−0.05
0
1000
2000
3000
4000
5000
6000
error index


imu0: estimated gyro bias (imu frame)
bias (rad/s)
0.0030
0.0025
0
10
20
30
40
50
60
70
bias (rad/s)
0.0040
0.0035
0
10
20
30
40
50
60
70
bias (rad/s)
0.0010
0.0005
0
10
20
30
40
50
60
70
time (s)


cam0: reprojection errors
error x (pix)
error y (pix)
image index
6
5
4
3
2
1
0
−1
−2
−4
−2
0
2
4
1000
800
600
400
200
0


cam1: reprojection errors
error x (pix)
error y (pix)
image index
−2
−1
0
1
2
3
4
5
0
200
400
600
800
1000