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

Reprojection error (cam0): mean 0.0442069016938, median 0.041170748539, std: 0.023418849181
Gyroscope error (imu0): mean 0.0532330878599, median 0.0483144086564, std: 0.0280202962724
Accelerometer error (imu0): mean 0.619905670651, median 0.364711021764, std: 0.610473186387

Residuals

Reprojection error (cam0) [px]: mean 0.0442069016938, median 0.041170748539, std: 0.023418849181
Gyroscope error (imu0) [rad/s]: mean 0.00376414774092, median 0.003416344599, std: 0.00198133415
Accelerometer error (imu0) [m/s^2]: mean 0.0876679006826, median 0.0515779273325, std: 0.086333945

Transformation (cam0):

T_ci: (imu0 to cam0):
[[0.99997106 0.00009551 0.00760693 -0.04532367]
 [-0.00002566 0.99995785 -0.00918168 -0.02582696]
 [-0.00760749 0.00918122 0.99992891 -0.01455859]
 [0.   0.   0.   1.   ]]

T_ic: (cam0 to imu0):
[[0.99997106 -0.00002566 -0.00760749 0.04521094]
 [0.00009551 0.99995785 0.00918122 0.02596386]
 [0.00760693 -0.00918168 0.99992891 0.0146652]
 [0.   0.   0.   1.   ]]

timeshift cam0 to imu0: [s] (t_imu = t_cam + shift)
0.001557271325479997

Gravity vector in target coords: [m/s^2]
[9.80400613 -0.21871476 0.0452829]

Calibration configuration

  Camera model: pinhole
  Focal length: [468.906082694885, 468.95979206327786]
  Principal point: [364.8533346068778, 215.4937445050946]
  Distortion model: equidistant
  Distortion coefficients: [0.012245093310874177, -0.06011529683474609, 0.17162762296825532, -0.1534
  Type: checkerboard
  Rows
    Count: 7
    Distance: 0.07 [m]
  Cols
    Count: 6
    Distance: 0.07 [m]

IMU configuration
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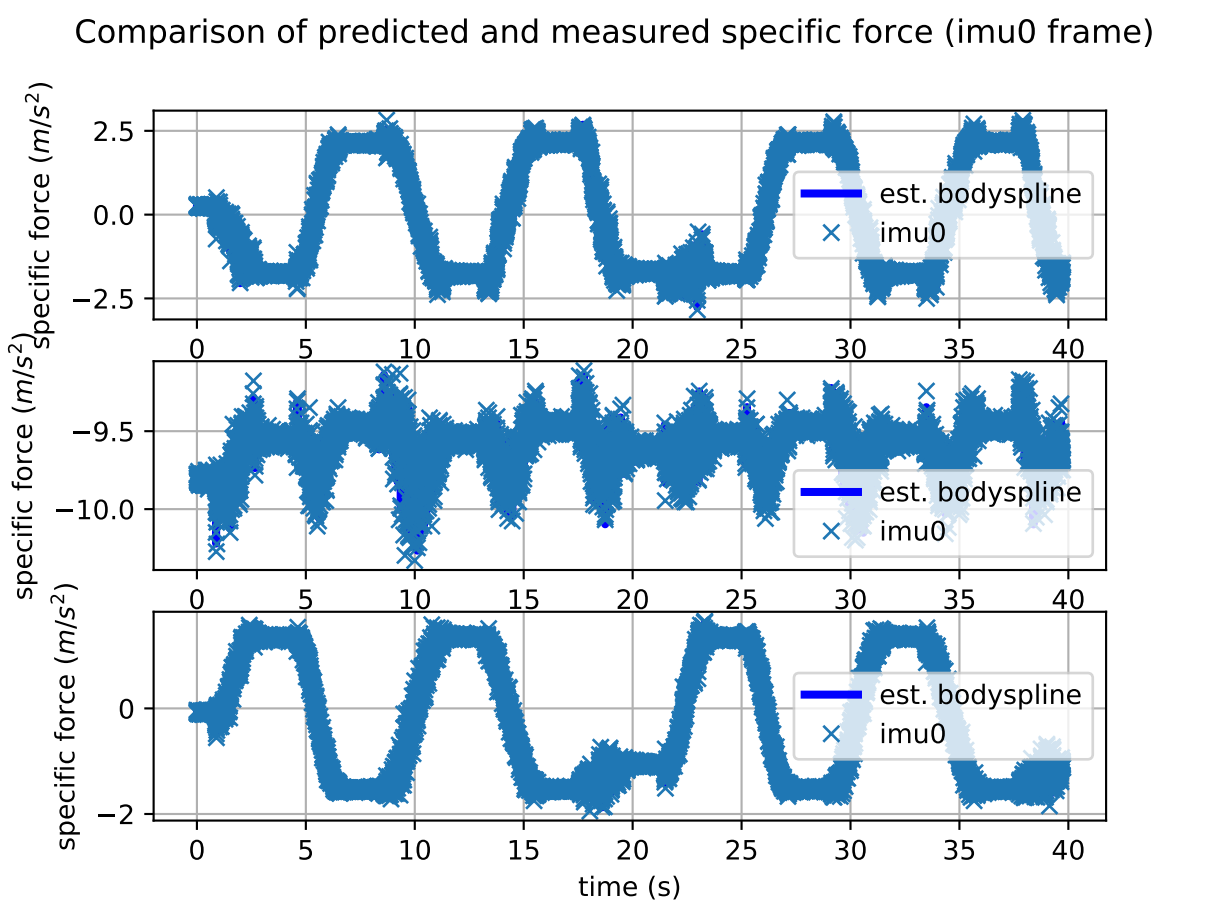
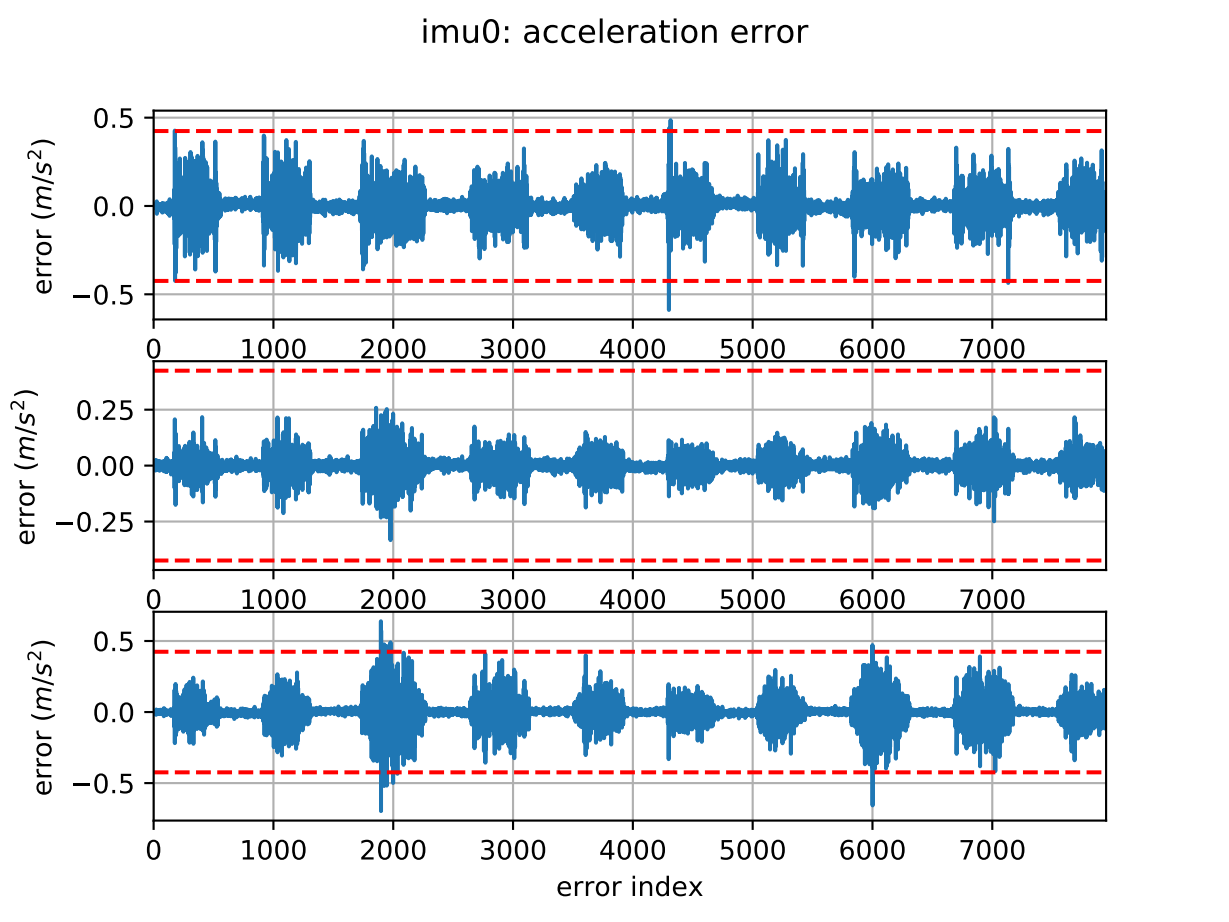
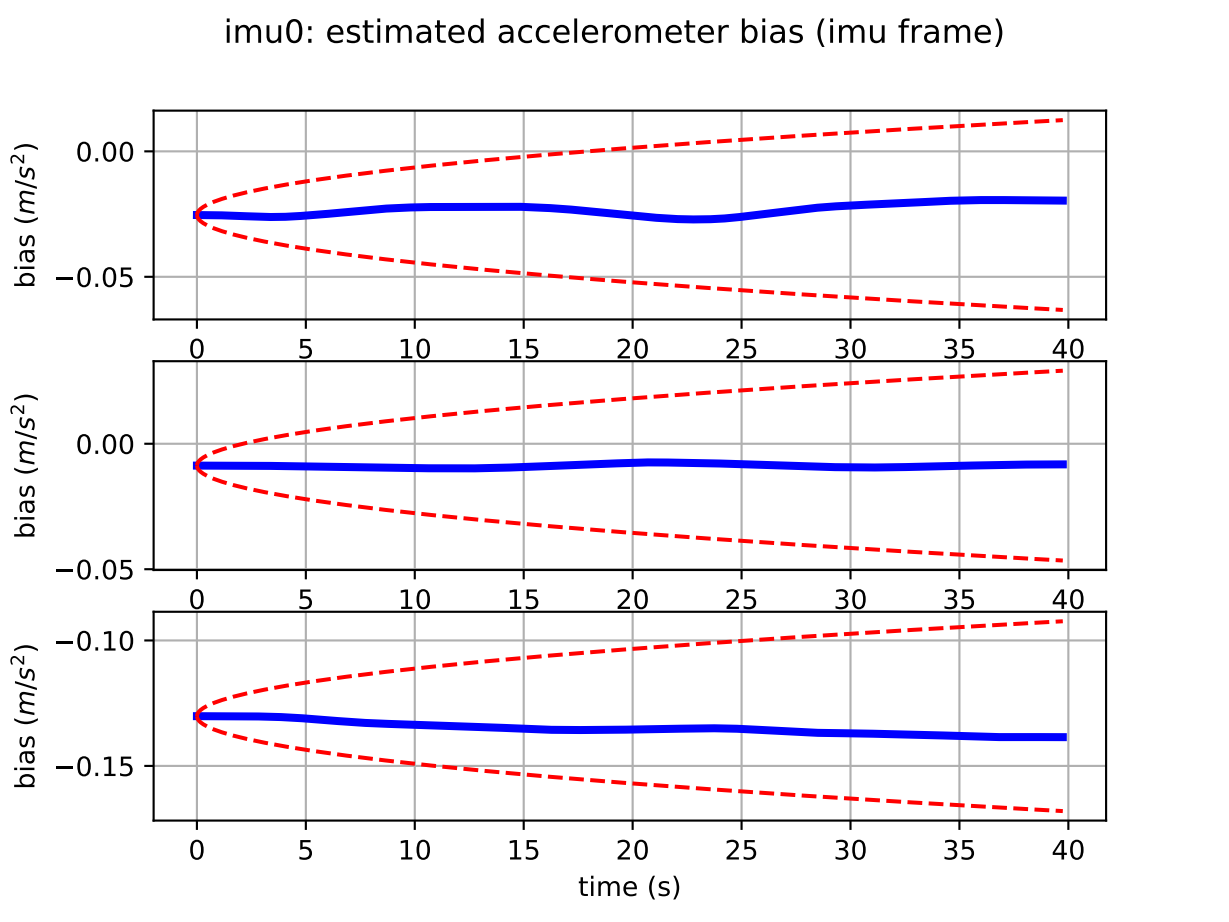
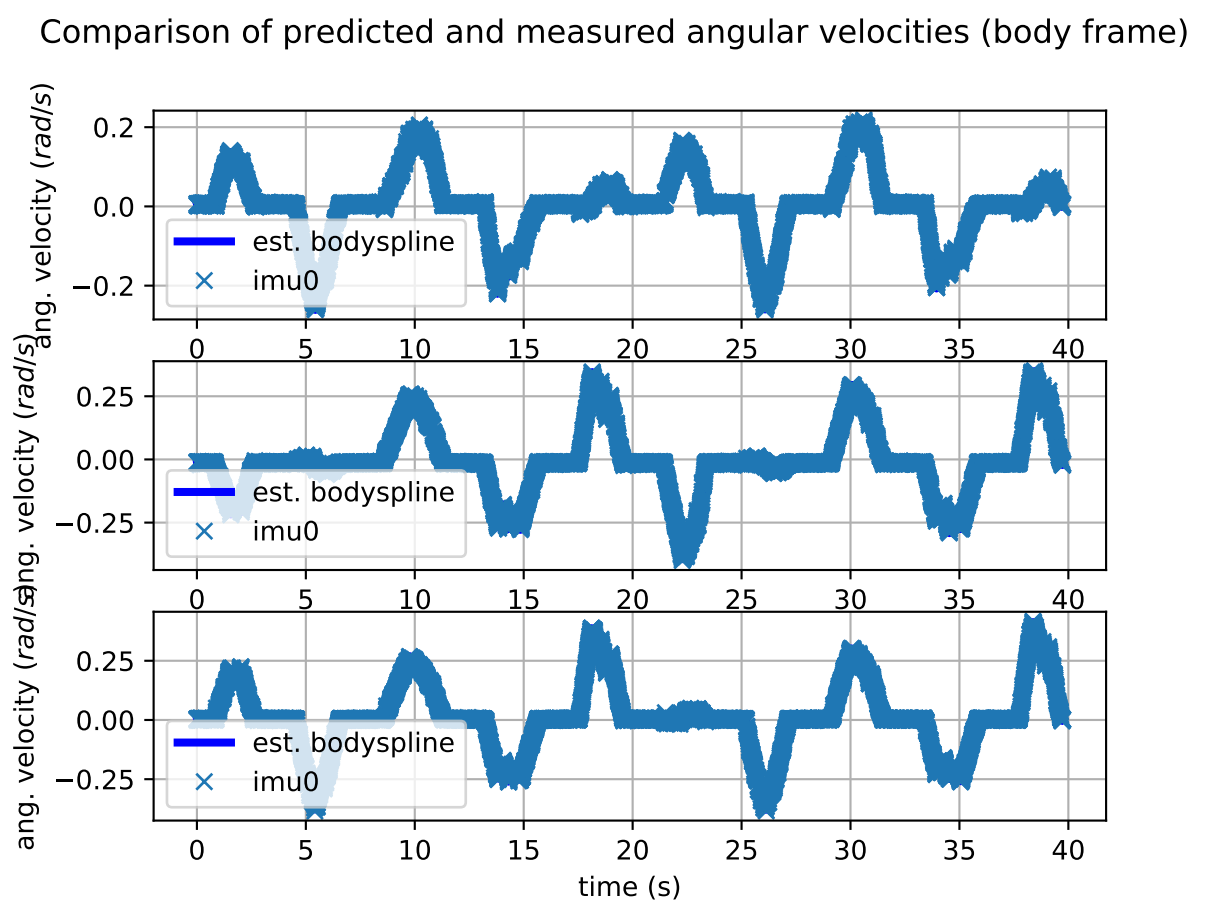
IMU0:

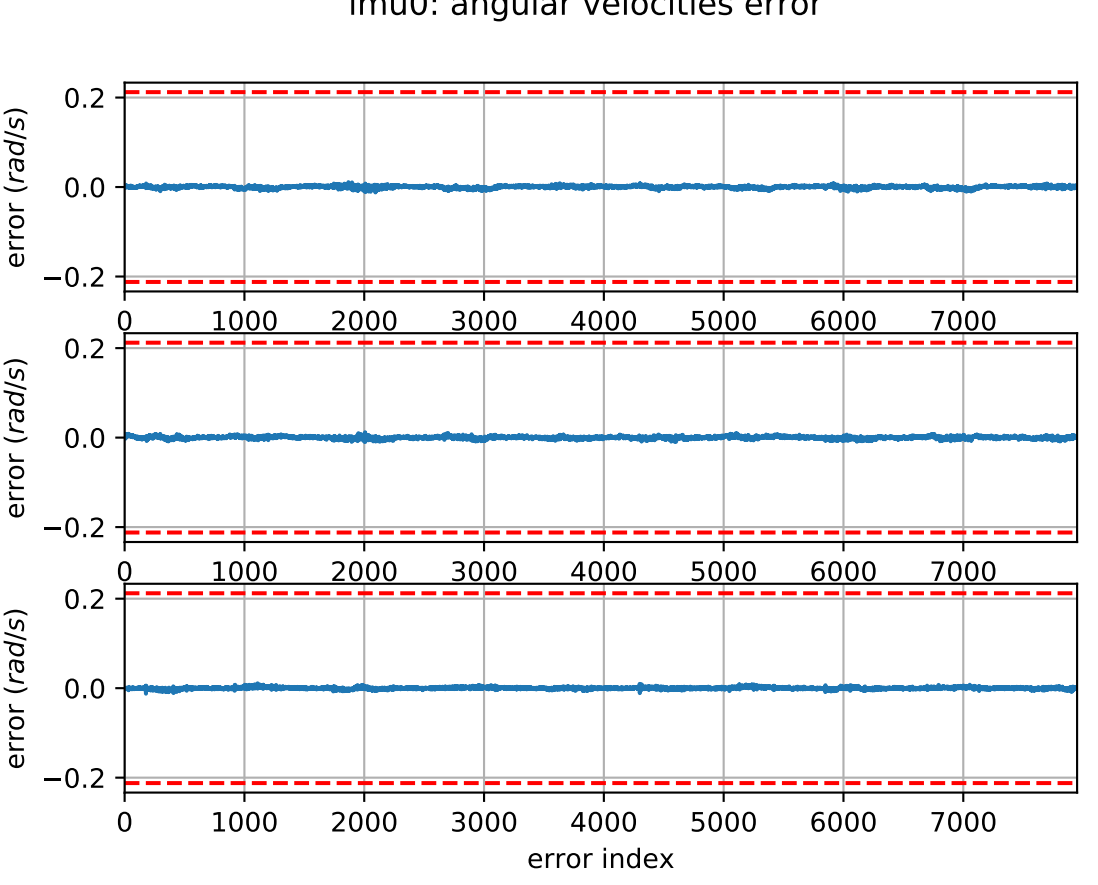
  Model: calibrated
  Update rate: 200.0
  Accelerometer:
    Noise density: 0.01
    Noise density (discrete): 0.141421356237
    Random walk: 0.002
  Gyroscope:
    Noise density: 0.005
    Noise density (discrete): 0.0707106781187
    Random walk: 4e-06
  T_i_b
    [[1. 0. 0. 0.]
     [0. 1. 0. 0.]
     [0. 0. 1. 0.]
     [0. 0. 0. 1.]]
  time offset with respect to IMU0: 0.0 [s]

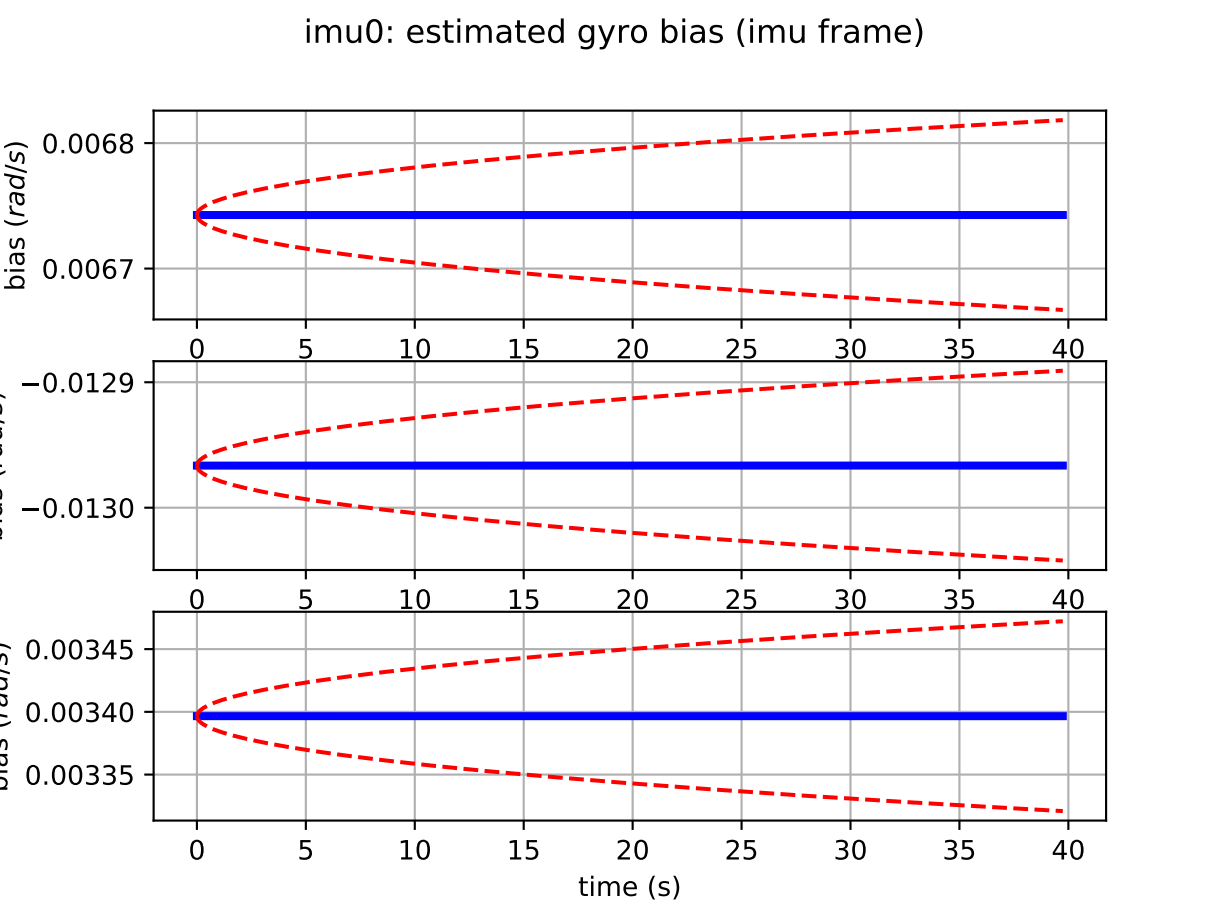

Comparison of predicted and measured specific force (imu0 frame)
specific force (m/s^2)
specific force (m/s^2)
specific force (m/s^2)
time (s)
est. bodyspline
imu0
est. bodyspline
imu0
est. bodyspline
imu0

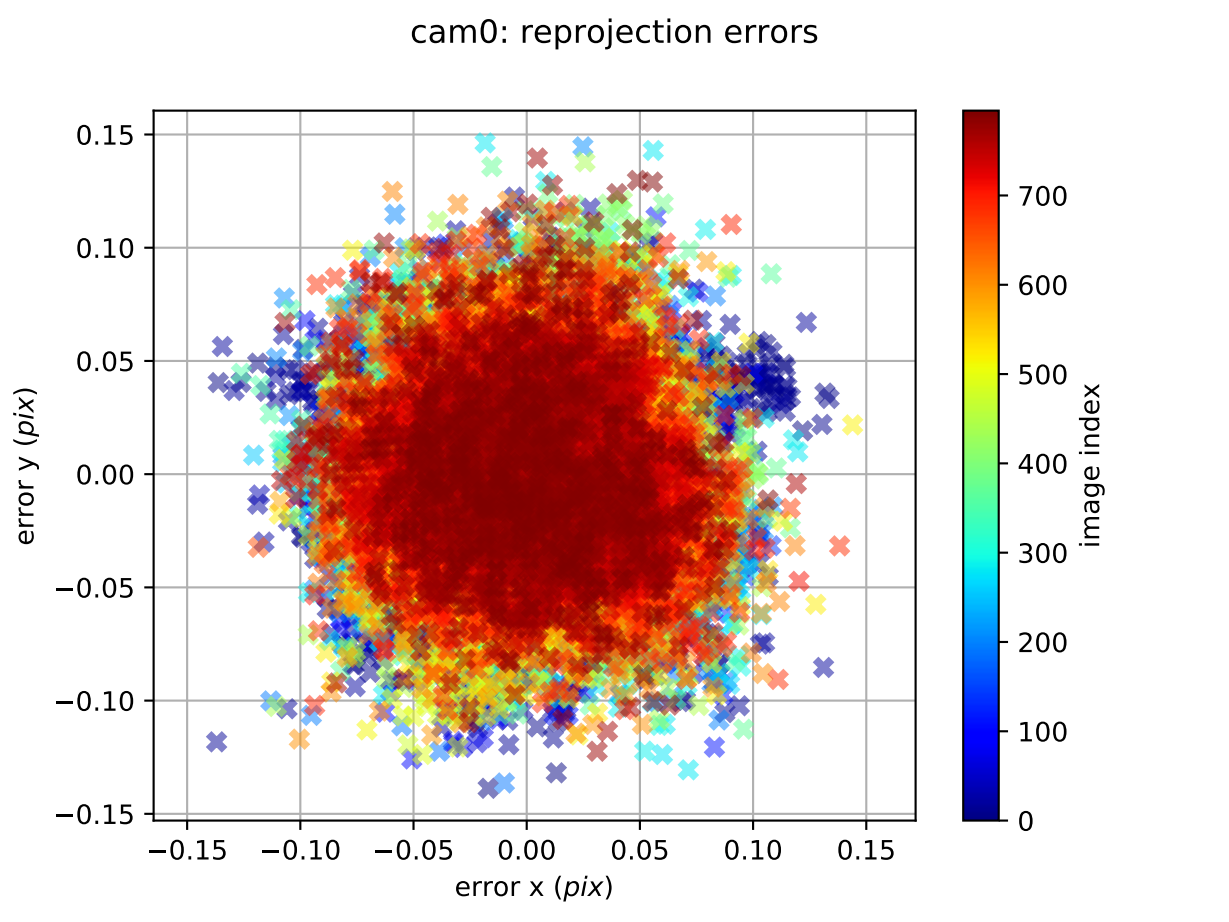

imu0: acceleration error
error (m/s^2)
0.5
0.0
−0.5
0
1000
2000
3000
4000
5000
6000
7000
error (m/s^2)
0.25
0.00
−0.25
0
1000
2000
3000
4000
5000
6000
7000
error (m/s^2)
0.5
0.0
−0.5
0
1000
2000
3000
4000
5000
6000
7000
error index


imu0: estimated accelerometer bias (imu frame)
bias (m/s^2)
0.00
−0.05
0
5
10
15
20
25
30
35
40
bias (m/s^2)
0.00
−0.05
0
5
10
15
20
25
30
35
40
bias (m/s^2)
−0.10
−0.15
0
5
10
15
20
25
30
35
40
time (s)


Comparison of predicted and measured angular velocities (body frame)
ang. velocity (rad/s)
ang. velocity (rad/s)
ang. velocity (rad/s)
est. bodyspline
imu0
est. bodyspline
imu0
est. bodyspline
imu0
0.2
0.0
−0.2
0.25
0.00
−0.25
0.25
0.00
−0.25
0
5
10
15
20
25
30
35
40
time (s)


imu0: angular velocities error
error (rad/s)
0.2
0.0
−0.2
0
1000
2000
3000
4000
5000
6000
7000
error index


imu0: estimated gyro bias (imu frame)
bias (rad/s)
0.0068
0.0067
−0.0129
−0.0130
0.00345
0.00340
0.00335
0
5
10
15
20
25
30
35
40
time (s)


cam0: reprojection errors
error x (pix)
error y (pix)
image index
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
0
100
200
300
400
500
600
700