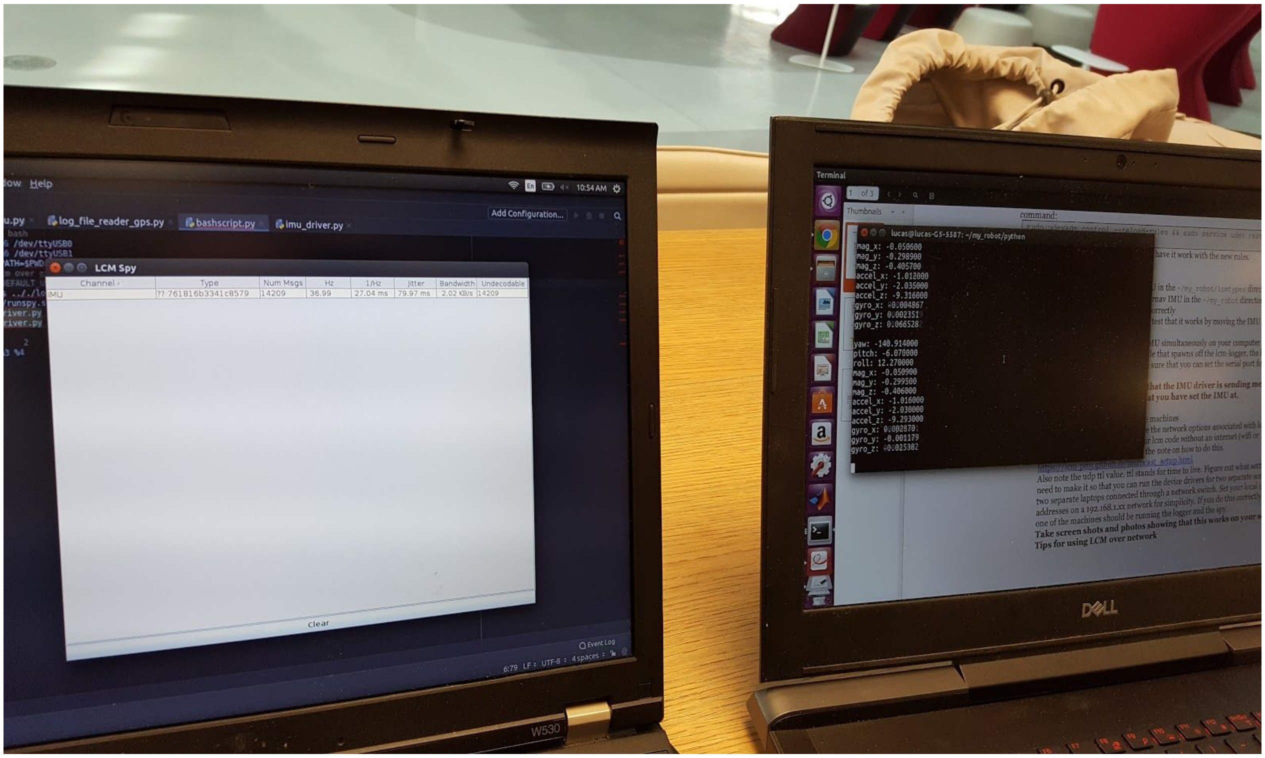
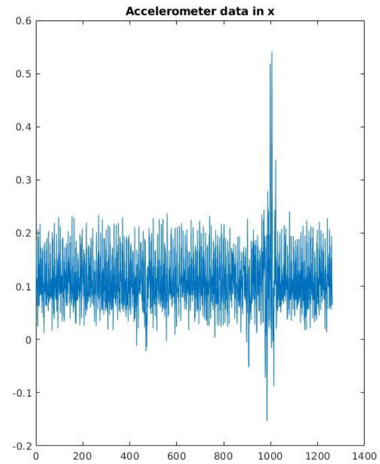
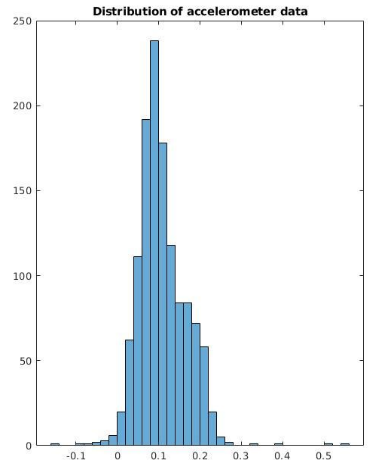
LCM over a network and Multicast

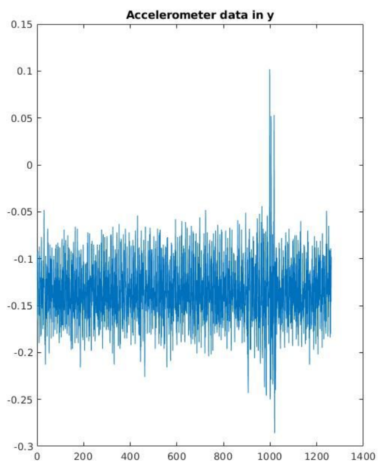


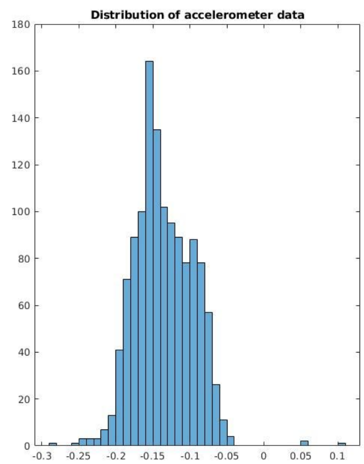
Udp Multicast time to live value is the default value which has been set to 1 second.

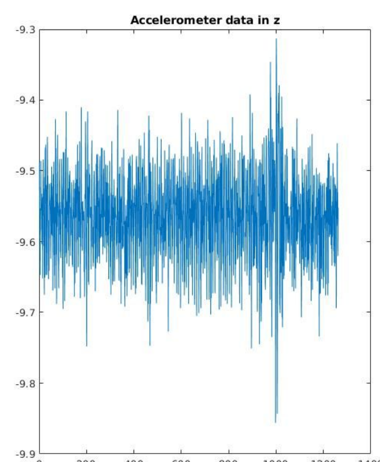
Noise Characteristics of the IMU data

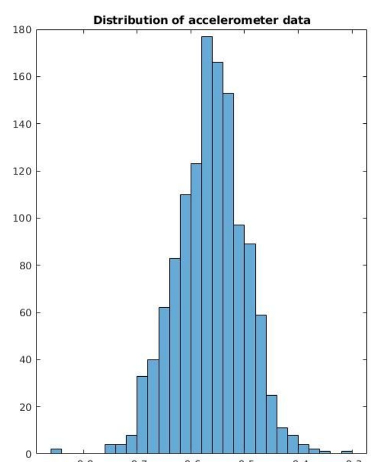


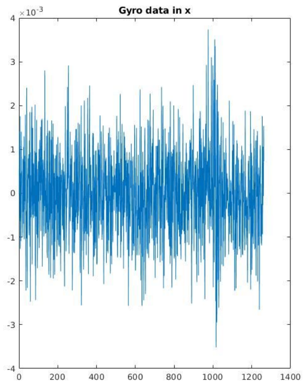


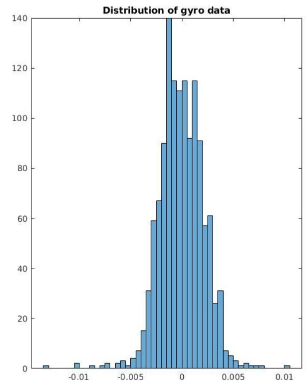


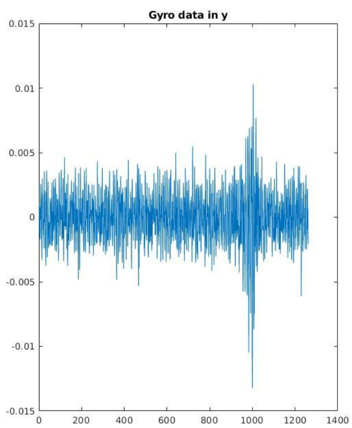


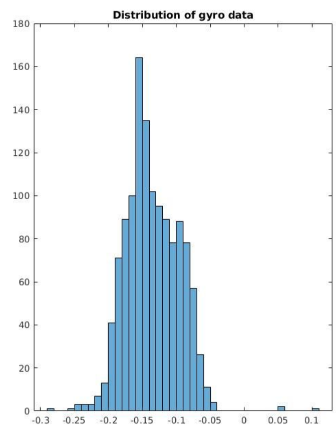


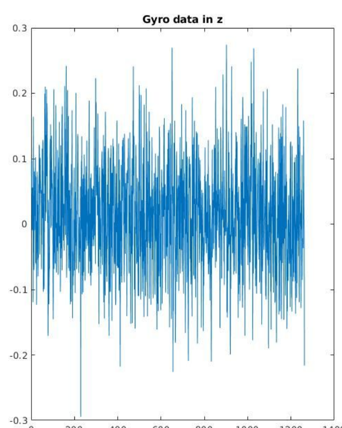


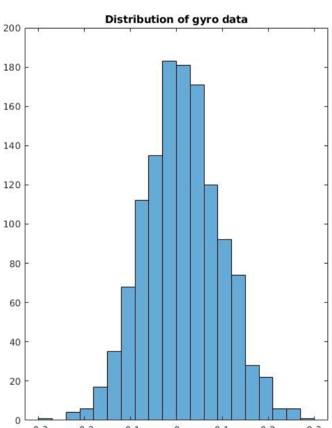

Gyro data in x
×10⁻³

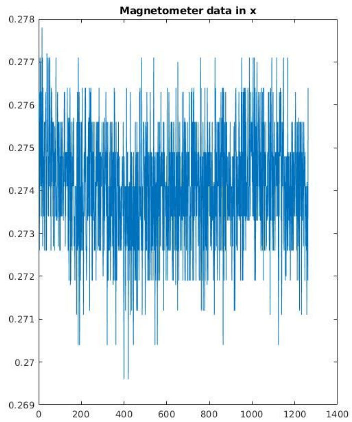

Distribution of gyro data

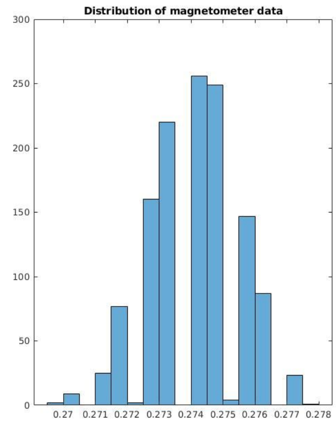

Gyro data in y

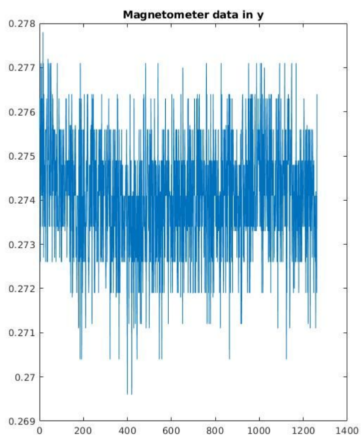

Distribution of gyro data

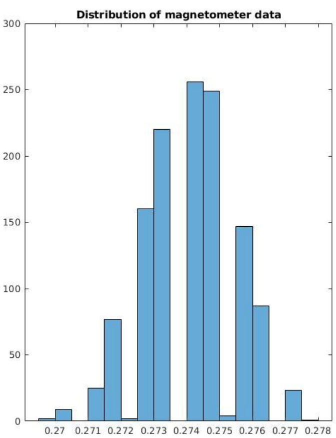

Gyro data in z

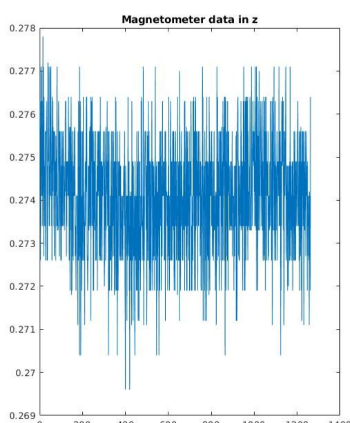

Distribution of gyro data

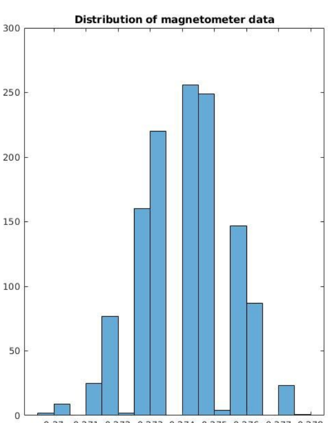

Magnetometer data in x
0.278
0.277
0.276
0.275
0.274
0.273
0.272
0.271
0.27
0.269
0
200
400
600
800
1000
1200
1400

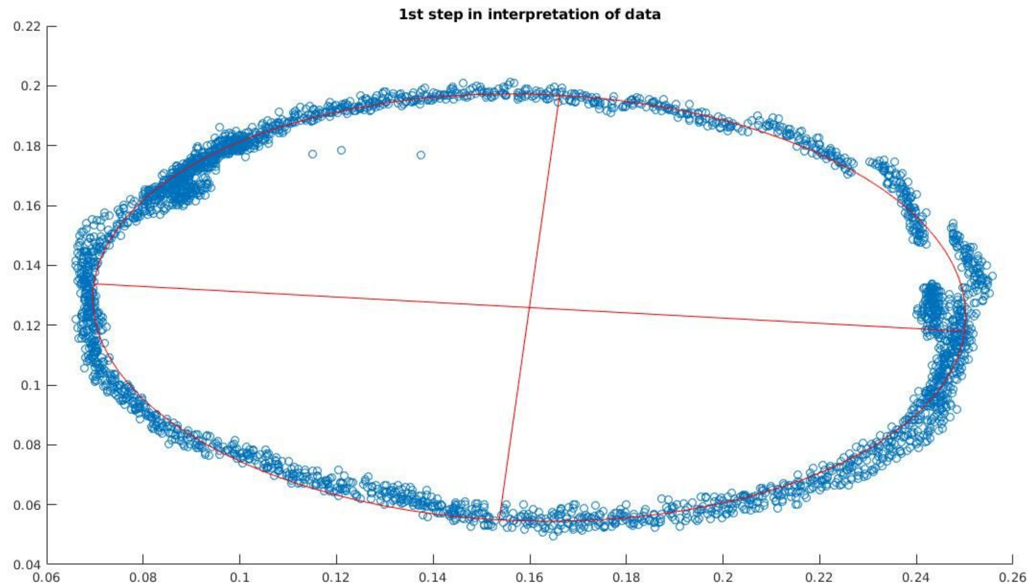

Distribution of magnetometer data
300
250
200
150
100
50
0
0.27
0.271
0.272
0.273
0.274
0.275
0.276
0.277
0.278


Magnetometer data in y
0.278
0.277
0.276
0.275
0.274
0.273
0.272
0.271
0.27
0.269
0
200
400
600
800
1000
1200
1400

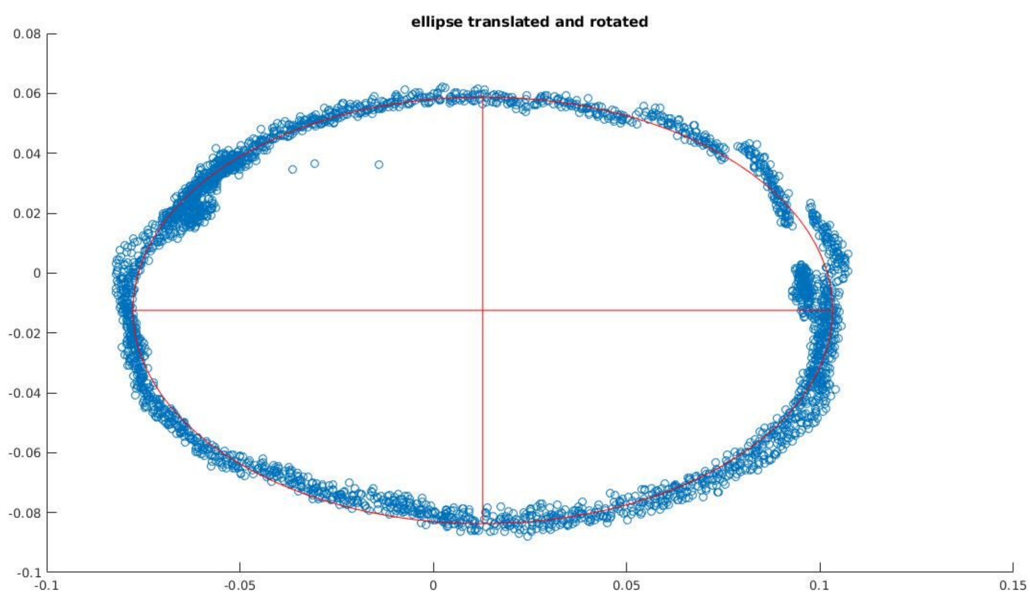

Distribution of magnetometer data
300
250
200
150
100
50
0
0.27
0.271
0.272
0.273
0.274
0.275
0.276
0.277
0.278


Magnetometer data in z
0.278
0.277
0.276
0.275
0.274
0.273
0.272
0.271
0.27
0.269
0
200
400
600
800
1000
1200
1400

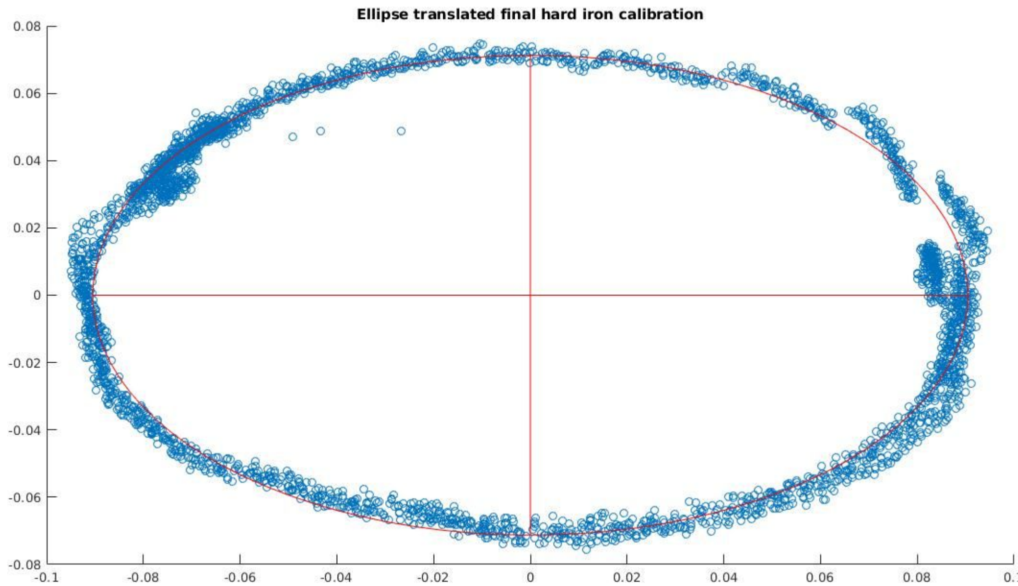

Distribution of magnetometer data
300
250
200
150
100
50
0
0.27
0.271
0.272
0.273
0.274
0.275
0.276
0.277
0.278



This is the initial interpretation of the ellipse.
When we scatter plot the mag X vs mag Y data, we get a nearly elliptical shape.
We use fit_ellipse to interpret the data to perform subsequent transformation and scaling for hard iron and soft iron.

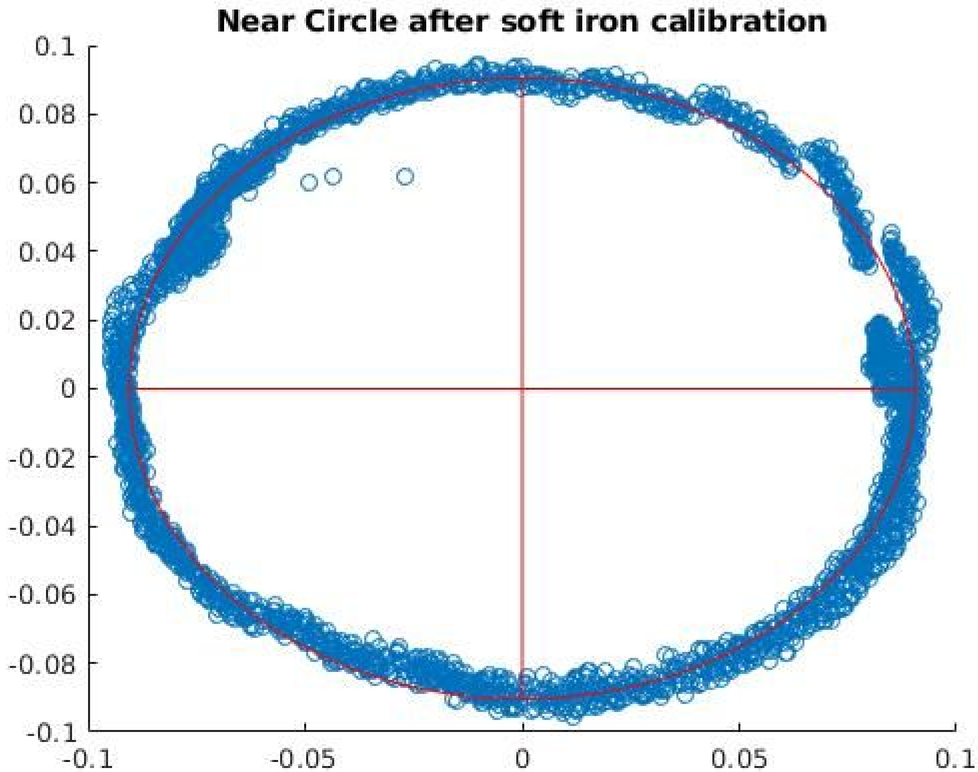


This is the previous ellipse translated and rotated.



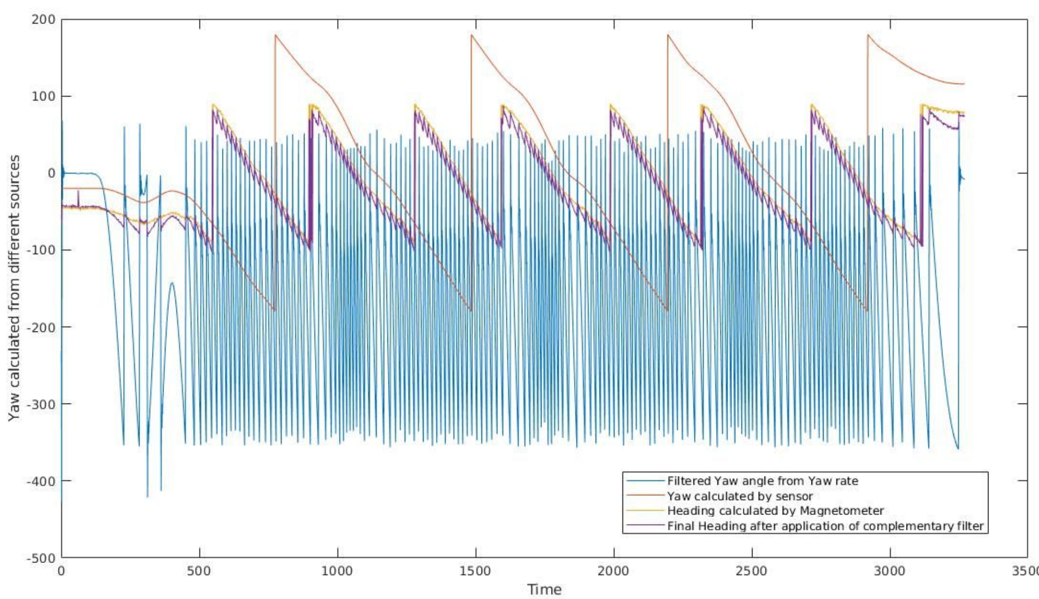
This is hard iron calibrated ellipse.

Now when the center is at (0,0) we notice how we can just warp the ellipse using transformation and scaling

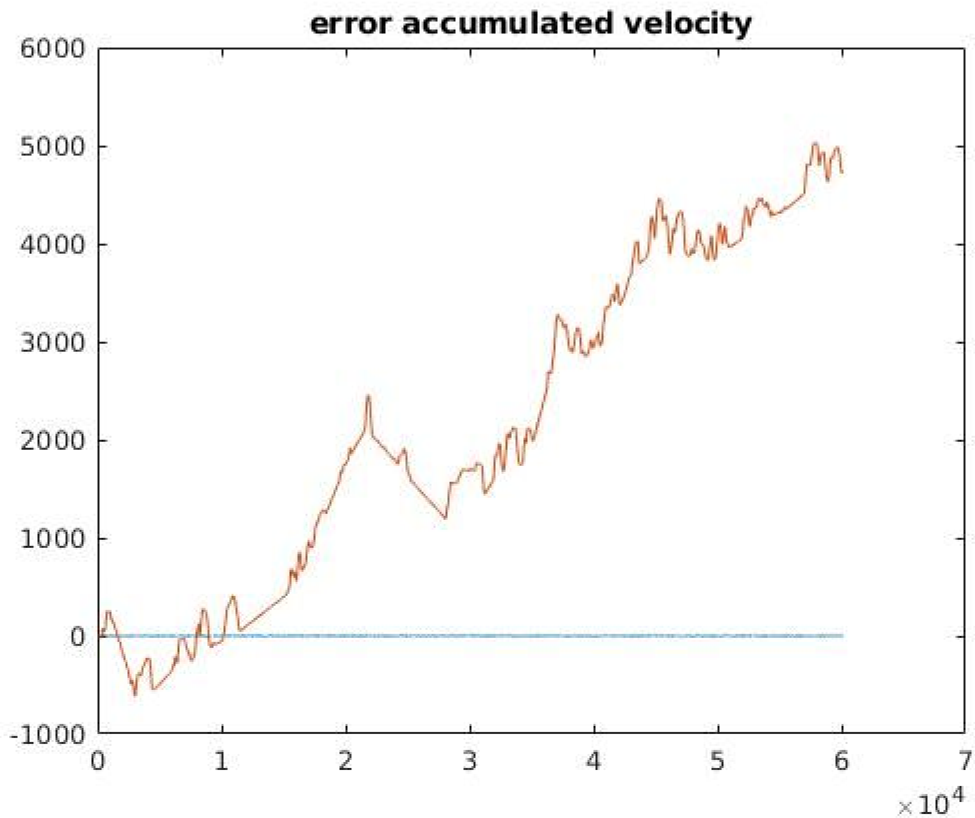


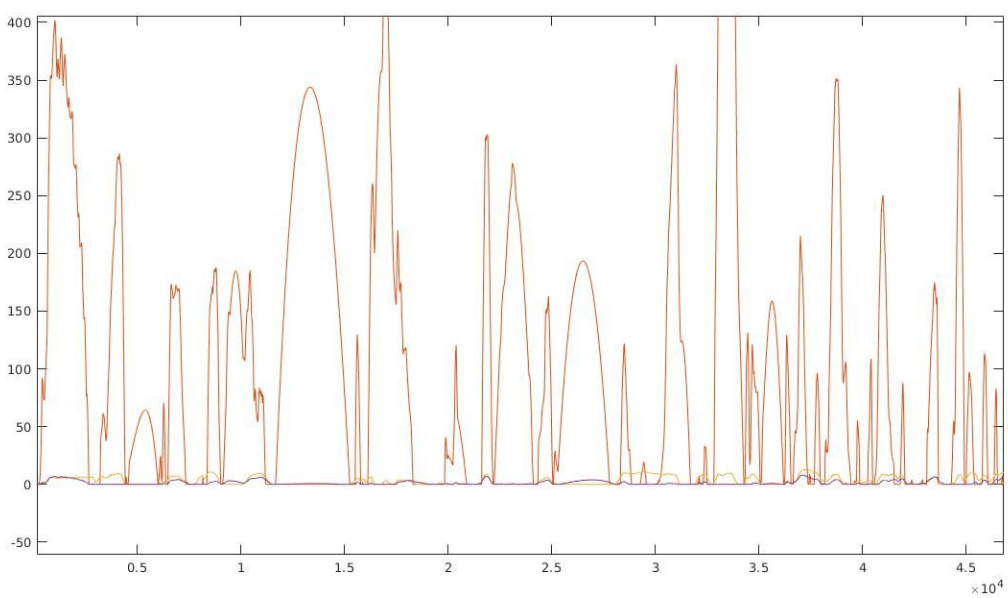
This is the soft iron calibrated result of the reading. Notice how the axis are of same length which gives a near circular result.

Now we get the yaw calculation readings from the different sources.

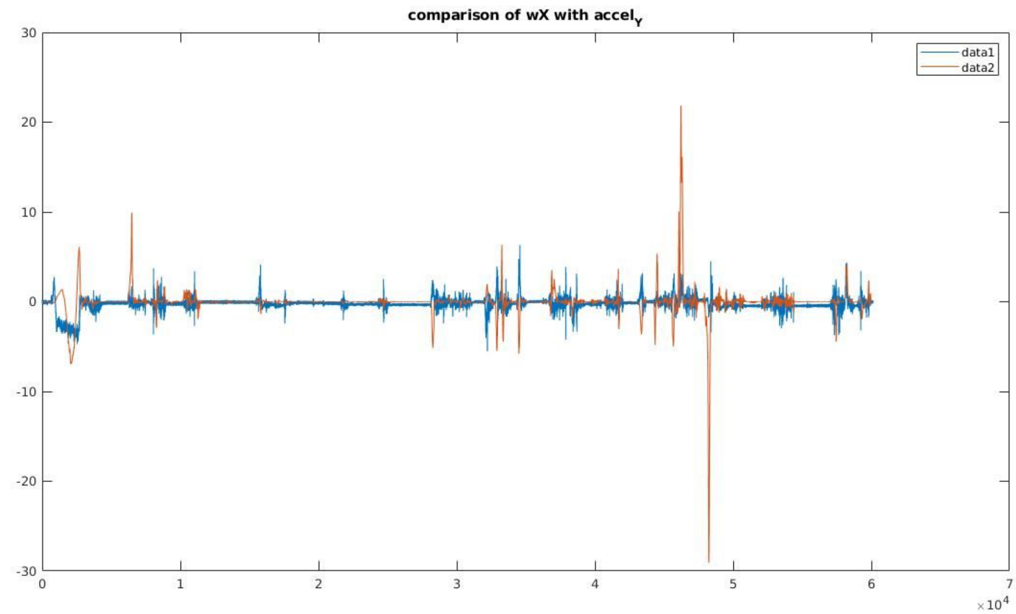


We notice that there is a certain offset in the yaw data, but the it seems to agree for most of the values after using the complementary filter.
Error Accumulated Velocity Plots

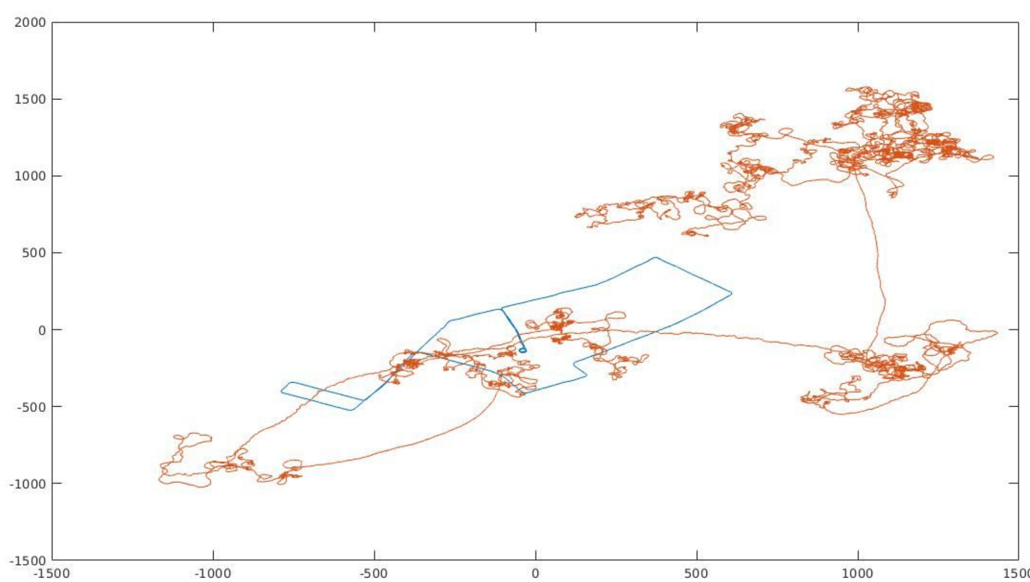




For adjusting velocity we use a model which denotes the baseline estimation for drift and error accumulation. There are similar algorithms like BEADS used in this estimation.
Scaled and adjusted velocity plots of both IMU(yellow) and GPS(purple).
Comparison of w$\dot{X}$ and $\ddot{y}$



GPS plot of trajectory



Comparison of GPS plot and IMU plot