Estimator Project Writeup

Determine the standard deviation of the measurement noise of both GPS X data and Accelerometer X data

I imported two columns of sensor measurements generated by gyro and accelerometer separately into Excel and compute the standard deviation for the two columns of data.

Implement a better rate gyro attitude integration scheme in the `UpdateFromIMU()` function

If we don't use the small Euler angle assumption, then we have to use a matrix to convert the body rate (quantities measured from by gyro) to the time rate of the Euler angles. Then we numerically integrate the roll, pitch and yaw angle. We also have to make sure that the yaw angle is within -pi and pi.

Implement all of the elements of the prediction step for the estimator.

In the state update step, The state include the drone position, velocity and the yaw angle. Using the numerically integration, I updated the position using the current velocity. Then convert the acceleration in body frame to inertial frame. Then I used the acceleration to update the velocities.

Then in the prediction step, the mean vector is given by the state update as described above. The updated covariance is given by $G_t'\Sigma_{t-1}{G_t'}^T + Q$.

Implement the magnetometer update.

Linearize the observation function of the magnetometer around the current state. Compute the linearized matrix and measurement prediction based on current state (zFromX).

Implement the GPS update.

Linearize the observation function of the GPS around the current state. Compute the linearized matrix and measurement prediction based on current state (zFromX).