ELEC 5660 Proj1_Phase1

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1. Controller parameters

I choose the PD controller, the parameters are all the same for the three trajectories:

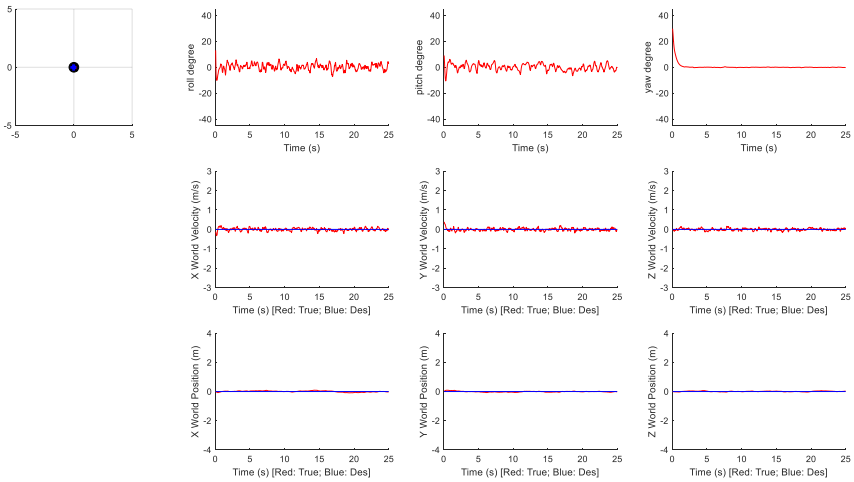
$$k_p[x, y, z] = [3, 50, 200]$$

$$k_d[x, y, z] = [7, 70, 300]$$

$$k_p[\phi, \theta, \psi] = [2000, 1000, 500]$$

$$k_d[\phi, \theta, \psi] = [100, 100, 200]$$

2. The figure and data for hover trajectory:



The RMS results for the position and velocity are:

$$RMS_x = 0.0427,\quad RMS_y = 0.0334,\quad RMS_z = 0.0239$$

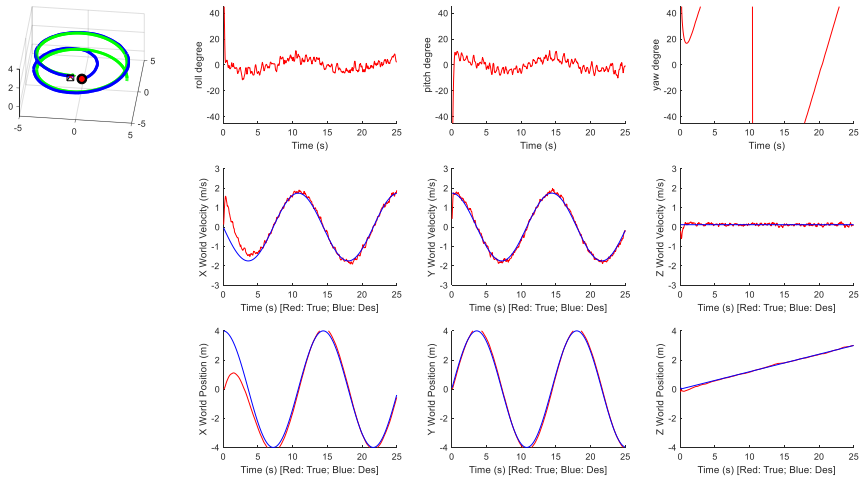
$$RMS_{vx} = 0.0765,\quad RMS_{vy} = 0.0725,\quad RMS_{vz} = 0.0556$$

3. The figure and data for circle trajectory:

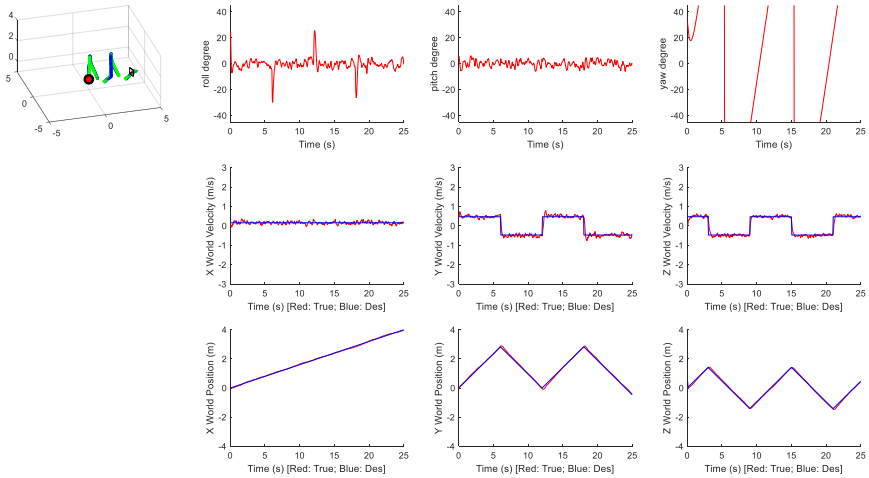
The RMS results for the position and velocity are:

$$RMS_x = 0.0427,\quad RMS_y = 0.0334,\quad RMS_z = 0.0239$$

$$RMS_{vx} = 0.0765,\quad RMS_{vy} = 0.0725,\quad RMS_{vz} = 0.0556$$



4. The figure and data for diamond trajectory:



The RMS results for the position and velocity are:

$$RMS_x = 0.0294,\quad RMS_y = 0.0634,\quad RMS_z = 0.0638$$

$$RMS_{vx} = 0.0697,\quad RMS_{vy} = 0.1370,\quad RMS_{vz} = 0.1217$$

5. Parameters studies

If turn up kp to a large value, the state will oscillate. If continue to turn up kp, the state will diverge. If trun up kd, the overshoot will be decreased. If continue to turn up kd, the state will diverge at start.