# Proj1phase3 Report

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## 1. Introduction

There are four maps for path planning. Two of them are in 2D space and the others are in 3D space. The PD parameters of the controller remain the same as those in Proj1phase1.

$$k_p[x, y, z] = [3, 50, 200]$$
$$k_d[x, y, z] = [7, 70, 300]$$
$$k_p[\phi, \theta, \psi] = [2000, 1000, 500]$$
$$k_d[\phi, \theta, \psi] = [100, 100, 200]$$

I apply minimum-snap trajectory method to generate trajectories because it can generate more smooth trajectories than polynomial method.

The procedures to run programs are shown in the README.md file. The source figures are in the same directory.

## 2. Result

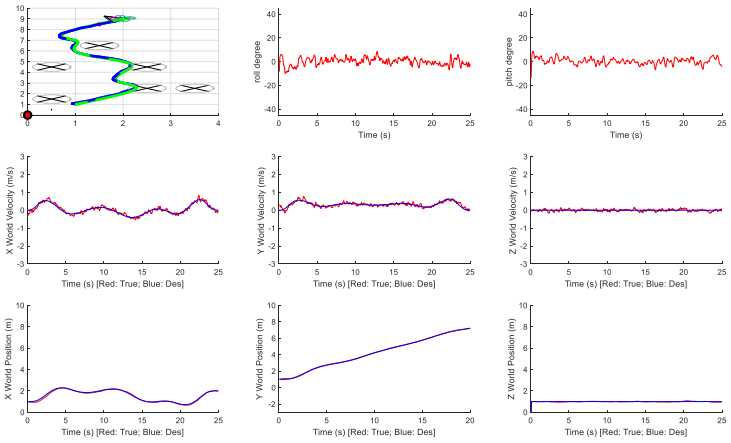


**Figure 1:** Map1 in 2D space (1, 1) → (2, 9)

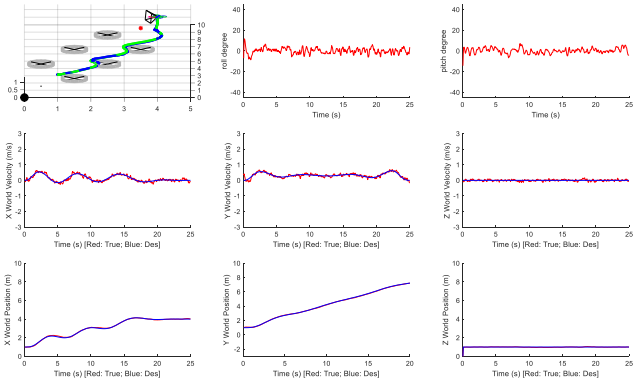


**Figure 2:** Map2 in 2D space (1, 1) → (4, 9)

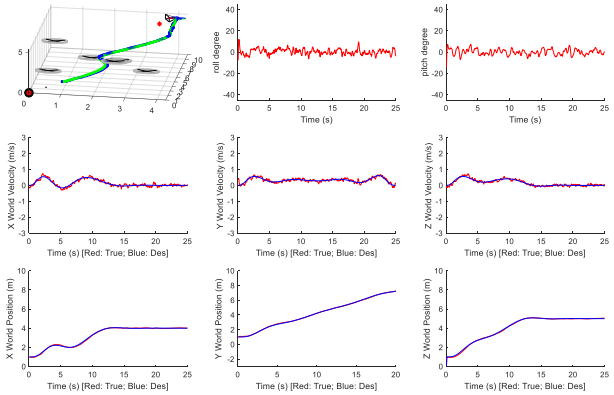


**Figure 3:** Map3 in 3D space (1, 1, 1) → (4, 9, 5)

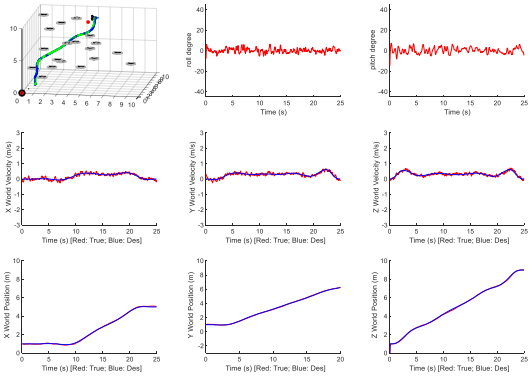


**Figure 4:** Map4 in 3D space (1, 1,1) → (5, 8, 9)

# 3. Analysis

In some simulation, the robots will interfere with the cylinders. The reason is that we consider the obstacles as particles so the robot can approach the obstacles in some time. To solve the problem, we can place more particles near the obstacles.