Project 1 Phase 2

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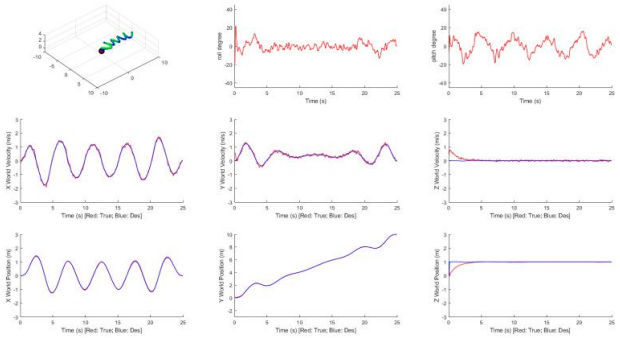
1. Brief introduction

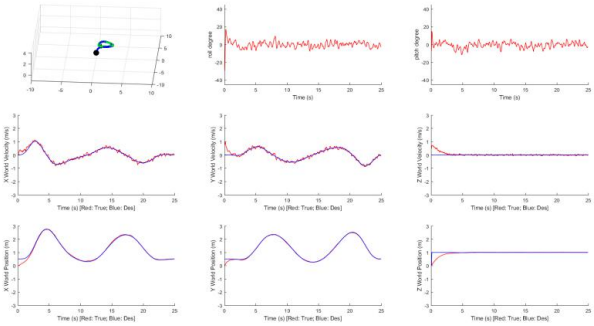
I used minimum snap trajectory generation with 7^{th} spline. And I use unconstrained QP to obtain parameters with position, velocity and acceleration constraints.

2. Figures

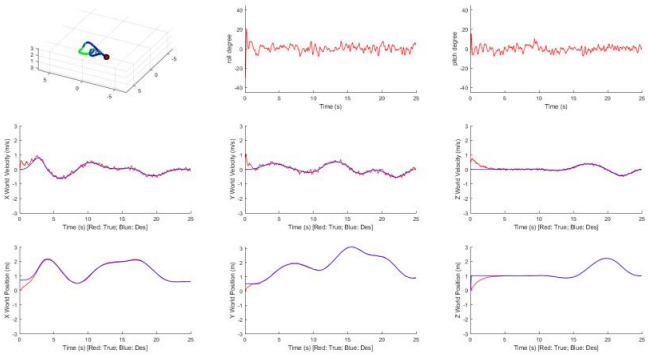
Path_1:



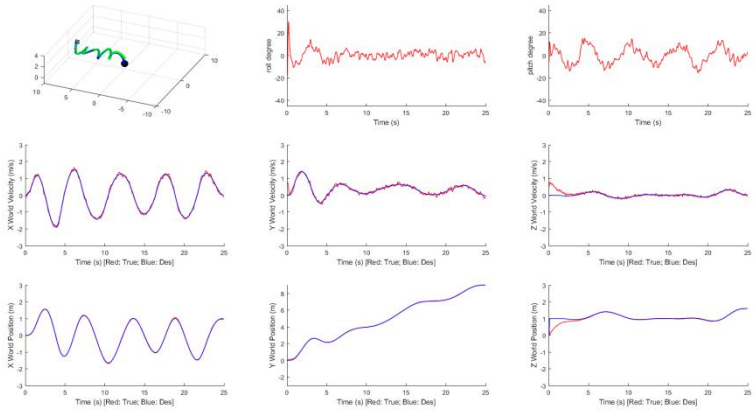
Path_2:



Path_3(self-defined):



Path_4(self-defined):



3. Statistics of RMSE

	Position_RMS	Velocity_RMS
Path_1	0.25893	0.1791
Path_2	0.19245	0.20363
Path_3	0.20908	0.21373
Path_4	0.24559	0.17399

4. Analysis

In this task, I choose minimum snap as solution, which means seventh spline to describe trajectory. I used unconstrained QP solver by myself instead of "quadprog" function in Matlab. Given k segments, I firstly calculated Q matrix and Mapping matrix according to 7^{th} spline. Then I choose position, velocity and acceleration constraints for continuity so that I have total $6k$ constraints and $3k+6$ non-repeating constraints. According to projection, I wrote C matrix and then calculated R matrix and d_F, d_P . Therefore, I obtained the final parameters according to unconstrained QP.

5. Other thoughts

During the programming period, I tried constrained QP solver and found it's less efficient than the unconstrained one. If we focus more on calculation efficiency, we can choose unconstrained QP solver.