16.30/31 Lab 2

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1 Executive Summary

The Pole-Placement Controller outperformed manual PID tuning in the key metrics of Mean Tracking Error and maximum Deviation. The error growth was negative for both cases due to the high initial error, which resulted in the first cycle error appearing larger than the rest. Ignoring this initial error (caused by bad positioning at the path start location), both controllers exhibit similar error growth. However, it should be expected that PID error accumulation will be worse in most cases. While neither controller met all of the requirements, the Pole-Placement controller was much closer to following the target trajectory.

In terms of design time, Pole-Placement is vastly superior. Where the PID tuning took well over 3 hours and dozens of iterations, the Pole-Placement could be done in less than an hour and only a few iterations. It should be noted that well over 15 hours and multiple sets of hardware (i.e. Tello Drones) were spent trying to achieve even passable performance using either of the controllers. This was mainly due to hardware problems but is cited as an explanation for the lack of concrete design time quantities.

Final Recommendation: AeroTech should use a Pole-Placement Controller for the Navy contract.

2 Plots

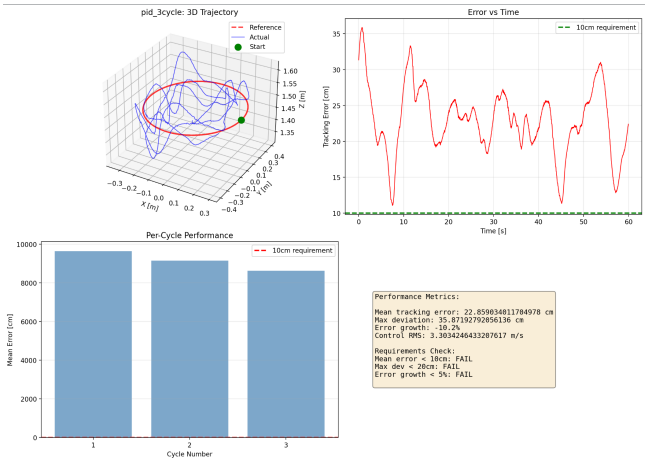

Figure 1: PID Controller

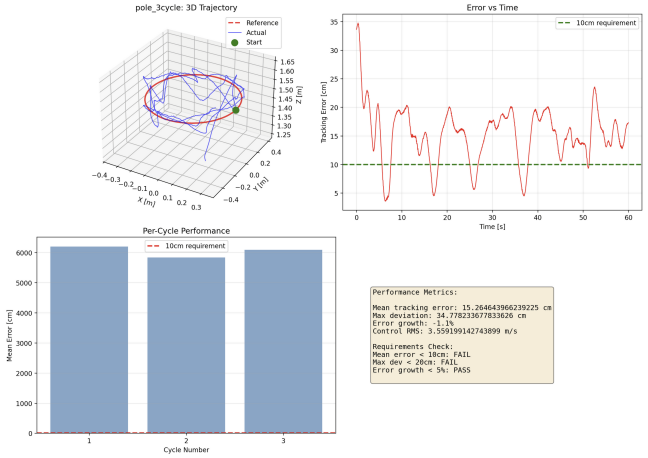

Figure 2: Pole-Placement Controller