

ME 410 - Week 5 Summary

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Summary

This week's objectives were to implement PID control for only the pitch angle, PID control for only the roll angle, and PID control for both pitch and roll angles.

After we set up the test rig, we began adjusting the gain combinations for the PID controller and observing how the drone responds to joystick commands as well as tilting. We settled on proportional, derivative, and integral gains of 10, 2, and 0.1, respectively and obtained the plot shown below. The response is slightly slow, but could be sped up by adjusting the controller gains if necessary.

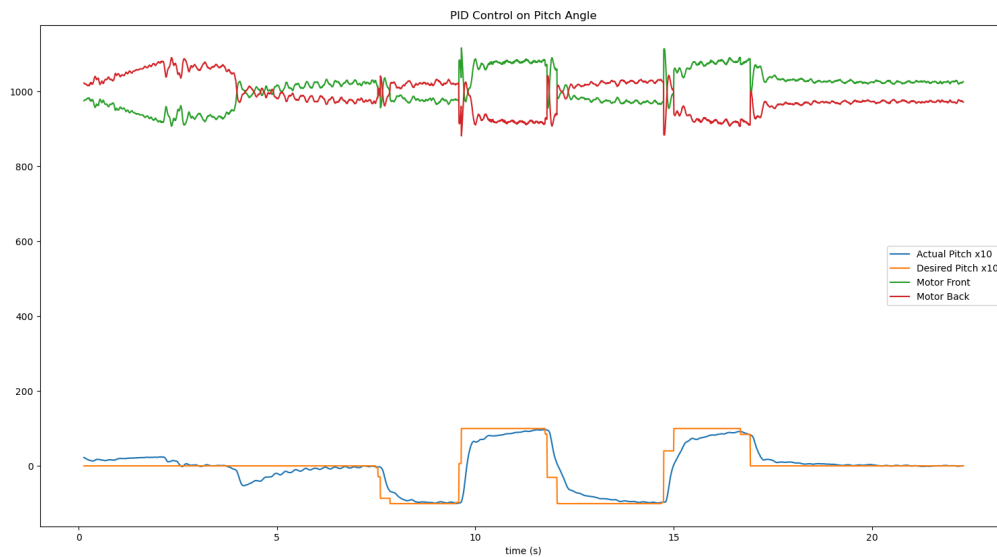


Figure 1: PID Control for Pitch Angle

Next, we moved on to PID control of the roll angle. Before testing the controller gains, we set up a few lines of code to convert the roll joystick values to degrees and add the contributions of the roll PID controllers components with the proper signs to the thrust calculations. We started testing with the pitch gains as a starting point and adjusted them accordingly and ended with gains of 12 (P), 2.5 (D), 0.1 (I) and some testing results are captured

in the plot below. Like with the pitch angle, the response is slightly slow but can be accounted for by adjusting gains.

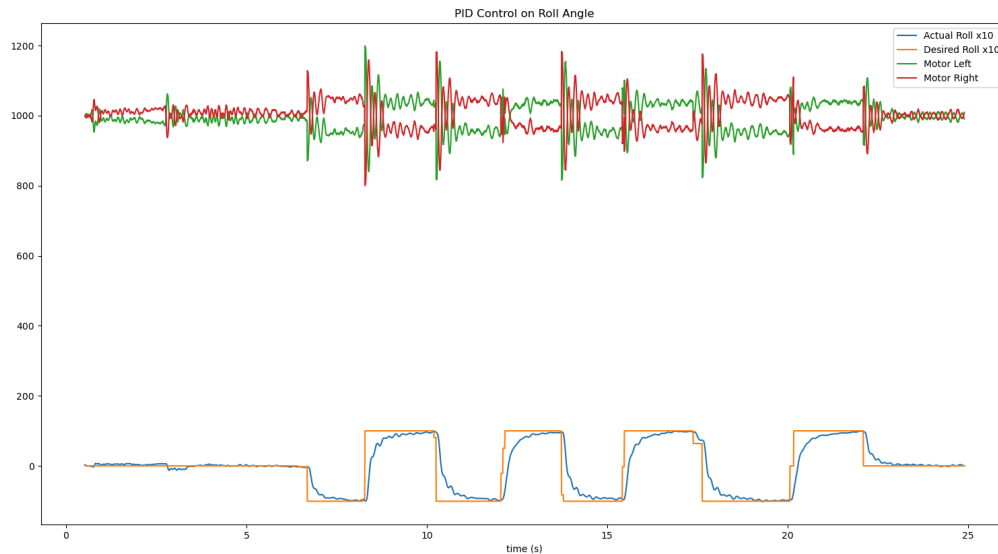


Figure 2: PID Control of Roll Angle

With both PID controllers working by themselves, we turned on both sets of gains and tested the combined controller by moving the joystick and tilting the drone to make sure the thrust-induced torque from the motors is correct to move the drone to the desired orientation. In addition to testing the combined PID controller, we added a pause command for the A button and an unpause command for the Y button on our controller so we can turn our motors on and off.

Assessment - What Went Well

I feel like most of the milestones went well this week. We set up the test rig much faster this week and it did not take us very long to tune the controller gains or add the button commands and using the usb drive to move csv files from one laptop to another for plotting has been a big time saver since the person connected to the drone's wifi does not have to disconnect to add files to github.

Assessment - What Did Not Go Well

This week, we did not have many hold-ups or issues. We were able to make steady progress throughout class time and asked for help/clarification if necessary.

Assessment - Adjustments for Next Class

Overall, I think we mainly just need to spend more time tuning our controller. Our responses were slightly slow, which could lead to issues when flying our drone, so we may need to spend a little more time tuning.

Team Member Effort

Me - 49% (Worked on plotting code on my laptop after collect data as csv file; helped Ben with editing our .cpp file; helped with testing setup)

Ben - 51% (We worked on his laptop to edit our .cpp file; saved our data to csv file; helped with testing setup)