

## ME 410 - Week 9 Summary

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### Summary

This week, we continued working on the final milestones for this quarter, starting with autonomous yaw control.

Picking up from where we left off last week, we continued tuning our autonomous yaw controller. In the previous week, we confirmed that the new proportional controller was generating yaw speeds for our yaw controller in the correct direction, but still needed proper tuning. We began testing the autonomous yaw control in ground effect with different gains to see how well the drone could track angles. We found a few gains that would work, but the drone response was slightly slow. After increasing the gain to 3.75, the yaw angle tracking was much better and a plot of the angle between the ArUco marker and the camera was generated.

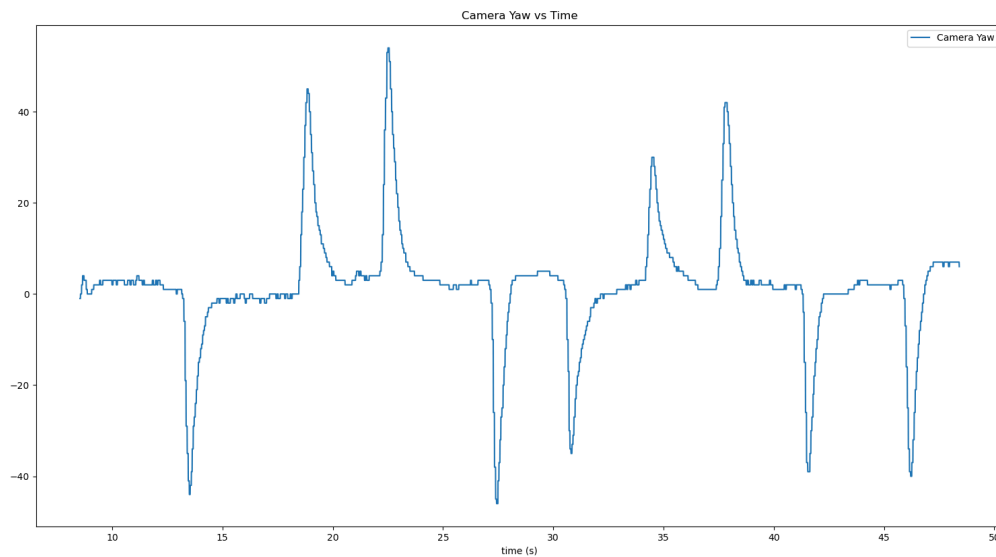


Figure 1: Auto Yaw Testing Results

Even when the angle changes rapidly, the drone is quick to correct itself and get close to 0 yaw error.

After completing the autonomous yaw milestone, we shifted our focus to the autonomous x, y milestone. To start, P controllers were added for x and y positions that calculate desired roll

and pitch angles that are fed into the respective controllers. Before starting the tuning process, we disabled neutral thrust and ran the drone while moving the marker to confirm that the signs were correct in our controller math. After this confirmation, we began tuning the proportional controllers. The tuning process for these controllers was difficult. We would move the marker to test, and the drone would sometimes tip over because the desired angle was too high or the drone would move towards the marker and not be able to stop once it reached it. We spent a large portion of class time tuning our proportional gains, but had no luck getting better results outside of the drone moving towards the target and not being able to stop itself. We decided that we should add the derivative components to the controller to provide some damping. At this point, we have added the derivative control compensation, but need to test and tune.

### **Assessment - What Went Well**

While this week went better than the week before, I still feel like we could have made more progress. We were able to tune the autonomous yaw control quickly this week after setting up the basic controller last week. We also set up the proportional controllers for x and y quickly this week even though we still need to tune our gains.

### **Assessment - What Did Not Go Well**

Overall, I think we spend too much time trying to get pure proportional control to work for autonomous x, y control instead of beginning to add the derivative control components. We verified that the desired angle directions and magnitudes seemed reasonable and the drone was able to move towards the target, but kept trying to improve performance instead of adding the derivative control components even though we knew we needed some damping.

### **Assessment - Adjustments for Next Class**

Next class, I think we just need to tune our controllers in a better manner. While spending time tuning is useful and necessary, we shouldn't spend too much time tuning a controller if we are going to add other gains to the controller later that will also need to be tuned.

**Team Member Effort**

Me - 52% (Edited .cpp file on my laptop; Kept batteries charging; helped with debugging)

Ben - 48% (Helped with .cpp file; helped with debugging)