SYSEN 5411 Fall 2025

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**Lab 6 Report – PID Control**

**Video A:** Wall Distance - <https://youtu.be/9_D-JTs9Ju0>

**Video B:** Wall Follow - <https://youtu.be/pVg3HicDFD0>

**Reflection:**

The first wall distance run with proportional control only had significant steady state error, but I was able to settle on a K\_p value of around 0.3 that had little oscillation. When I then went to full PID wall distance control, I found I had to decrease that to about 0.2. I started with the 0.05 and 0.02 gain values from the lab document, but I

I found that increasing K\_d to a high number led to significant jerkiness and “hesitation” as the robot moved forwards towards the wall. Increasing K\_i led to high overshoot and a lot of oscillation to recorrect. I noticed that due to internal errors in the motor controllers not being identical, the robot heading tended to drift clockwise from the initially perpendicular to the wall. That drift led to the robot trying to correct for the distance reading going up when in fact the cause of that rise was the angle of incidence on the wall. I thus added the “safety button” so that the while loop would exit when I pressed the onboard button.

For the wall following section, I had to turn the base speed down to 40% and cap the correction at 10% as I was seeing too violent overcorrections. I don’t have any long walls in my apartment, so it was tough to observe steady state, but I was able to find a PID set that had minimal oscillation.

Final PID values

|  |  |  |
| --- | --- | --- |
|  | Wall Distance | Wall Follow |
| K\_p | 0.25 | 0.08 |
| K\_i | 0.06 | 0.0 |
| K\_d | 0.04 | 0.03 |

It took me 5 hours to complete the lab, and I did use AI to help give suggestions on which direction/increments to tune my PID knobs based on the reactions I was seeing. I also got a helpful tip that the max correction should typically be 20-40% of base speed.