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Hand Place Poles:

In order to hand place our poles we simulated the response of the system to determine what poles would give us the best gain values. We choose the poles -8.0 for position and -7.0 for angular velocity. This gave us the gain values of 0.135 and 0.0852. The poles could potentially be moved back further but we decided these were adequate. We then adjusted them slightly to values of 0.14 and 0.09 when implementing the controller in the code.

Results:

The hover copter maintained its position with a small margin of error. Sometimes it would overcompensate and then enter a momentary oscillating state but then restabilize. It never went too far past its set point or fell back down. Overall, implementing the hand places poles were a success. There could be some things that could be improved. For example we created a delay for each time we update in order for the encoder to give an accurate reading of the pwm just generated. This delay could potentially be minimized in hopes that it could maintain stability longer and have less oscillating states. The poles could also potentially be adjusted some but we did get our best results with the poles above.