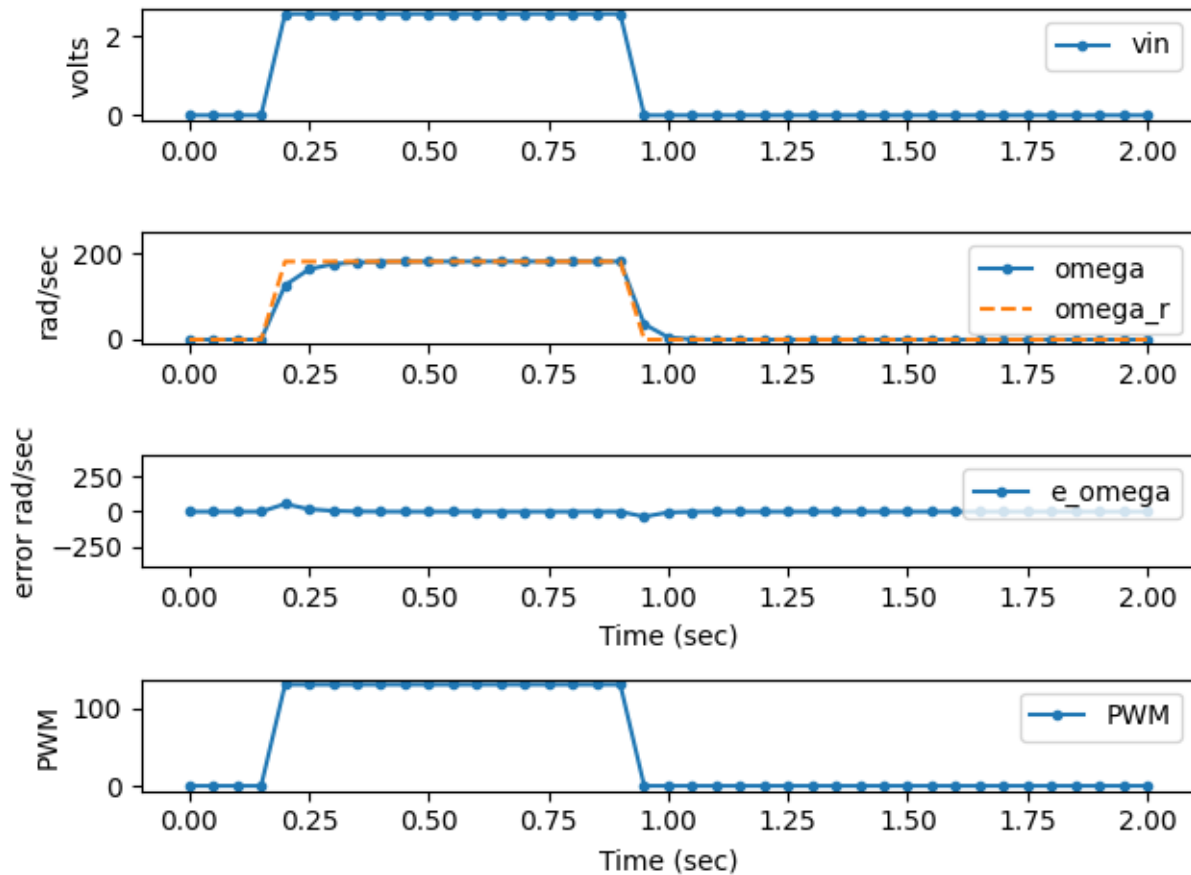


1)

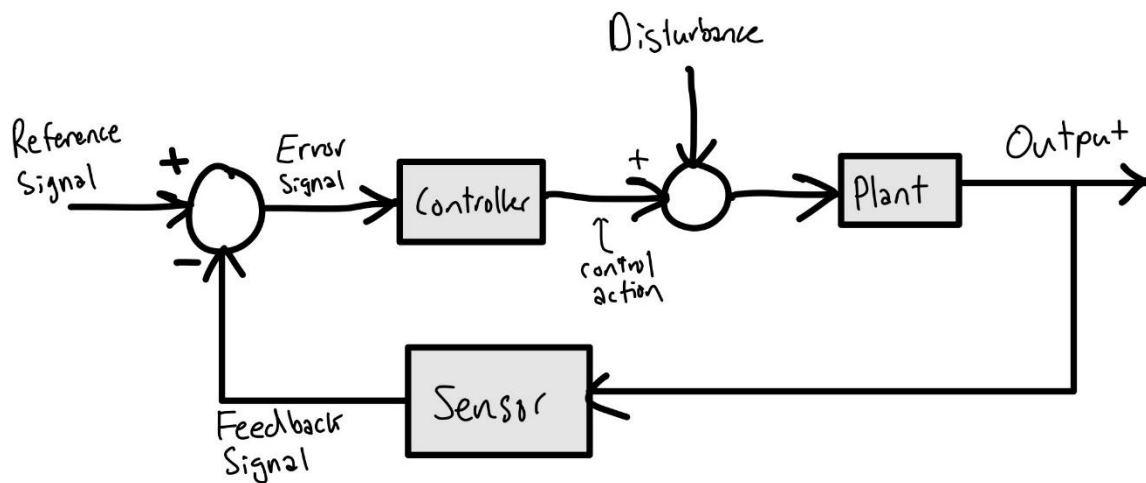


2)

| Simulation vs Experimental Results |                            |               |                  |                |               |
|------------------------------------|----------------------------|---------------|------------------|----------------|---------------|
| Experimental Omega [rad/sec]       | Simulation Omega [rad/sec] | Percent Error | Experimental PWM | Simulation PWM | Percent Error |
| 211                                | 211.08                     | 0.03%         | 140              | 163.12         | 16.51%        |
| 241                                | 241.1                      | 0.04%         | 160              | 182.16         | 13.85%        |
| 273                                | 272.97                     | 0.01%         | 180              | 202.47         | 12.48%        |

The results indicate that the experimental and simulated values are very close. The simulated PWM values increase by nearly 20, which is close to what they should change by.

3)



- Reference Signal: The desired value (PWM, or end result) that the system should have
- Feedback Signal: A signal from the sensor indicating the current value of the system
- Error Signal: The difference between the reference and feedback signal, how far off the system is from the desired value
- Controller: Used to change the value of the system
- Control Action: The action that is taken by the system to get closer to the desired value, could be through PID control
- Disturbance: Any other factors that can affect the value of the system or have an impact on the value
- Plant: The physical system that is being controlled, such as a motor or a valve
- Output: The physical result of the closed loop system
- Sensor: Typically an encoder or some sort of measuring device that is used as a feedback signal to find the error signal of the system

With a very noisy sensor, closing the loop will result in values that oscillate quite frequently at steady state, all while trying to achieve the target value. However, an advantage is that if the motor changes characteristics, the feedback system can account for it and make the necessary changes, while with an open loop system, this cannot be done, and the value could be significantly different from what it needs to be at.