Vocabulary

* PWM = pulse width modulation
  + Same cycle != same speed
* Duty cycle = percent of the time that the motor is running
  + Describes the amount of on time for motors
* Steady state error = error that exists even after a system has settled down

Variables

* Control Variable = duty cycle of the PWN signal that drives the motor
* Process Variable = feedback value returned by system to control
  + Ex. could be current angle or state of the thingy
* Set Point = value you want
  + Ex. target position
* Error = difference between set point and process variable
  + Difference between current and target

Implementation

* Proportional
  + Apply power to motor proportional to the current error (ex. amount of power decreases as you get closer to target, increases if you get farther away)
  + Done by multiplying error as a function of time and a constant
    - CV = Kp \* e(t)
    - Pick Kp carefully – balance between overshooting and undershooting
      * Determined by testing (?)
* Integral
  + With just P, position will not quite reach target cause needs to factor in friction and gravity
  + Calculate integral of accumulated error signals since t = 0
  + Also multiply by Ki
  + Equations for PI:
    - E(t) = setpoint – process
    - Integral = integral + error
    - CV = Kp\*Error + Ki\*Integral
* Derivative = error – Last error
  + Basically accounts for how error changes over time (de/dt)
  + Multiply by constant by Kd 🡪 also found by testing (?)
  + Equation for PD
    - CV = (Kp\*e(t)) + Kd\*derivative
* PID
  + CV = Kp\*e(t) + Ki\*integral(e(t)dt) + Kd\*(de/dt)