Intro to PID

Vanderbilt Robotics: Programming Workshop #1

Your Challenge

- Move a motor to a certain position
- Use a potentiometer to read current position and provide feedback
- Use H-Bridge to drive motor output

Keys Terms

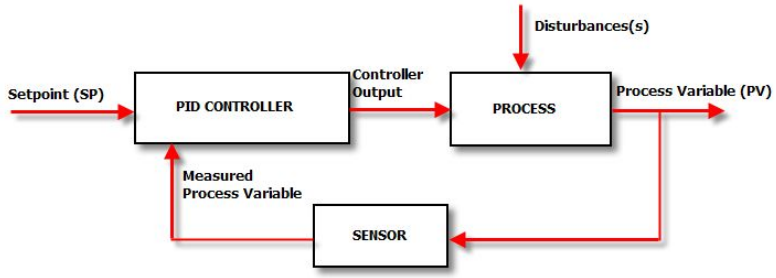
- Process: The physical system being controlled
- Setpoint (SP): The desired state of the system
- Control Variable (CV): The output of the PID controller given to the process
- Process Variable (PV): The sensor feedback from the process
- Error: The difference between SP and PV; The term fed into the controller

What is PID?

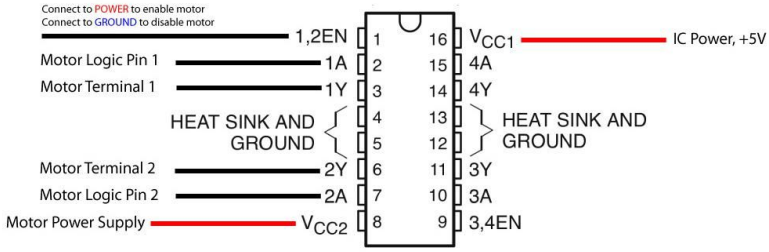
- Industrial control technique for using process feedback to drive output
- **P**roportional, **I**ntegral, **D**erivative

$$u(t) = K_\mathrm{p} e(t) + K_\mathrm{i} \int_0^t e(\tau)\,d\tau + K_\mathrm{d} \frac{de(t)}{dt}$$

- Kp drives PV towards SP when far away and diminishes as error approaches zero
- Ki builds up output overtime to correct for steady state error
- Kd slows down changes in PV to cause convergence towards SP



L293NE or SN754410



EN	1A	2A	FUNCTION
H	L	H	Turn right
H	H	L	Turn left
H	L	L	Fast motor stop
H	H	H	Fast motor stop
L	X	X	Fast motor stop

L = low, H = high, X = don't care

Arduino Programming Example

https://github.com/vanderbiltrobotics/workshop1

How to Deploy Code

1. Connect Arduino to computer with a USB cable
2. Go to Tools>Board and pick “Arduino/Genuino Uno”
3. Go to Tools>Port and pick the Serial Port
4. Click Upload