A

MOE University

Course

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The Miracle Workerz, FIRST Team 365

First State Robotics, Inc.
Wilmington, Delaware
www.moe365.org

MOE University

Design of Autonomous Robots

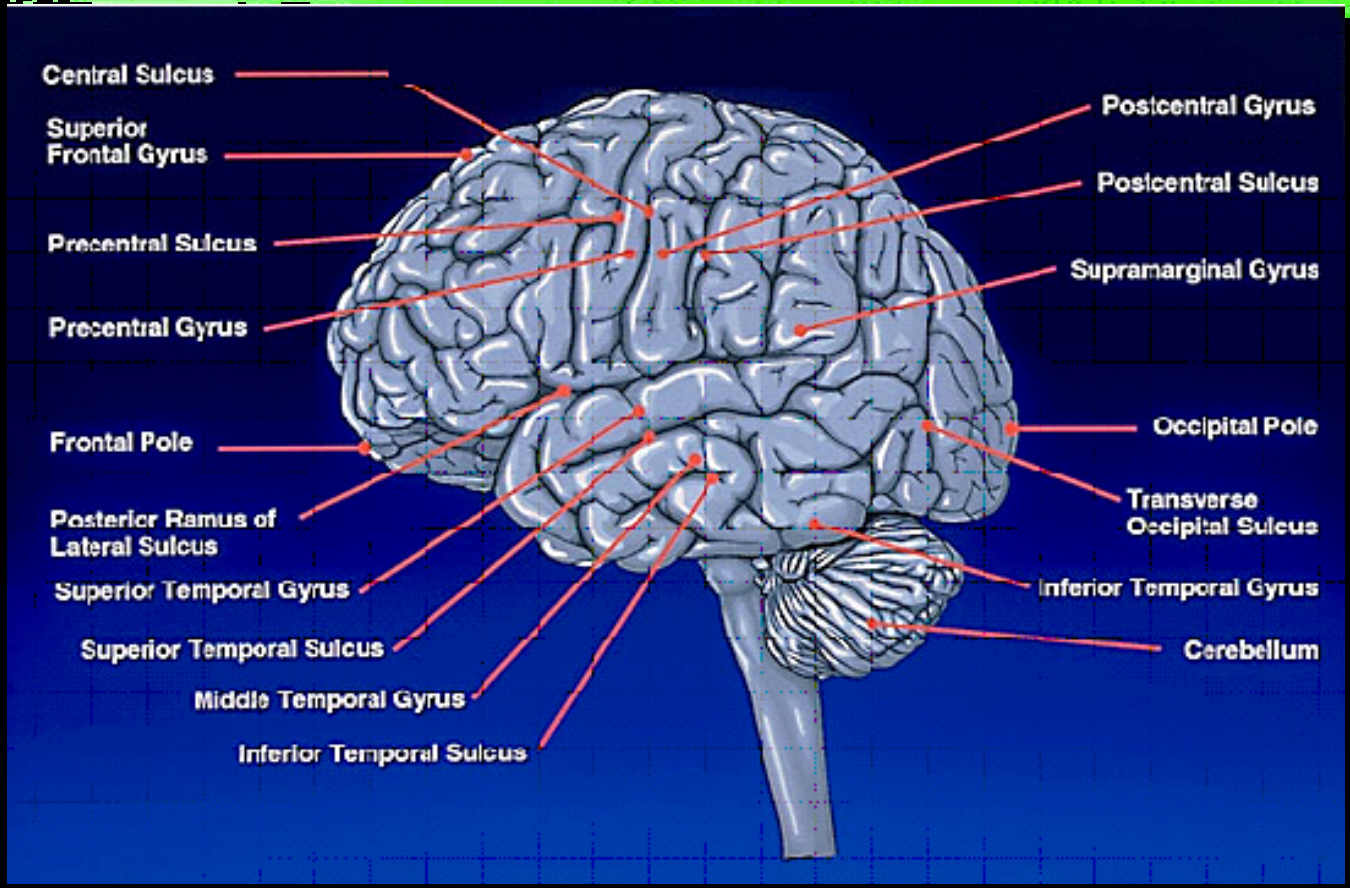
Tonight's Faculty

- Lucie Wilkens
- Mike McQuade

Autonomous Mode

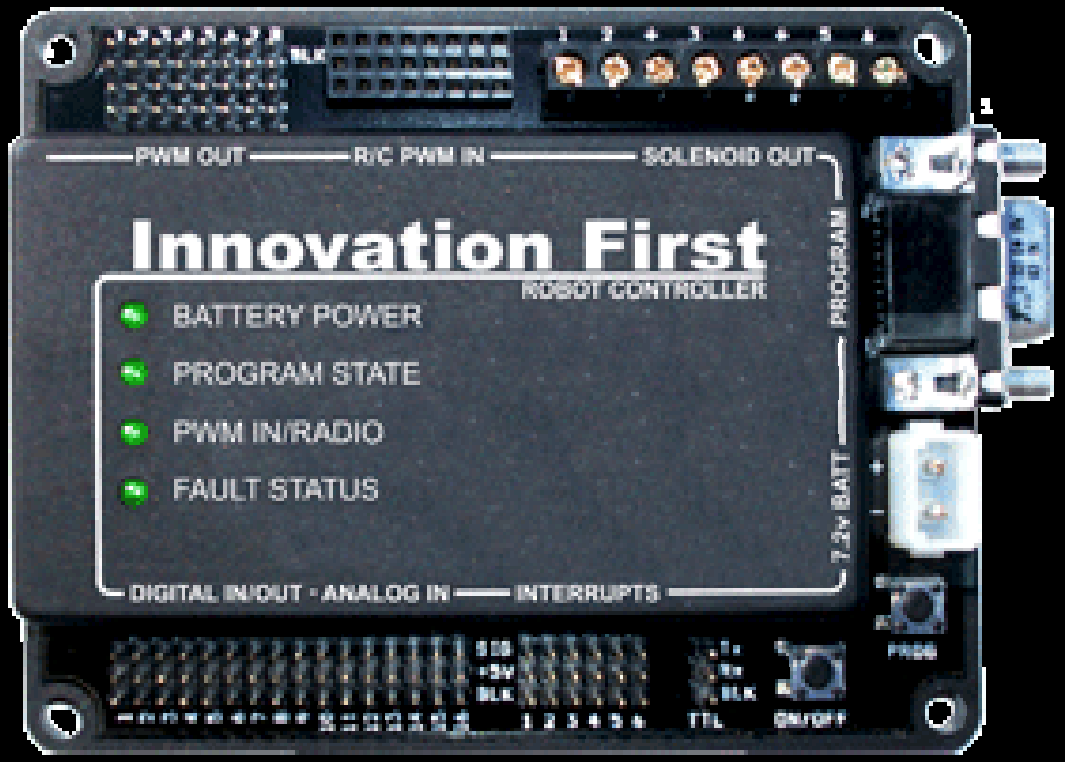
Huh?

Remote Mode Controller



Remote Mode Inputs

Autonomous Mode Controller



Open Loop Control

- Requires no inputs from outside the controller
- Uses predetermined power levels to the motors
- Generally requires a timing function

Open Loop Control

- Advantages
  - Simple
  - Easy to implement
- Disadvantages
  - Non robust
  - Very dependent on robot dynamics
  - Time consuming to tune

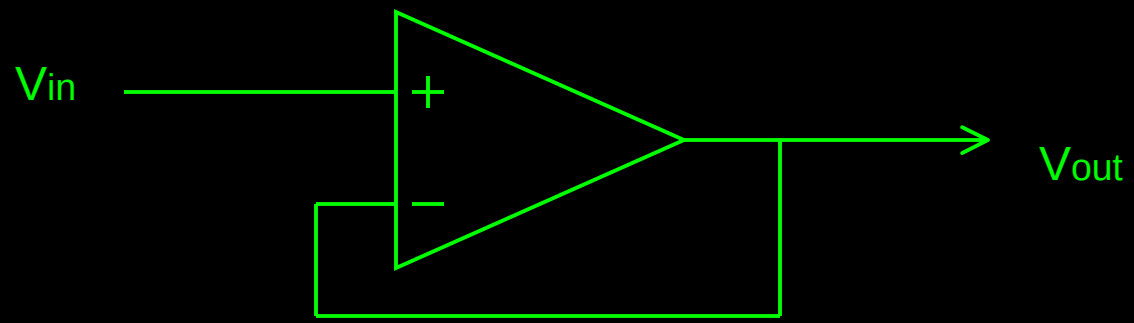
Closed Loop Control

- Uses a feedback scheme to generate corrections
- Requires external sensors
- Amount of correction determined multiple ways
  - Proportional (Analog or Digital)
  - Integral
  - Differential

Closed Loop Control

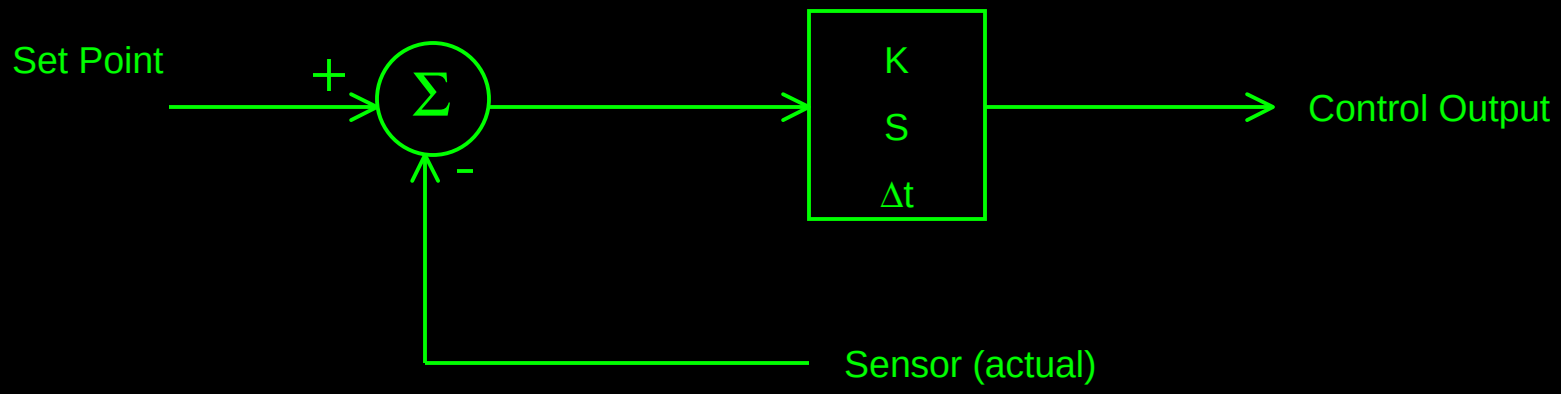
- Advantages
  - Robust
  - Insensitive to robot dynamics
  - Minimal tuning required
- Disadvantages
  - Complex
  - More difficult to implement

Simple Closed Loop Controller



$V_{out} = V_+ - V_-$

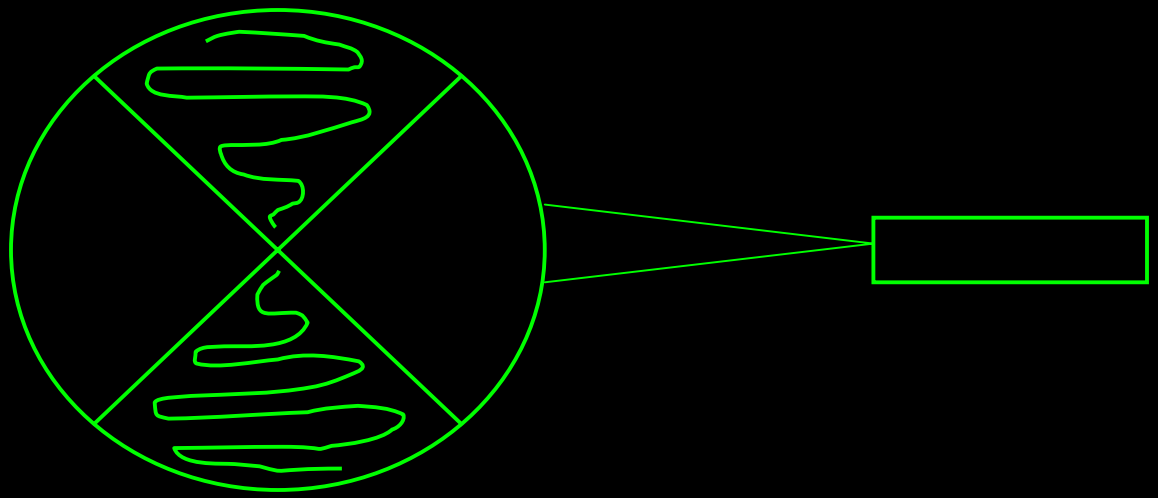
Closed Loop Controller



Useful Things To Know

- Where is the robot
- What direction is the robot pointing
- Is the robot moving
- Where is an object
- What is the object
- Robot position with respect to a reference

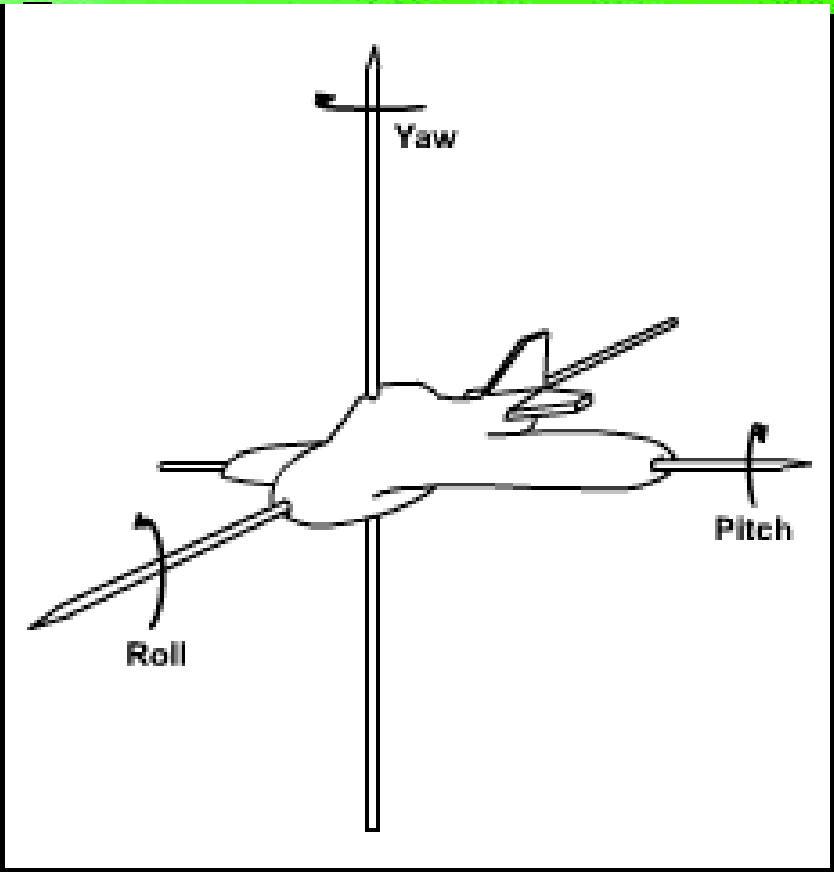
Distance Traveled



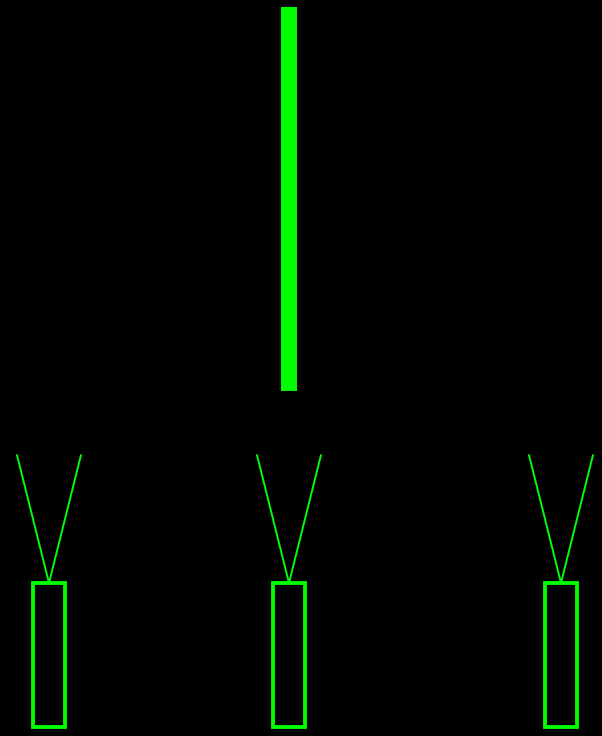
Distance = $\pi d/4$

Angular Position

Three Control Axes



Follow A Line



Position Relative To An Object