Lecture 3-1:   Feedback (Closed-loop) Control

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Objectives:

- Define closed-loop and open-loop control

- Describe the different types of feedback control

- Compare and contrast the system responses based upon the types of control

- Use feedback control to create basic behaviors for a mobile robot

_____ is a means of a getting a robot to achieve and maintain a desired state by comparing the difference between the current and desired state (error).

This is also referred to as _____ because it feeds the output of the robot system back to the controller by using sensor feedback to determine the robot's progress toward the goal.
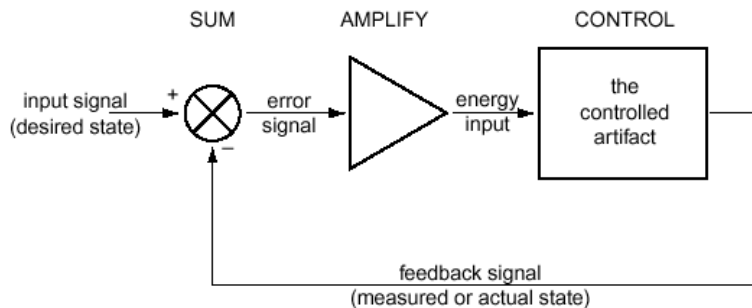
Tuning the controller is the process of selecting the correct gain to quickly minimize the error between the robot's set point and current state. If the gain is too high the system will overshoot or undershoot the desired stated and cause _____.

_____ is the process of systematically decreasing oscillations.
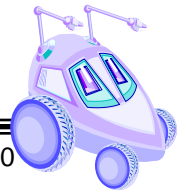
The three most common types of feedback control are:

- _____

- _____

- _____

A **_proportional controller_** with a gain that it too high may experience

- _____

- _____

There are three types of responses based upon controller gain.

1. _____ has the fastest response time but exhibits overshoot

2. _____ has the fastest settling time with slight overshoot

3. _____ has the slowest response time with no overshoot

What can be added to a proportional controller to correct for the **momentum problem** and **_overshoot error_** when the gain is too small?

A **_proportional – derivative controller_** may exhibit _____ errors.
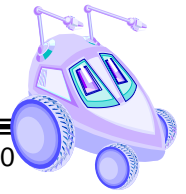
What can be added to a PD controller to correct for steady state or offset errors?

_____ is the lowest level of control theory or the
engineering approach to control for controlling wheels or continuously moving actuators.

In order to achieve higher level control such as with control architectures it is necessary to
apply techniques from the field of _____.