(501(c)(3) not-for-profit organization)

What's FIRST®?

Igniting young minds.

Teaching life skills.

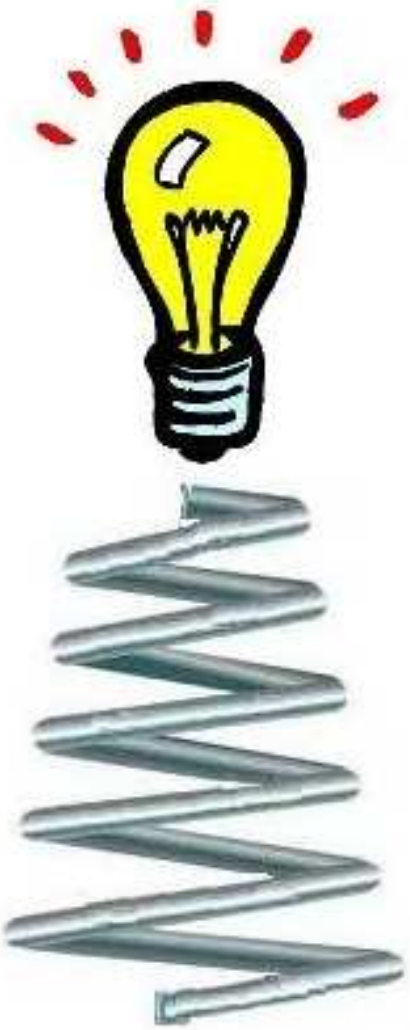
Nurturing passions for science and technology.

Practicing "Gracious Professionalism®."

***F**OR **I**NSPIRATION AND **R**ECOGNITION OF **S**CIENCE AND **T**ECHNOLOGY*

FIRST®

The robot control design process.



TEST AND
EVALUATE

BUILD MODEL

REFINE PROBLEM

The Model.

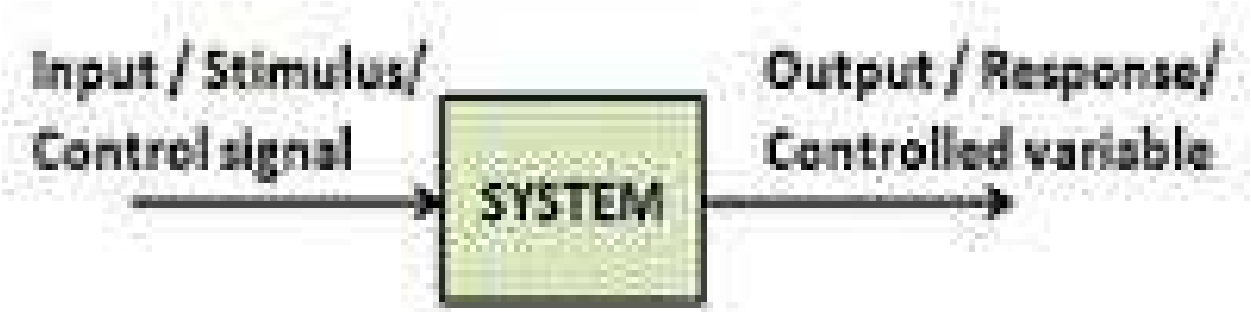
- Model should be as simple as practical.
- Mathematics allows the same concept to be simple or complex.
- Results must be useful.

Robot Basics

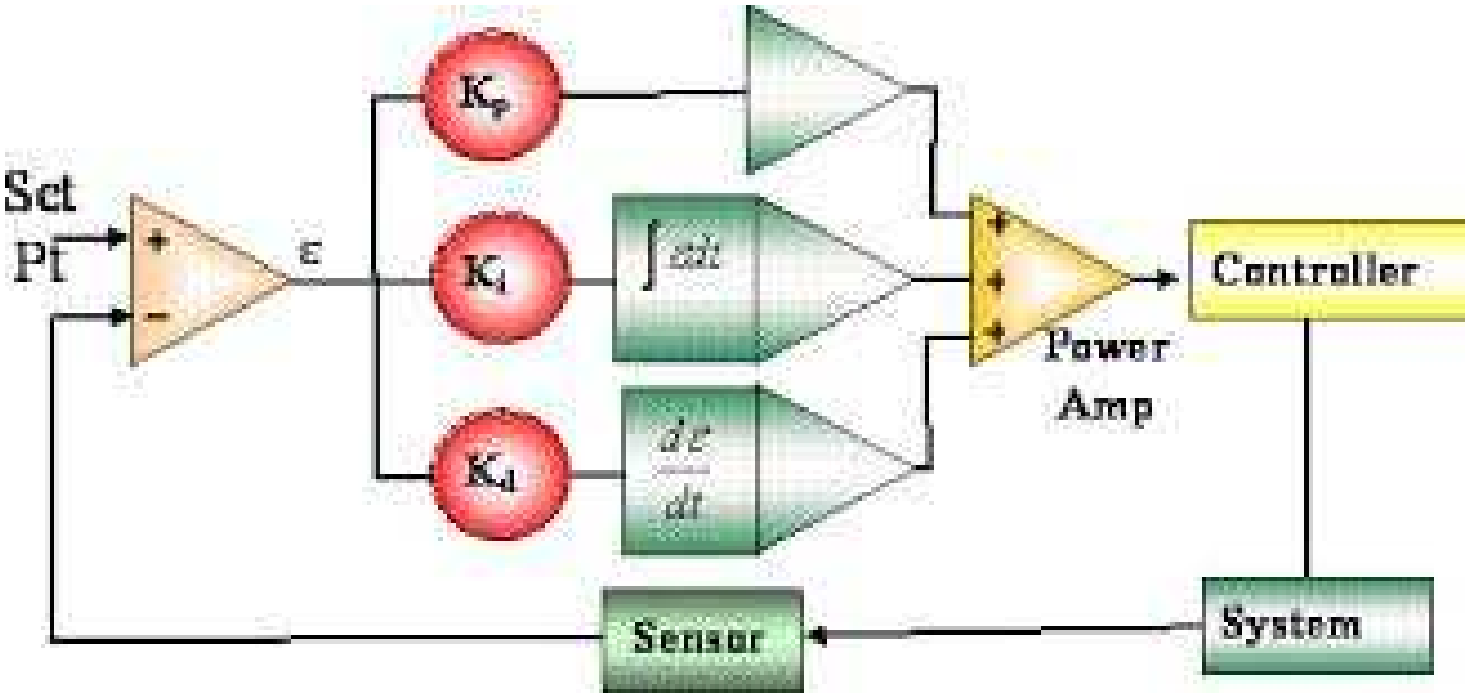
- Keep a journal of activity.
- Can be written on paper or electronic.
- Photos and videos are useful.
- Maintain journal for future reference.

Open Loop

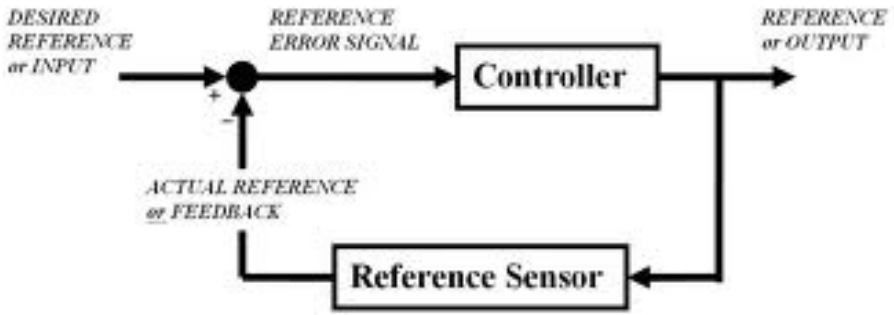
- Control system runs program.
- Examples are estimating direction.
- Estimating wheel revolutions



Simple Line follower.



Feedback Control Loop

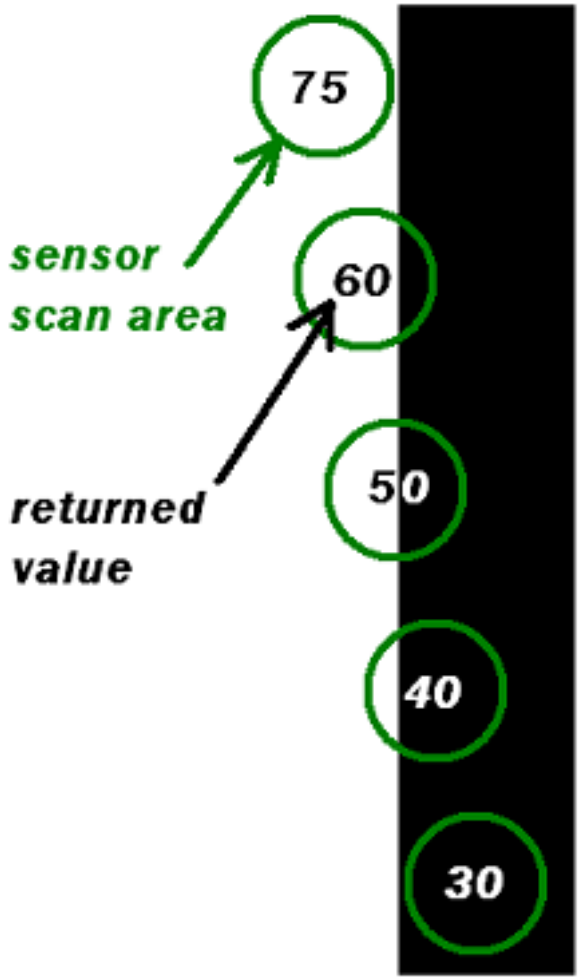


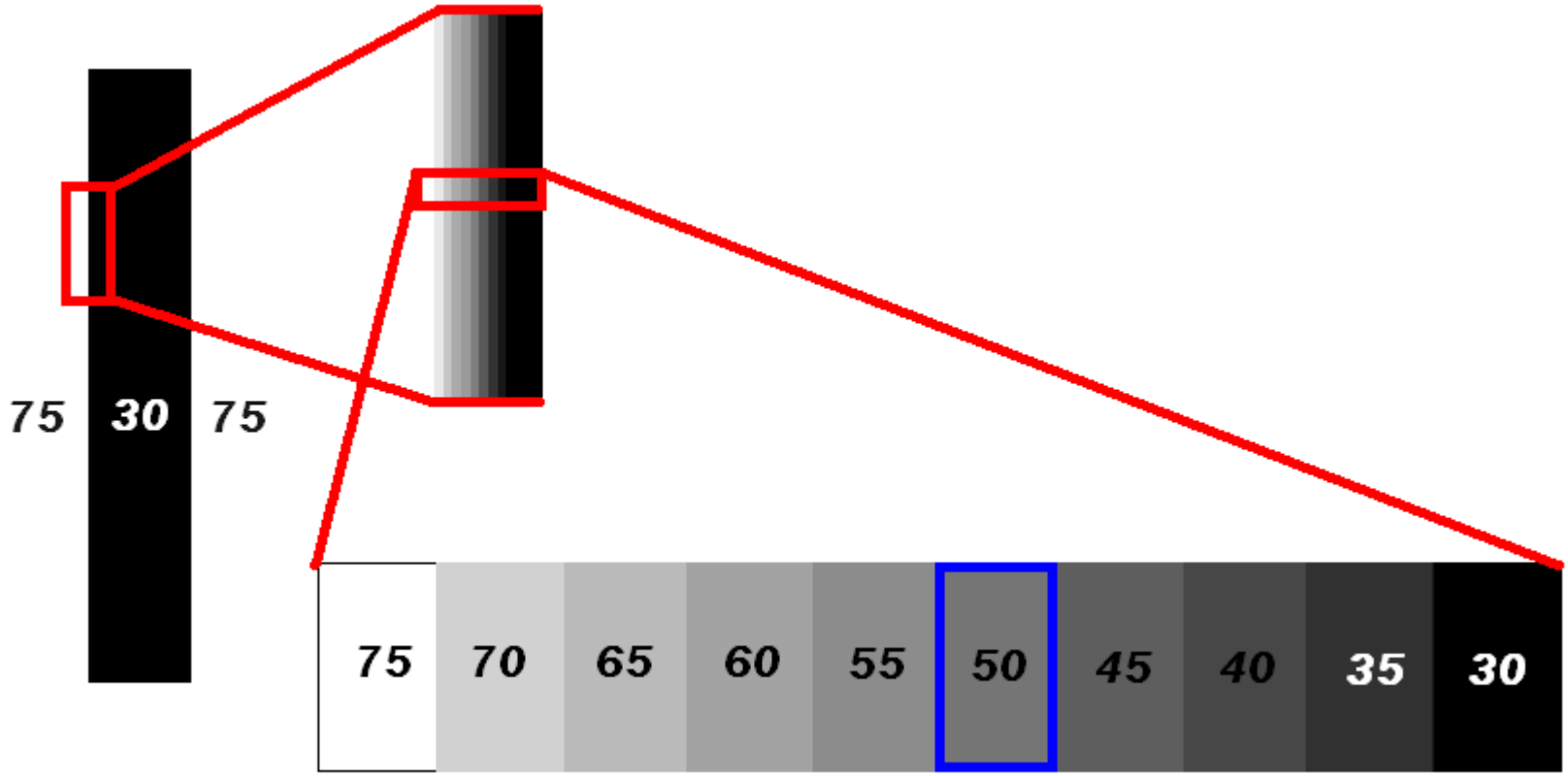
- Current location compared to desired location.
- Error is fed back into system as a correction.
- System responds to environment.

Simple Line Following.

- If on line, turn left.
- If on white, turn right.
- Is never going straight.
- 50 is target.

Graph of Proportional – current error.

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PID Controller

- Proportional, Integral, Differential.
- Model can be simple or complex.
- Should not be more complex than needed.

Proportional component

What's FIRST?

- $\frac{a}{b} = \frac{c}{d}$
- $\frac{1}{2} = \frac{4}{x}$

Proportional Response to error.

- y=mx
- The bigger the error (x) – the bigger the correction (y)
- (m) is constant
- Proportional identifies the current error.

FLL Problem Statement.

- Write and test Proportional line follower.
- Walk through program to test software operation. Hand out sheet.
- Test with Different variables.

Integral.

- Integral is error over time.
- The longer a system is in error, the bigger the correction.
- Integral determines the past error, and adjusts accordingly.
- Sum of past error values.

Problem Statement further refined.

- Write a proportional and integral line follower.
- Test with Different variables.

Problem Statement further refined.

- Differential looks to the future.
- The rate of error change.
- Write Differential program.
- Test with different variables.

PID Controllers

- Which one worked best for straight lines?
- Which one worked best for Curves?
- Could change control scheme in each area.