22. Electrical Feedback – Notes

TOPIC 1: Sensing

Sensing is the measurement of some physical attribute of a system, circuit, or circuit element.

1. A thermometer senses the temperature of a room

2. A speedometer senses the speed of your car

3. A volt meter senses voltage

4. A wattmeter senses energy
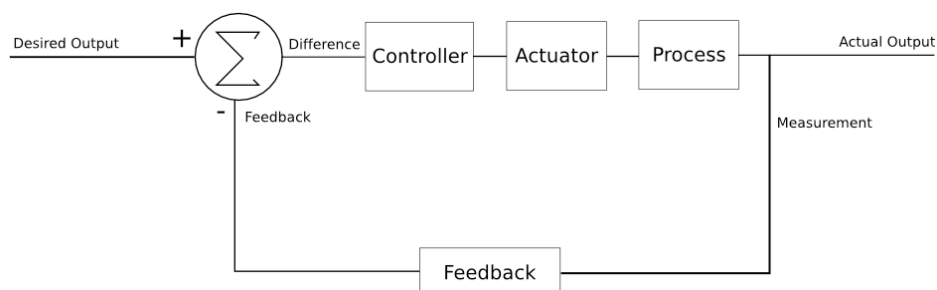
In and of themselves sensors are useless!

TOPIC 2: Control

Sensors are only useful if they affect or control something.

1. A thermometer is useless unless a decision is made based on the temperature it displays. For example your thermostat on your furnace decides when to turn the heat on based on the current temperature. You decide to put on a coat when the temperature on the thermometer drops to a certain level.

2. A speedometer is useless unless you look at it and slow down or speed up based on this information. Another application would be speed control. Your speed control uses the speedometer to determine the current speed and decides what the updated stoichiometric ratio should be to change your speed based on the difference between your current speed and your set speed.

3. A volt meter senses the voltage of a battery being charged and uses the information it reads to determine the current that should be flowing into the battery and can be used to decide what indicator lights to display on the battery charger.

4. A wattmeter senses energy being consumed and can be used to turn down the temperature on a water heater or turn up the temperature setting on the air conditioner during peak energy usage (corresponding with peak cost) times during the day.

If a sensor is used to control something automatically, the difference in sensed value and and desired value is used to adjust the control variables. In your thermostat, the temperature of the room is measured and the difference between the actual temperature and the desired temperature are used to determine if the heat should come on and for how long.

The following diagram describes a basic control system.

If this were the control diagram for your cruise control in your car, the desired output would be the speed you set the cruise at or some voltage representing this speed, the actual output would be your actual speed, the measurement would be some value based on a sensor sensing how many rpms your tires are moving at, the feedback would be a conversion from rpms of the wheel to a voltage representing the speed of the vehicle, the difference would be the difference between the voltage representing your desired speed and the feedback received, the controller would be something that made a decision based on the difference and the history of the difference, the actuator would be your engine, and the process would be your car moving down the highway.