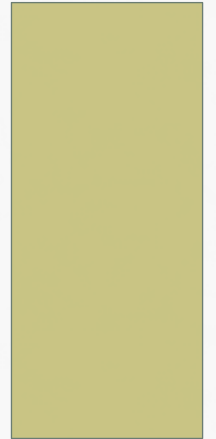


SENSORS!!!!!!!!!!!!!!

OU ROBOTICS CLUB – SPRING 2015



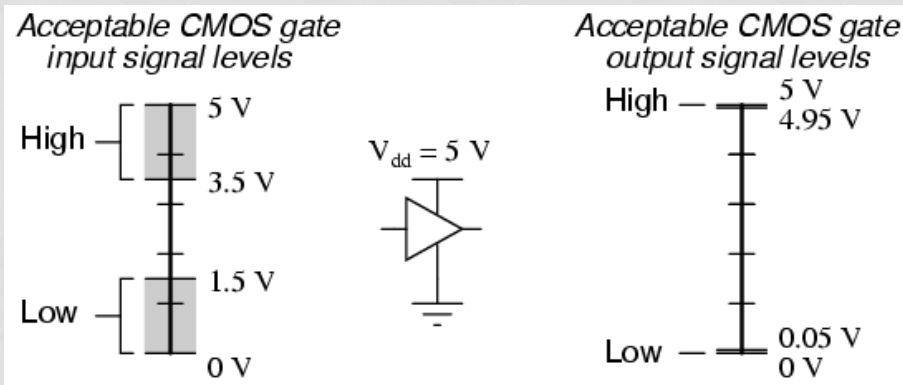
WHAT ARE SENSORS?

- Used to measure the real world
 - Temperature
 - Ambient light
 - Pressure
 - Object proximity
 - Color
 - Angle / Orientation
 - Magnetic field strength
 - Rotation speed
- Sensors can be simple or extremely complex
 - Simple
 - Bump sensor
 - Pressure sensor
 - Reflected/Ambient light
 - Complex
 - Camera module
 - Accelerometer

DIGITAL VS. ANALOG

- Digital

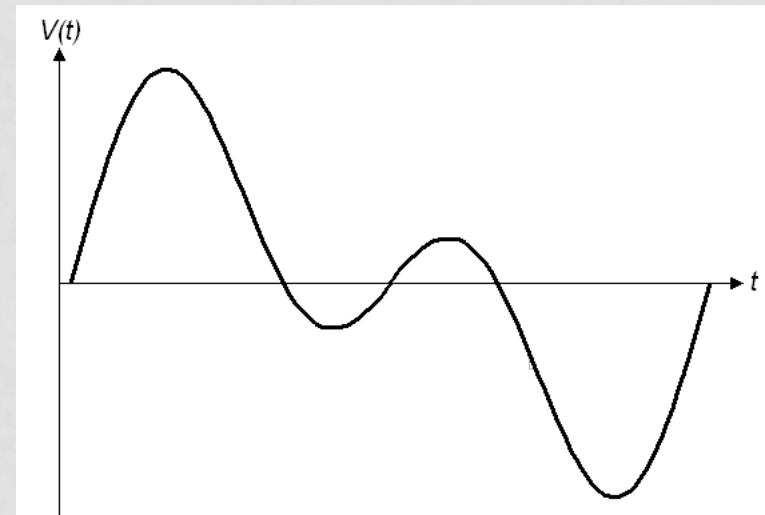
- 2 states/values
 - 0, 1
 - Low, High
 - Off, On
 - False, True



Source:
http://www.allaboutcircuits.com/vol_4/chpt_3/10.html

- Analog

- Many values
- 0, 0.01, 0.02, 0.03, ...



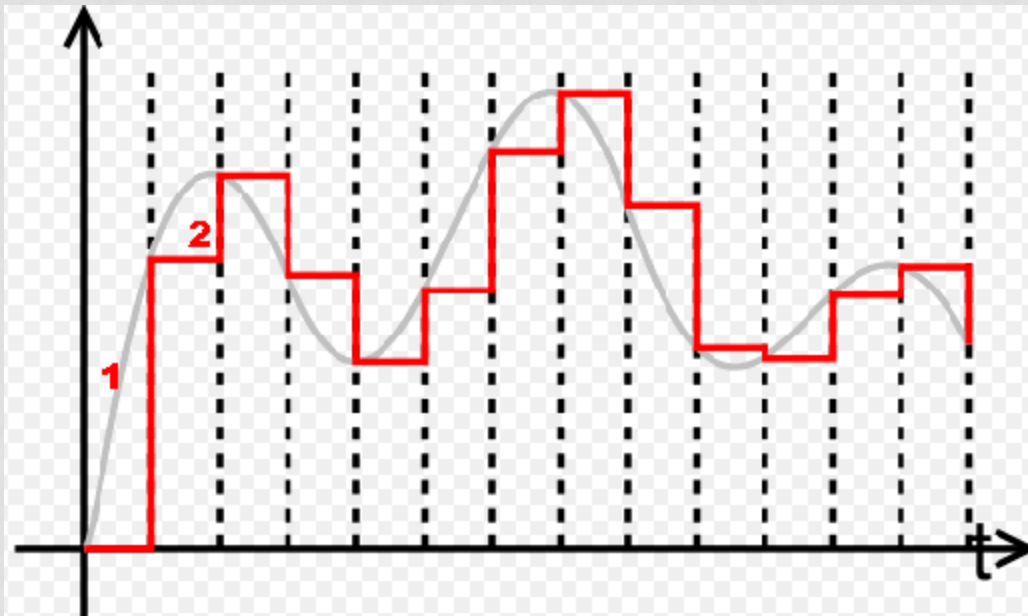
Source:
<http://www.beatstamm.com/scienceorsnakeoil.htm>

ANALOG TO DIGITAL CONVERSION

$$\text{Voltage} = \frac{\text{Max Voltage}}{\# \text{ of bins}} \times \text{ADC Value}$$

Example:

- 5V max
- 8 bits of data (256 bins)
- ADC Value of 128
- Measured Voltage:
 - 2.5V
- Usually need another formula to get a meaningful value
 - Temperature
 - Distance



Source:

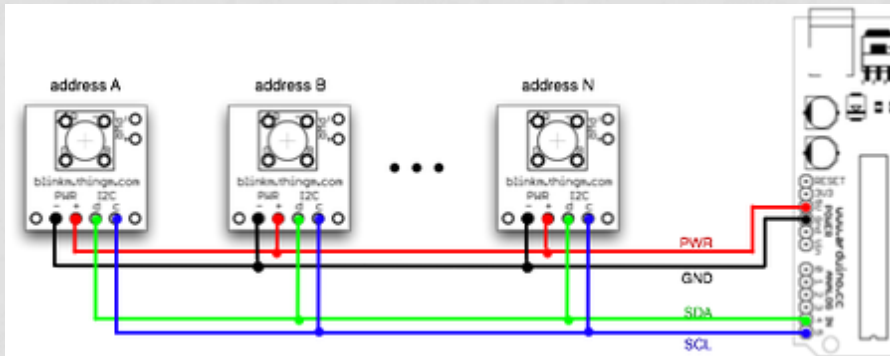
<http://automationprimer.com/2012/07/08/the-basics-analog-and-digital/>

DATA COMMUNICATION

Some sensors can communicate directly to give you real values or to reconfigure their settings.

- I2C

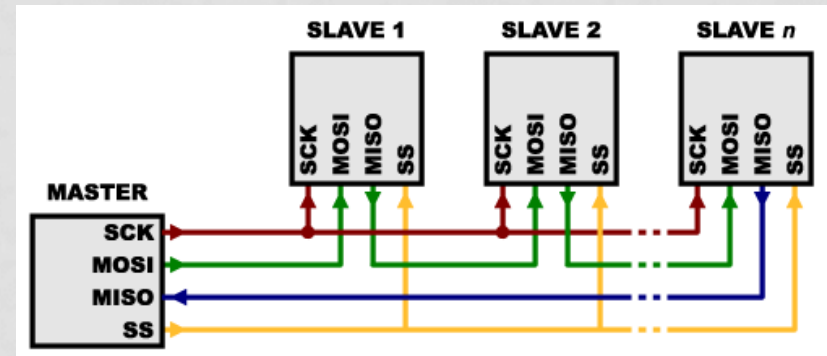
- Sends commands to all sensors with an address to select which sensor



Source:
<http://todbot.com/blog/2008/06/17/get-on-the-blinkm-bus-with-a-blinkm-cylon/>

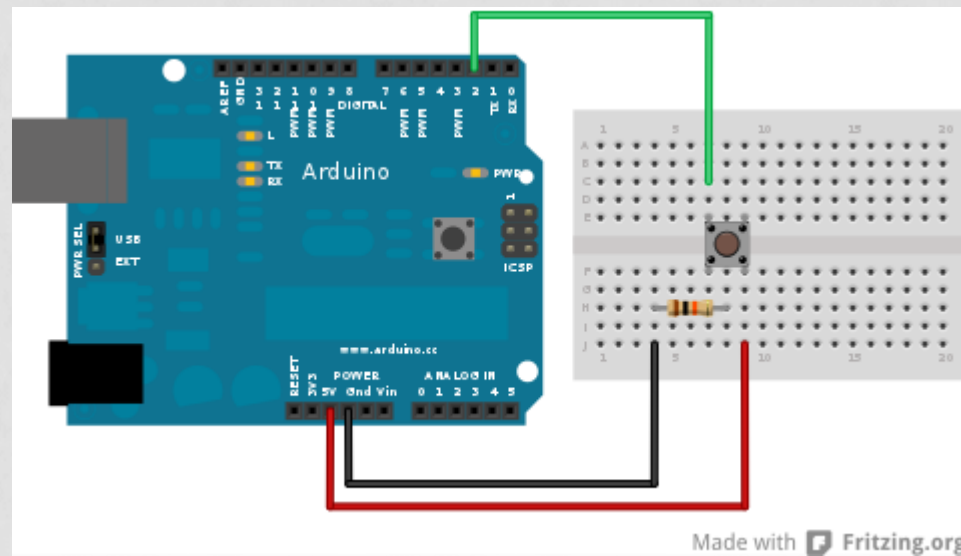
- SPI

- Uses a “chip select” to tell which sensor should be listening for commands

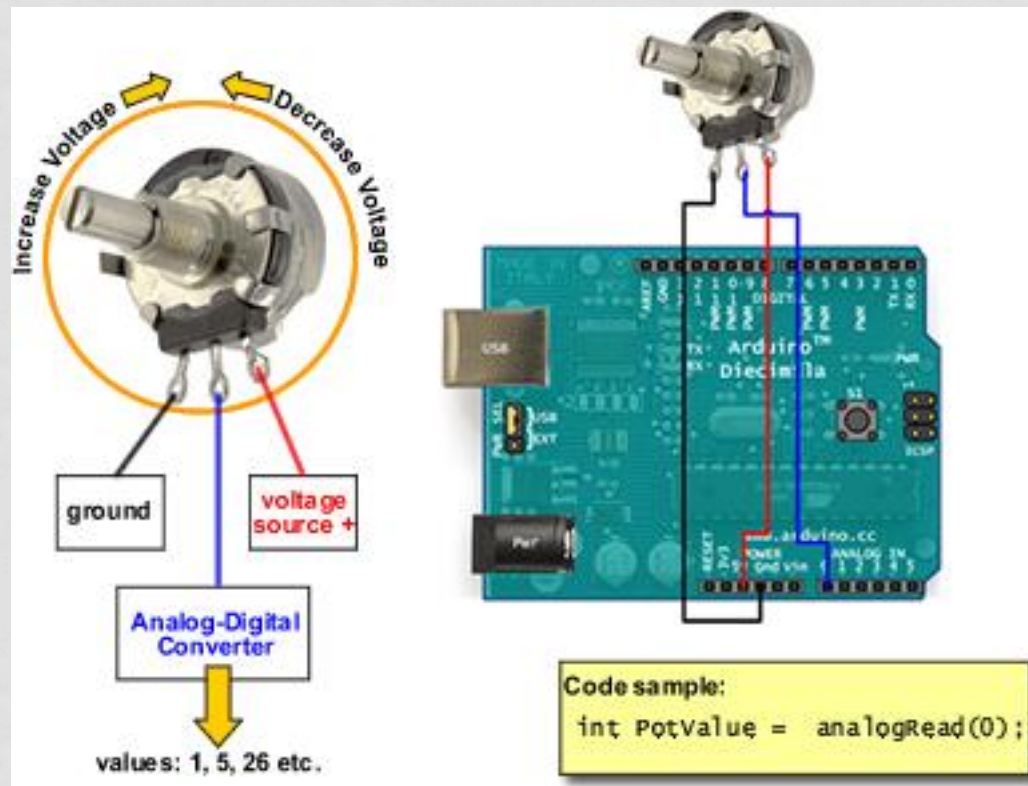


Source:
<https://learn.sparkfun.com/tutorials/serial-peripheral-interface-spi>

HANDS ON: DIGITAL



HANDS ON: ANALOG



SENSOR FREE FOR ALL!!



QUESTIONS

Austin Lee

rlee@ou.edu