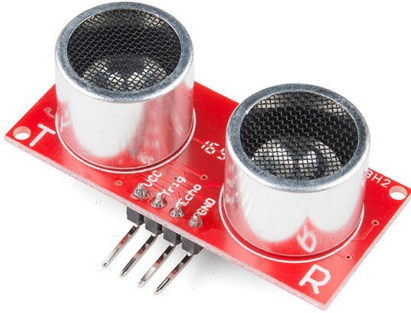


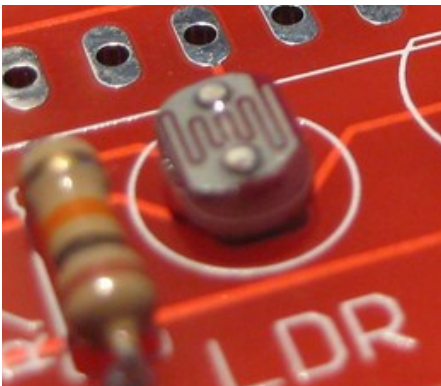
Ultrasonic Sensor



- This sensor uses ultrasonic sound waves to measure the distance between the sensor and objects.
- It uses transducers to send and receive ultrasonic pulses (sound waves) that are at a frequency above the range of human hearing.
- The pulse travels through the air and will bounce back to the sensor when it hits an obstacle.
- Distance is determined based on time lapses between the sending and receiving of the ultrasonic pulse.

Reference: <https://www.maxbotix.com/articles/how-ultrasonic-sensors-work.htm>
Image Source: <https://www.flickr.com/photos/sparkfun/33583319416>

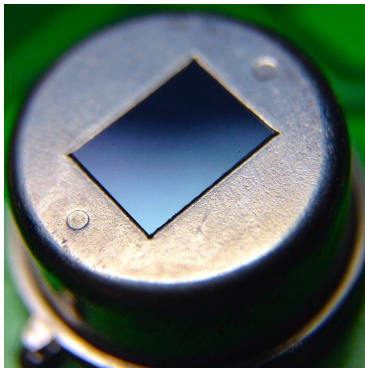
Light Sensor (LDR)



- This sensor is a photoelectric device. It converts light energy into an electrical signal.
- The sensor we used has an LDR (Light Dependent Resistor).
- The exposed semiconductor changes its electrical resistance when light hits it (electron-hole pairs are created).
- When the light get brighter, the resistance decreases.

Reference: https://www.electronics-tutorials.ws/io/io_4.html
Image Source: <https://www.flickr.com/photos/hoeken/2421222358/>

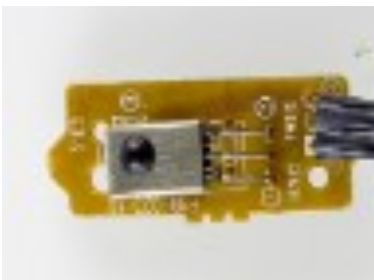
PIR Sensor (Motion Detector)



- PIR stands for Passive InfraRed
- The sensors we used in class have a Fresnel lens to condense light, which provides a larger range.
- The sensor has two slots. When both slots detect the same amount of IR, there is not motion detected.
- When a warm body moves into the sensing area, it is first detected by one of the slots. This causes a positive difference between what the two halves are sensing.
- When a warm body leaves the sensing area, the result is a negative difference between the two halves.
- When there is a difference (positive or negative), motion is detected.

Reference: <https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/how-pirs-work>
Image Source: <https://www.flickr.com/photos/collinmel/14046924897/>

IR Sensor



- IR detectors are filtered for Infrared light.
- They only detect IR light blinking at 38KHz. They will not detect a regular IR LED that is not blinking.
- IR detectors are actually “digital out”. This means they either output 0 volts (if IR signal is detected) or 5 volts (if no IR signal is detected)
- Remote controls use PWM (pulse width modulation) to send different “commands” to an IR sensor.

Reference: <https://learn.adafruit.com/ir-sensor>
Image Source: https://commons.wikimedia.org/wiki/File:JVC_MX-J950R_-_PCBS_for_on-off,_IR_sensor,_and_CD-changer-4910.jpg