
Engineering Technology (ENGR 101)

Arduino and light sensors

Mohammad Nekooei

Engineering and Computer Science

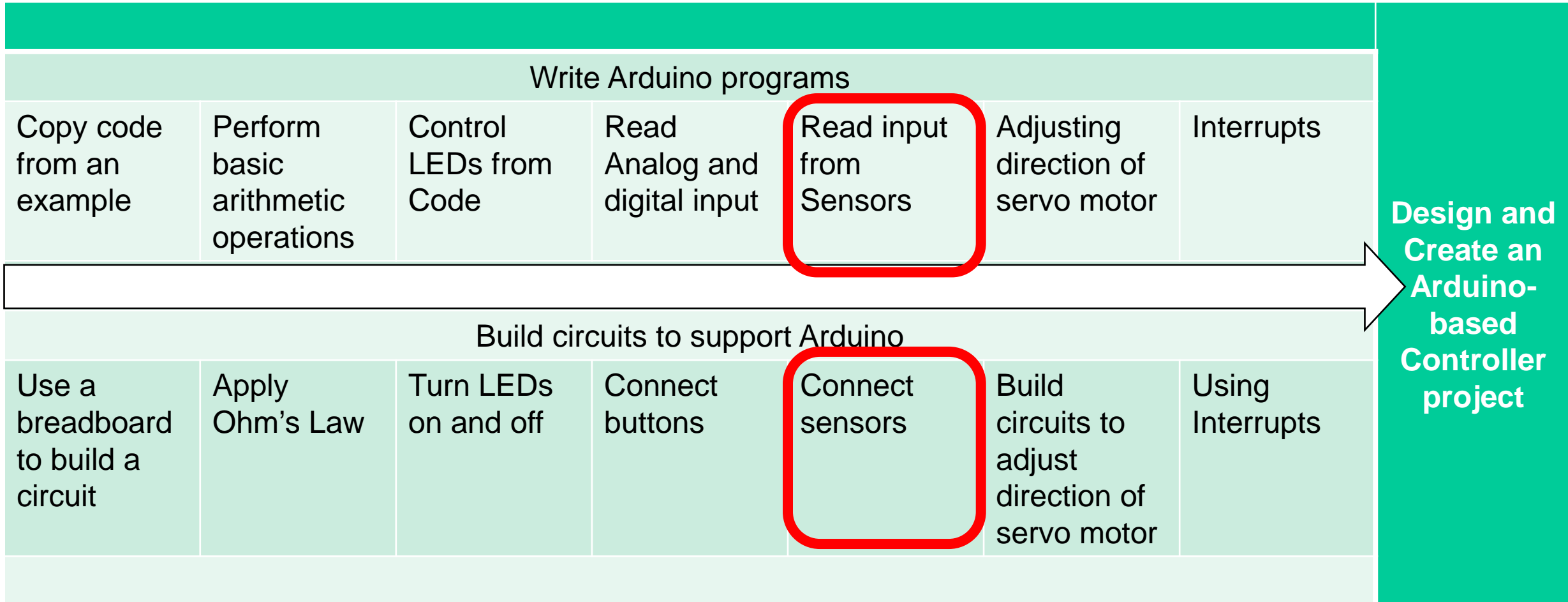
Victoria University of Wellington

Introduction Why Sensors

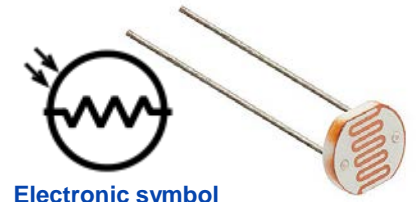
- Human body has the five sensory organs :
 - eye,
 - ear,
 - tongue,
 - nose,
 - skin.
- Human take the information about the environment and react.
- An automatic system is very much like the human body.
 - It receives information and command inputs
 - It sends this information as input signals to Arduino.
 - Arduino can make decisions and respond by sending output signals to actuators and indicators.
- Sensors in this course:
 - Light Sensor
 - Ultrasonic Distance Sensor



Road Map

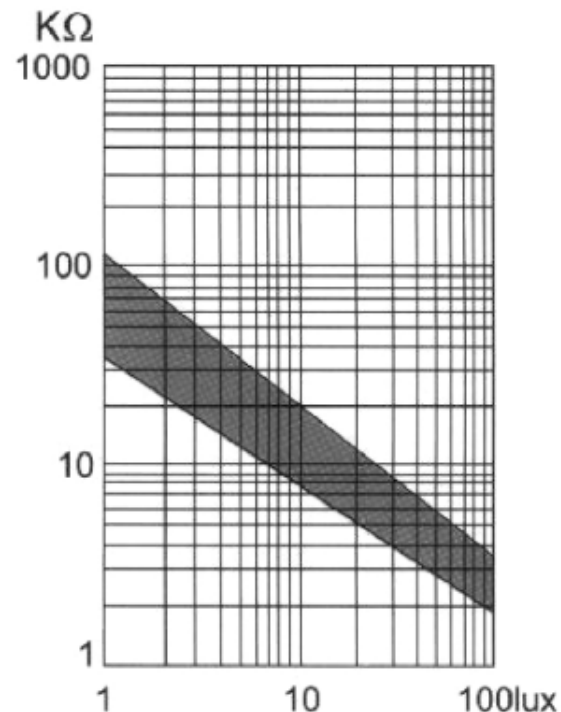


Light Sensor

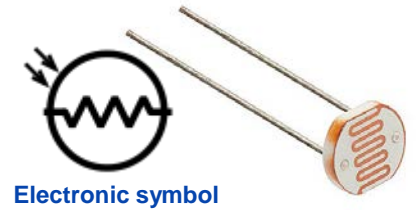


- Photoresistor or photocell is one type of light sensors
 - The resistance of a photoresistor decreases with increase in incident light intensity (luminosity)
 - lux is the unit of illuminance, measuring luminous flux per unit area.
 - Luminous flux or luminous power is the measure of the perceived power of light.

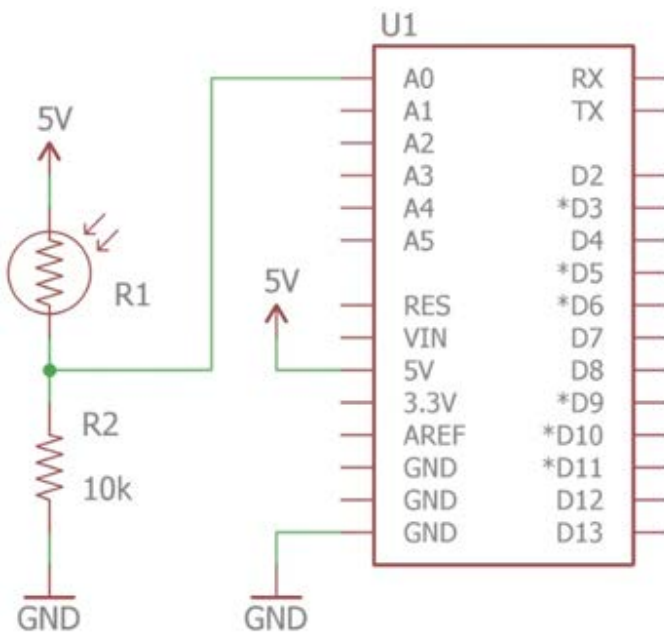
Illuminance Vs. Photo Resistance



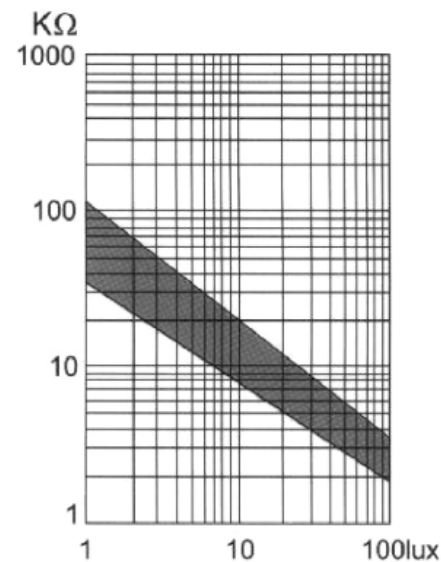
Photoresistor



- Arduino cannot measure the change in resistor
 - To measure the change in resistance, we use another resistor to create voltage divider.
 - As the resistance of photocell changes, it will cause a change in voltage divider, which Arduino can measure.



Illuminance Vs. Photo Resistance



$$V_{out} = V_{in} \times \frac{R_2}{R_1 + R_2}$$

$$V_{out,dark} = 5V \times \frac{10k}{100k + 10k} = 0.45V$$

$$V_{out,light} = 5V \times \frac{10k}{2k + 10k} = 4.17V$$

Analogue Input

int `analogRead(pin)`

- Returns the state of an analogue input pin
- Returns an integer from 0 to 1023
- 0 for 0 volts, 1023 for 5 volts

- Example:
 - `int pin_val;`
 - `pin_val = analogRead(A3);`

- pin must be an analogue pin
 - (A0, A1, A2, A3, A4, or A5)

Photoresistor

```

const int light_pin = A0;
void setup() {
  Serial.begin(9600);
  pinMode(light_pin, INPUT);
}

void loop() {
  // Get the input
  int light_val;
  light_val = analogRead(light_pin);
  Serial.println(light_val);
  delay(1000);
}

```

returns int between 0-1023
(0V – 5V)

