Basics: Sensors

Sensors allow us to translate real-world quantities into voltages that we can interpret with programs.

**Suggested Prerequisites**

- Circuits Intro
- Programming Intro
- Conditional Statements
- Loops
- Functions
- Arrays

**Setup and Preparation**

**List of Supplies**

- TI MSP430G2 LaunchPad
- Breadboard
- M/F Jumper Wires (3)
- M/M Jumper Wires (2)
- Resistors of various value (2)
- Photoresistor
- Hall Effect Sensor
**Prepare the Program**

Create and upload the following program (Figure 1) to the LaunchPad.

```cpp
void setup() {
    Serial.begin(9600);
    pinMode(P1_7, INPUT);
    pinMode(RED_LED, OUTPUT);

    int numDataPoints = 100;
    int data[numDataPoints];
    int increment_ms = 50; // equates to 20 readings per second

    // Reading data...
    digitalWrite(RED_LED, HIGH);
    for (int i = 0; i < numDataPoints; i++) {
        data[i] = analogRead(P1_7);
        delay(increment_ms);
    }
    digitalWrite(RED_LED, LOW);

    // Printing data in CSV format...
    Serial.println("Time (ms), Value");
    for (int i = 0; i < numDataPoints; i++) {
        Serial.print(i*increment_ms);
        Serial.print(",");
        Serial.println(data[i]);
    }
}

void loop() {
}
```

Figure 1: Data Collection Program

*Note that all of the sensors will be read by using the pin P1.7.*
**Sensor 1: Photoresistor**

Create and test the following circuit (Figure 2).

![Light Sensing Circuit Diagram](image)

**Figure 2: Light Sensing Circuit**

**Things to consider**

- The photoresistor detects light intensity. You can learn more at the following link:
  - [https://en.wikipedia.org/wiki/Photoresistor](https://en.wikipedia.org/wiki/Photoresistor)
- When the program is running, try changing the light intensity above the photoresistor by casting a shadow with your hand or by applying a light source, like a flashlight.
- You can plot the data that appears in the Serial Monitor. (Refer to Tutorials: Plotting Data)

**Sensor 2: Infrared**

Not yet available.

**Sensor 3: Hall Effect Sensor**

This section is not complete. Ask a mentor if you are interested in learning about this.
Sensor 4: Microphone

Not yet available.