Arduino Programming Case Study: Potentiometer and Photoresistor Measurements

ME 120
Mechanical and Materials Engineering
Portland State University
http://web.cecs.pdx.edu/~me120
Overview

• Experiment with a potentiometer
  ❖ Measure of the potentiometer’s output
  ❖ Potentiometer values reading and reporting

• Experiment with a photoresistor
  ❖ What is a photoresistor?
  ❖ Measure of the photoresistor’s output
  ❖ Photoresistor values reading and reporting
  ❖ Using “if” statements to respond to analog input readings

• See on-line reference:
Experiment with a potentiometer
Analog input

analogRead(pin)

❖ Reads the voltage on an analog input pin
❖ **pin** – an integer that specifies the analog input channel: 0 to 5. **pin** can also be referred to by name as A0, A1, A2, A3, A4 or A5
❖ Returns an int in the range 0 to 1023 (for an Arduino Uno)

Example: Read a potentiometer

```java
void setup() {
    Serial.begin(9600);
}

void loop() {
    int reading;
    reading = analogRead(A0);
    Serial.println(reading);
}
```

What is a photoresistor?
A photoresistor is a two-terminal semiconductor device that has an electrical resistance that depends on the light incident on the exposed semiconductor surface. The resistance decreases with increases in incident.

![Graph showing the relationship between incident light level and electrical resistance](image)
More information is available via the datasheet

1. Visit sparkfun.com
2. Enter “photoresistor” in the search box
3. Locate product #9088 or its more recent replacement
4. Click on the datasheet link
5. Note that there are many vendors
Voltage divider circuit for photoresistor

Why is the fixed resistor on the bottom of the voltage divider?
Basic Arduino code to read and report photoresistor output
Display voltage divider output on the serial monitor

Connect the voltage divider output to analog pin 0

```cpp
void setup() {
  Serial.begin(9600);       // Initialize serial port object
}

void loop() {
  int reading;
  float voltage;

  reading = analogRead(A0);   // Read analog input channel 0
  voltage = reading*(5.0/1023.0); // and convert to voltage

  Serial.print(reading);      // Print the raw reading
  Serial.print(" ");        // Make a horizontal space
  Serial.println(voltage);    // Print voltage value
}```
Use an “if” statement to respond to analog input readings
Output dependent on photoresistor reading

```cpp
void setup() {
    Serial.begin(9600);        // Initialize serial port object
}

void loop() {
    int reading;
    float voltage;

    reading = analogRead(A0);   // Read analog input channel 0
    voltage = reading * (5.0 / 1023.0);  // and convert to voltage

    if (voltage < 2.5) {
        Serial.println("Getting dark");  // Print the raw reading
    }
}
```
Output dependent on photoresistor reading

• Next step
  ❖ Add a second test at 1.75 V (or some value). Print a different message for very low analog input (low ambient light values)

• Study questions
  ❖ What are minimum and maximum voltage levels for photoresistor outputs?
  ❖ Will the test for darkness work without converting to voltage first?