Electronics 1

Electronics for Interactive Media Design
Les 6

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Assignment

The name of the semester project will be: make it interactive.
Select an object that originally is not interactive and transform it.
Examples:

- a pillow that doesn't allow you to sit because it generates an annoying sound.
- A cereal box that actually create a rainbow light when you open it.
- A vase with a plant that asks for hugs.
- A shoe that behave as a door alarm.
- A paint/frame that is a dice

Answer the following questions:

- what object will you use?
- What will the object do? What does it trigger? What is the generated feedback?
- Which sensor will you use?
- Which output will you use?
- How the sensor will trigger the output device?

Assignment

Start the development of the project:

- input device:
    - Design the schematic for the sensor
    - Make the circuit of breadboard
    - Write and test the code to read the sensor and print on serial monitor the values

- output device:
    - Design the schematic for the output device
    - Make the circuit on breadboard
    - Write and test the code to control the output device.

Control Structures

- if…else // If
- do…while // do
- switch…case

Control Structures: If…else // If

```
if (condition) {
   //action A
} else {
   // action B
}
```

Condition: comparison Operators

```
x == y (x is equal to y)
x != y (x is not equal to y)
x <  y (x is less than y)
x >  y (x is greater than y)
x <= y (x is less than or equal to y)
x >= y (x is greater than or equal to y)
```

Control Structures: do…while // While

A `while` loop will loop continuously, and infinitely, until the expression inside the parenthesis, () becomes false.

```
do {
   //action
} while (condition);
```

```
do {

  digitalWrite(led_pin, HIGH);
  sensor_value = analogWrite(A0);

} while (sensor_value < 500);
```

```
while(condition){
  // action
}
```

```
while (sensor_value < 500) {

  digitalWrite(led_pin, HIGH);
  sensor_value = analogWrite(A0);

}
```

Control Structures: switch…case

Like if statements, switch case controls the flow of programs by allowing programmers to specify different code that should be executed in various conditions. In particular, a switch statement compares the value of a variable to the values specified in case statements. When a case statement is found whose value matches that of the variable, the code in that case statement is run.

In this case the variable var can have the values: label1 or label2

```
switch (var) {

  case label1:
    // action 1
    break;

  case label2:
    // action 2
    break;

  default:
    // action default
    break;

}
```

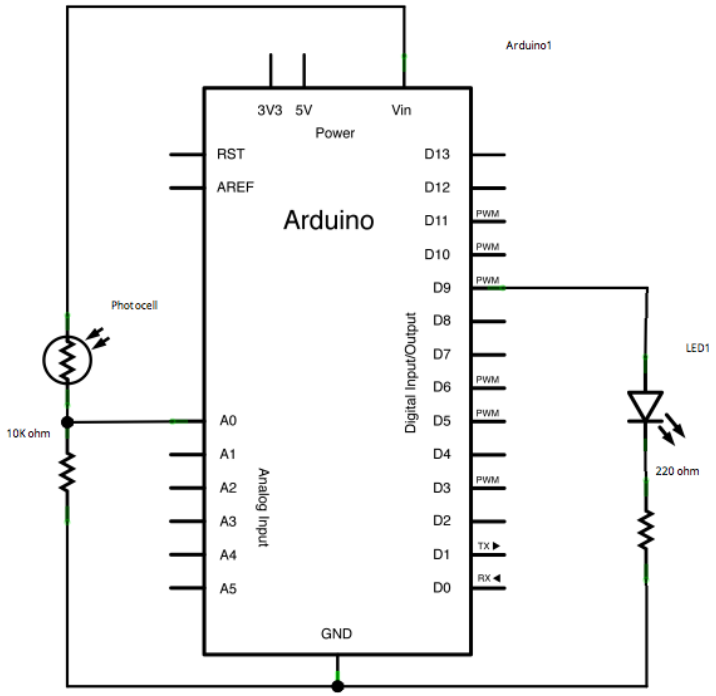
Calibration

When you use an analog sensor, usually you need to know what are the maximum and minimum value that the sensor detect and use those values in your code.

Ex: with a light sensor, the behaviour of the sensor and the range of its values depend on the surrounding environment, indoor or outdoor.

The calibration is a routine that allows you to get the maximum and the minimum value of the sensor during the first seconds of the operation and automatically use those information in your code. No need to write the code every time you change place of you sensor.

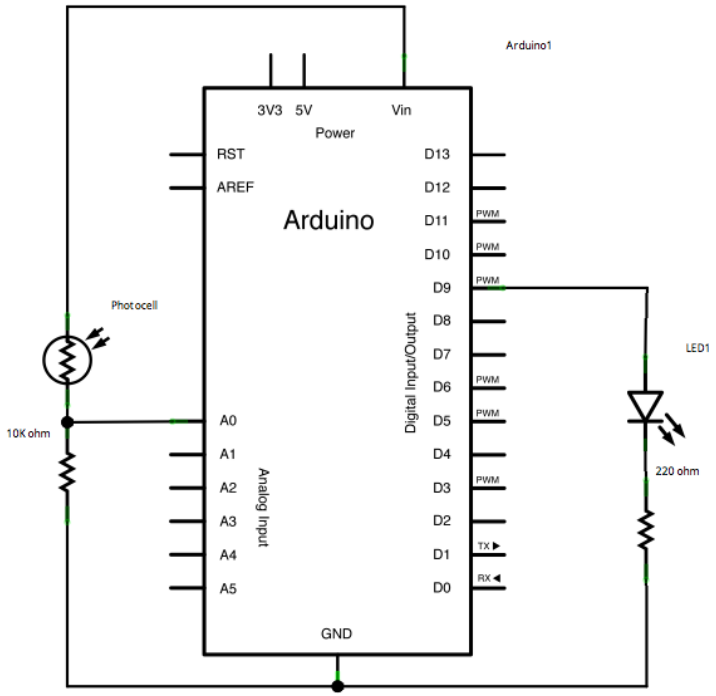
Without Calibration



You want to control the intensity of the Led depending on the environmental light.

1- read the sensor values
2- take note of the min-max values
3- use those values in your code

With Calibration - method 1



You want to control the intensity of the Led depending on the environmental light.

During the "void setup()", arduino read and save the min and max values. Those values will be used in the code. During the calibration the led on pin 13, embedded on the board, stays on. When the led turns off, the calibration is finished.

With Calibration - method 1

Calibration §

```
//CALIBRATION EXAMPLE
// These constants won't change:
const int sensorPin = A0;    // pin that the sensor is attached to
const int ledPin = 9;        // pin that the LED is attached to

// variables:
int sensorValue = 0;         // the sensor value
int sensorMin = 1023;        // minimum sensor value
int sensorMax = 0;           // maximum sensor value


void setup() {
  // turn on LED to signal the start of the calibration period:
  pinMode(13, OUTPUT);
  digitalWrite(13, HIGH);

  // calibrate during the first five seconds
  while (millis() < 5000) {
    sensorValue = analogRead(sensorPin);

    // record the maximum sensor value
    if (sensorValue > sensorMax) {
      sensorMax = sensorValue;
    }

    // record the minimum sensor value
    if (sensorValue < sensorMin) {
      sensorMin = sensorValue;
    }
  }

  // signal the end of the calibration period
  digitalWrite(13, LOW);
}
```