UP Competitive Robotics Club (CRC)

Research and Design Committee

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Light Sensor Documentation

I. Overview of the Circuit

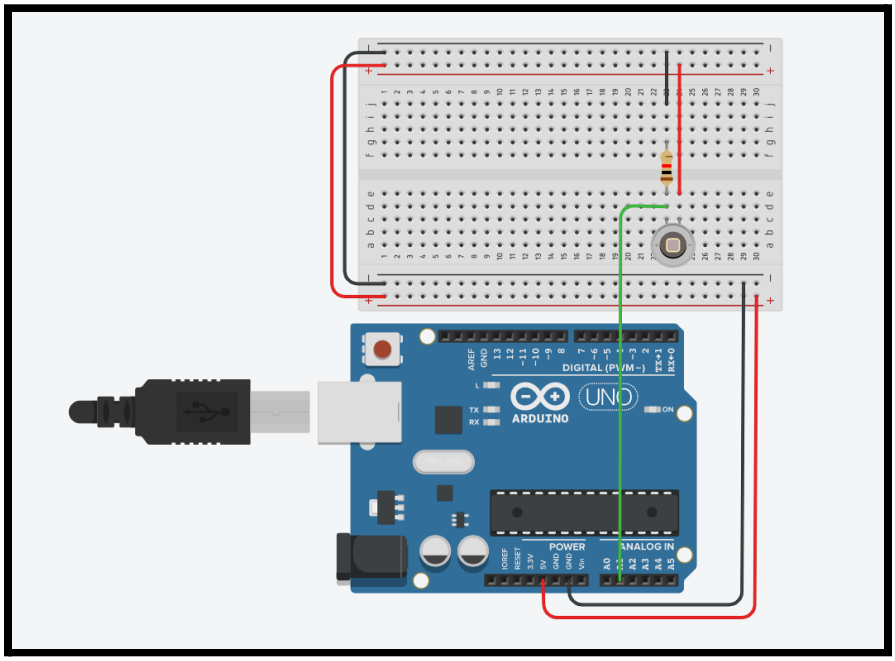

Fig. 1. Schematic implementation of the light sensor circuit in Tinkercad

The light sensor circuit comprises the following components: (i) Arduino Uno, (ii) photodiode, and a (iii) resistor, all of which are placed in series connection. The circuit essentially functions to detect the intensity of the light exposed to the photodiode. The light intensity reading of the circuit can be viewed through the *Serial Monitor tab* in the Tinkercad web application.

A. Breadboard

A breadboard, otherwise known as a protoboard, serves as a platform for electronic components. It is the preferred base for constructing circuits due to the ease of connecting devices. Placing devices on a breadboard only involves attaching the two ends of a component (can be more than two for some devices) on the contact holes of the board. The breadboard consists of two areas for electric connection, the bus strips and the terminal strips. For the former, these are usually located at the ends of the board (i.e. when oriented in landscape, they can be found at the top and at the bottom). In the schematic above, this can be located by looking for the rows with the gray-colored and red-colored strip, denoted by a negative and a positive sign respectively. These strips are usually utilized for connecting a supply (e.g. voltage source) to the circuit. The electrical connection for the bus strips is horizontal, making them useful for adding multiple connections to the supply. On the other hand, the terminal strips are the areas where the majority of the components are placed and connected with each other. These are located in the central region of the board, which can be identified by looking at the area with more contact holes. Unlike with the bus strips, the electrical connections for this area of the board is vertical.

B. Arduino Uno

Arduino Uno is a programmable microcontroller which consists of fourteen (14) digital pins and six (6) analog pins. It can be operated through an external voltage source (e.g. battery) rated between seven (7) and twenty (20) volts or through a USB connection. For the circuit implementation, only a single analog pin, i.e. *pin A1*, is used.

C. Photodiode

A photodiode is a semiconductor component which detects the presence of light and converts this into current. The value of the current varies depending on the intensity of light at which the diode is exposed to. In the light sensor circuit above, a generic model is used for this purpose.

II. Breakdown of the Code

A. Setting up Arduino Uno

```
void setup()
{
  Serial.begin(9600);
  pinMode(A1, INPUT);

}
```

Fig. 2. Initializing Arduino Uno

To test the functionality of the light sensor circuit, the Arduino Uno must first be initialized in order to be able to collect current readings from the photodiode. In the code above, the polling rate is set to 9600 bits per second. This is a standard line of code for programs involving collection of data from a circuit device, in this case, the photodiode. The second line of code essentially initializes *pin A1* for the collection of current readings to be displayed in *Serial Monitor*.

B. Displaying of photodiode readings

```
int current = 0;
void loop()
{
  int sensor_val = analogRead(A1);
  if(current != sensor_val)
  {
  Serial.println(sensor_val);
  current = sensor_val;
  }
  delay(1000);
}
```

Fig. 3. Conditional logic for displaying current readings

The purpose of the code above is essentially to obtain the current readings from *pin A1*, to check whether there is current flowing through the circuit, and to display the value of the current, if the value of the current is nonzero. The readings are displayed in the *Serial Monitor* tab of Tinkercad. The

aforementioned functions are looped for an indefinite amount of time and each reading is given a 1000 millisecond delay.