Tuskegee University's Department of Defense-Aerospace Education, Research & Innovation Center

TUSKEGEE UNIVERSITY

SUMMER OUTREACH
MENTORING INTO ENGINEERING I
(MITE I)

CONTINUITY PACKAGE

Wonderful World of Engineering (WWE)

THURSDAY

Blinking LED w/ Arduino

Individual (10:15 – 11:45)

Overview

An electric circuit is an interconnection of two or more electric components that perform some desired tasks. You can use a microcontroller (e.g., ARDUINO board) in a circuit to control how it behaves. Students will build a simple electronic circuit comprised of an LED light, a resistor and an ARDUINO board. Students will then copy, upload and run a program on the ARDUINO board to make the LED blink every one second.

Material List

- A breadboard
- Two male-to-male jumper wires (for example, 1 red wire and 1 blue wire)
- 1 LED light
- 1 resistor of value of 220 ohms (or 330 ohms)

Instructions

Part 1: Connecting the components of the circuit

- Connect one end of the red jumper wire to Pin # 13 of the Arduino (as in Figure 1)
- Connect the other end of red jumper wire to one leg of the resistor (as in Figure 1)
- Connect the other leg of the resistor to the longer leg of the LED (as in Figure 1)
- Connect the shorter leg of the LED to the one end of blue jumper wire (as in Figure 1)
- Connect the other end of blue jumper wire to the GND pin of the Arduino (as in Figure 1)

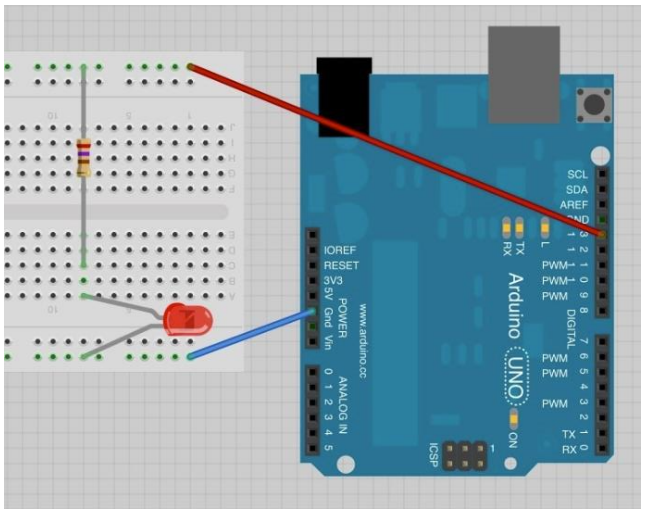

Figure 1: schematic of circuit

Part2: Programming the Arduino to perform the desired task

- Connect your Arduino to a computer that have ARDUINO application installed.
- Open the ARDUINO application on the computer
- Setup the ARDUINO board by choosing the correct port and the correct board type

- Type the Arduino program (see below in Figure 2)
- Check and run the program to observe that the LED is blinking every 1 second.
- Change the program by replacing **delay(1000)** with **delay(500).** Check and run the program to observe that the LED is now blinking twice as fast.
- Play with the value of the delay function. Can you make it blink so fast that the human eye is not be able to see the blinking of the LED. Try it and see.

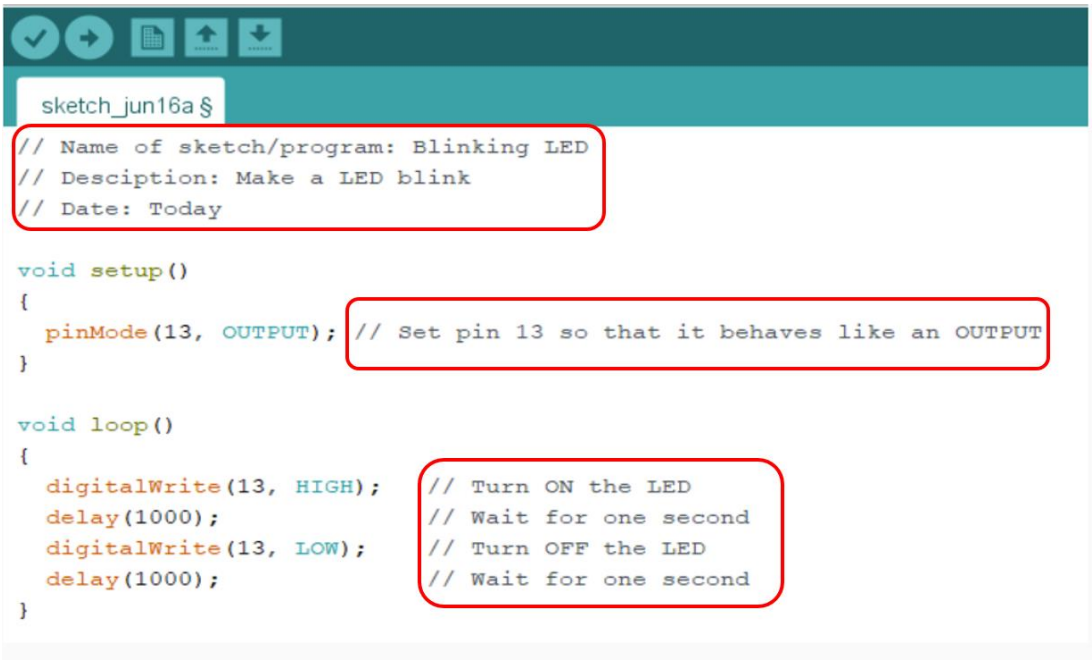

Figure 2: Blinking LED code.

Note: You can omit the comments (encircled in red). The program will still work. Comments are information that are only for the users and are ignored by the ARDUINO board when the program is run.

Program LED Feedback w/Arduino

Group (1:15 – 2:45, 3:00 – 4:30)

Overview

We build a slightly complex circuit and program the ARDUINO board to perform a different task. The students build a circuit with three LEDs (RED, GREEN and BLUE) and program it so that they turn ON/OFF in sequence at a fixed rate: The BLUE LED turns ON for 1 second and then turn OFF for 1 second. Next, the GREEN LED turns ON for 1 second and then turn OFF for 1 second. Then the LED turns ON for 1 second and then turn OFF for 1 second and the sequence repeats again.

Material List

- A breadboard, 7 male-to-male jumper wires, 3 LEDs (RED, GREEN and BLUE) and 3 resistors of value 220 ohms (or 330 ohms)

Instructions

- Use the provided material and build your circuit as shown in Figure 3 below.
- Make sure that the shorter legs of LEDs connect to the GND pin of the ARDUINO board
- Connect your ARDUINO to your computer
- Open the ARDUINO application
- Verify in the ARDUINO application that the port and board type are correct
- Type the Arduino program (see below in Figure 4) and run it to observe the behavior.
- Change the code so that each LED turn ON for 1.5 second and turn OFF for half-a-second, run the program.

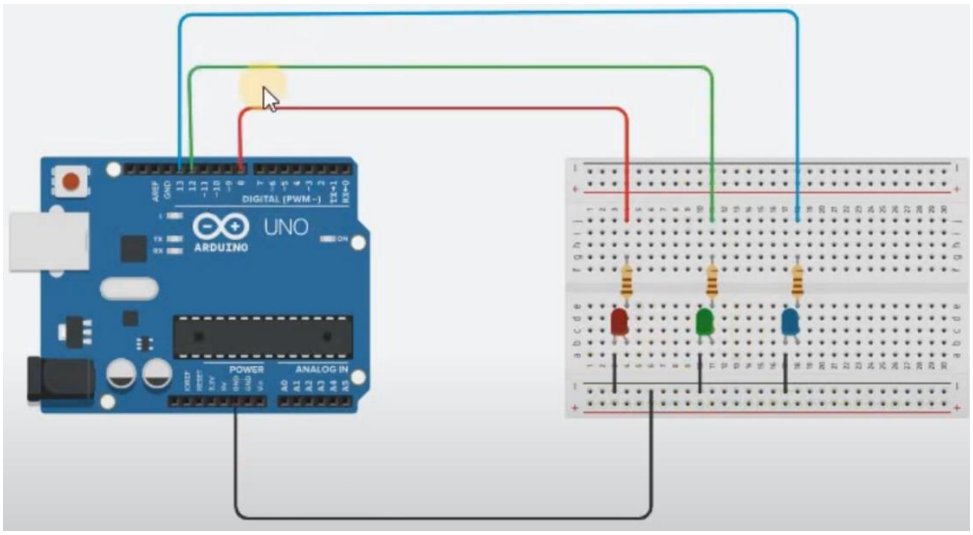

Figure 3: Three LEDs ARDUINO circuit

```
void setup()
{
 pinMode(13, OUTPUT);
 pinMode(12, OUTPUT);
 pinMode(8, OUTPUT);
}

void loop()
{
  digitalWrite(13, HIGH);
  delay(1000);
  digitalWrite(13, LOW);
  delay(1000);
  digitalWrite(12, HIGH);
  delay(1000);
  digitalWrite(12, LOW);
  delay(1000);
  digitalWrite(8, HIGH);
  delay(1000);
  digitalWrite(8, LOW);
  delay(1000);
}
```

Figure 4: Code for the three-LEDs ARDUINO circuit

Extra Activity: If you have time, also type and run the program below, which will make all the three LEDs blink at the same time.

```
void setup()
{
 pinMode(13, OUTPUT);
 pinMode(12, OUTPUT);
 pinMode(8, OUTPUT);
}

void loop()
{
  digitalWrite(13, HIGH);
  digitalWrite(12, HIGH);
  digitalWrite(8, HIGH);
  delay(1000);
  digitalWrite(13, LOW);
  digitalWrite(12, LOW);
  digitalWrite(8, LOW);
  delay(1000);
}
```