CS 5331-003: Special Problems in Computer Science: Embedded Systems

Instructor: Dr. Morshed, Associate Professor

Assignment-3: Arduino Code for LED

Anvesh Muppeda

R11840667

amuppeda@ttu.edu

Submission Date: 02/13/2024

TEXAS TECH

UNIVERSITY.

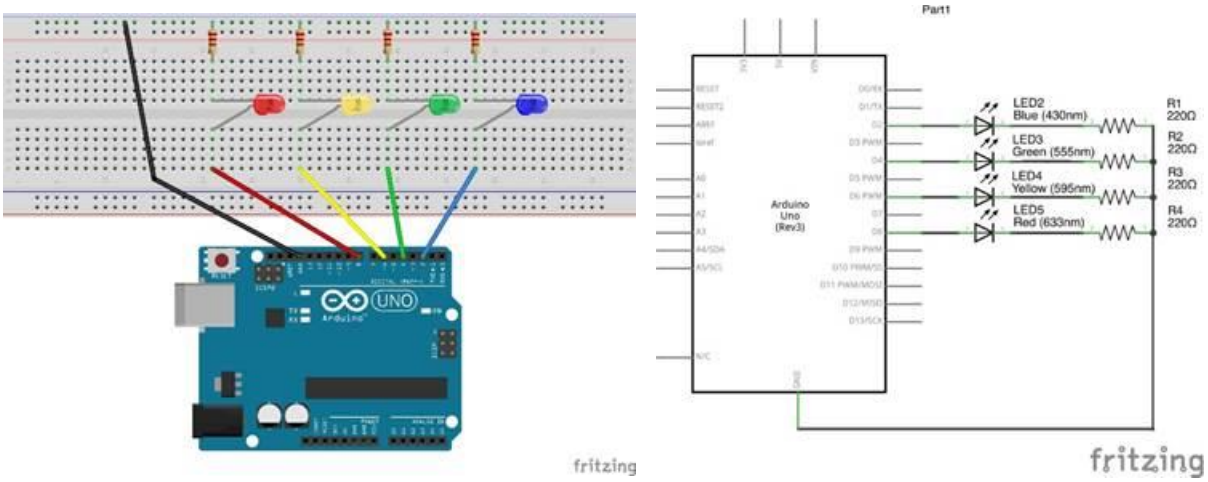
Problem-1(100%)

Write **a complete C code for Arduino Uno** in Sketch software to turn ON and OFF 4 LEDs (e.g., Blue, Green, Yellow, Red) in sequence. Details of the design are described below.

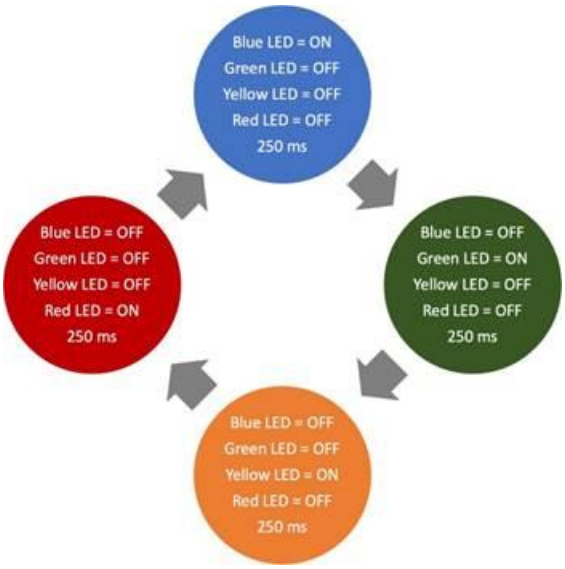
The positive terminals of the LEDs are connected to Arduino Uno board as follows:

LED color	PIN
Blue	2
Green	4
Yellow	6
Red	8

The negative terminals of each LED connect to separate 220Ω resistors. The other terminals of these resistors are connected to ground (GND) pin of the Arduino Uno board. The hardware connectiondiagram is shown below in two different ways: on a breadboard image and a schematic diagram.

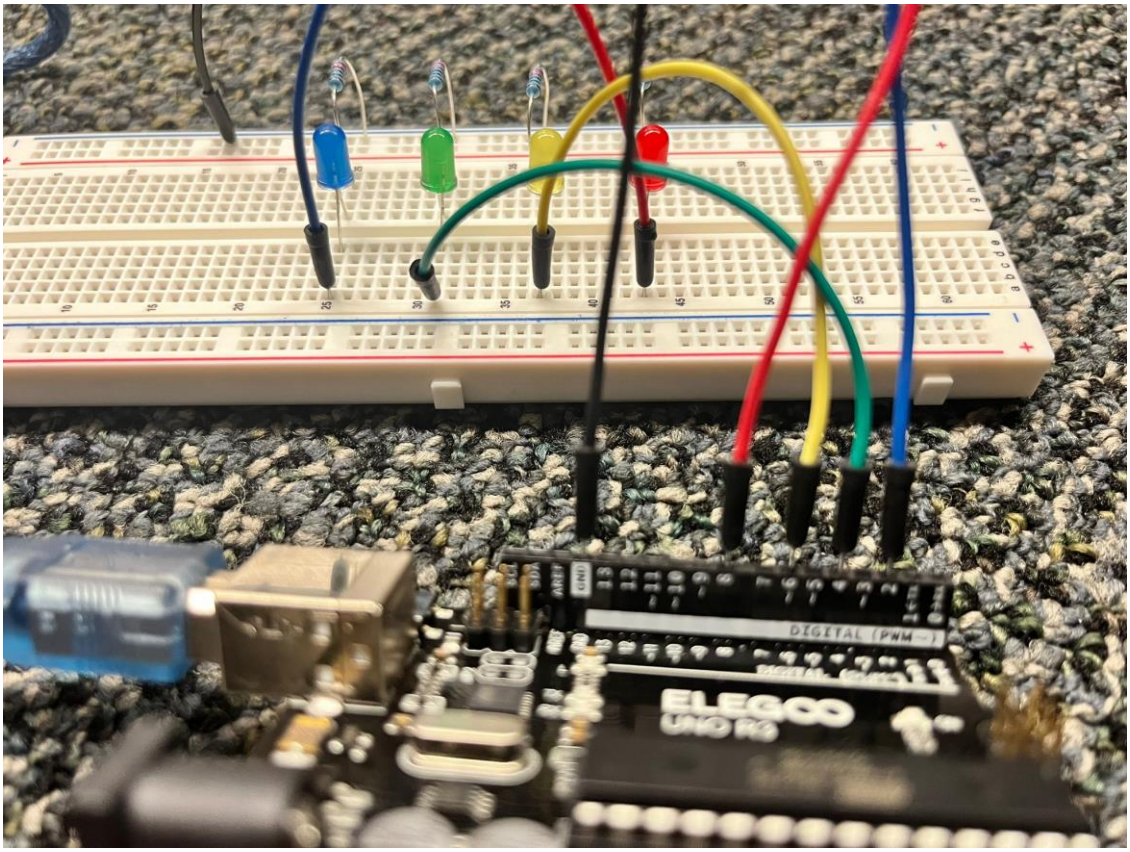


The following state machine shows the sequence of operations (and timing) of the LEDs.



In the report, provide the followings:

1) A picture of the hardware setup.



2) **The complete C code with comments for each line describing the purpose of that line of code.**

C code for the delay time of 250ms:

```
// define the Pin numbers for led's:

// Pin variable name followed by the Pin number
int bluepinnum = 2;
int greenpinnum = 4;
int yellowpinnum = 6;
int redpinnum = 8;

// wait time in milliseconds
int waittime = 250;

//setup function definition which runs for one time during the startup of the
board
void setup() {

  //setting up the respective Pins as a OUTPUT mode to control the led's
  pinMode(bluepinnum, OUTPUT);
  pinMode(greenpinnum, OUTPUT);
  pinMode(yellowpinnum, OUTPUT);
  pinMode(redpinnum, OUTPUT);

}

// loop function definition which runs after the setup function
void loop() {

  //tunring on the blue light followed by the delay with above mentioned wait
time
  digitalWrite(bluepinnum, HIGH);
  delay(waittime);

  //turning off the above blue light and start with green same as above
  digitalWrite(bluepinnum, LOW);
  digitalWrite(greenpinnum, HIGH);
  delay(waittime);

  //repeat same for green light like above green light
  digitalWrite(greenpinnum, LOW);
  digitalWrite(yellowpinnum, HIGH);
  delay(waittime);
```

```
  //repeat the same for red light like above light
  digitalWrite(yellowpinnum, LOW);
  digitalWrite(redpinnum, HIGH);
  delay(waittime);

  //Finally turning off the red light followed by the wait time
  digitalWrite(redpinnum, LOW);
  delay(waittime);

}
```

3) **Change the duration of each state from 250 ms to 100 ms. Provide the new complete code. Provide the complete C code. Describe the difference in observation due to change of duration of eachstate.**

When DELAY is 250ms:

Code:

```
// define the Pin numbers for led's:
// Pin variable name followed by the Pin number
int bluepinnum = 2;
int greenpinnum = 4;
int yellowpinnum = 6;
int redpinnum = 8;

// wait time in milliseconds
int waittime = 250;

//setup function definition which runs for one time during the startup of the
board
void setup() {

  //setting up the respective Pins as a OUTPUT mode to control the led's
  pinMode(bluepinnum, OUTPUT);
  pinMode(greenpinnum, OUTPUT);
  pinMode(yellowpinnum, OUTPUT);
  pinMode(redpinnum, OUTPUT);

}

// loop function definition which runs after the setup function
void loop() {
```

```
  //tunring on the blue light followed by the delay with above mentioned wait
time
  digitalWrite(bluepinnum, HIGH);
  delay(waittime);

  //turning off the above blue light and start with green same as above
  digitalWrite(bluepinnum, LOW);
  digitalWrite(greenpinnum, HIGH);
  delay(waittime);

  //repeat same for green light like above green light
  digitalWrite(greenpinnum, LOW);
  digitalWrite(yellowpinnum, HIGH);
  delay(waittime);

  //repeat the same for red light like above light
  digitalWrite(yellowpinnum, LOW);
  digitalWrite(redpinnum, HIGH);
  delay(waittime);

  //Finally turning off the red light followed by the wait time
  digitalWrite(redpinnum, LOW);
  delay(waittime);

}
```

Output:

When DELAY is 100ms:

Code:

```
// define the Pin numbers for led's:
// Pin variable name followed by the Pin number
int bluepinnum = 2;
int greenpinnum = 4;
int yellowpinnum = 6;
int redpinnum = 8;

// wait time in milliseconds
int waittime = 100;

//setup function definition which runs for one time during the startup of the
board
void setup() {

  //setting up the respective Pins as a OUTPUT mode to control the led's
  pinMode(bluepinnum, OUTPUT);
  pinMode(greenpinnum, OUTPUT);
  pinMode(yellowpinnum, OUTPUT);
  pinMode(redpinnum, OUTPUT);

}

// loop function definition which runs after the setup function
void loop() {

  //tunring on the blue light followed by the delay with above mentioned wait
time
  digitalWrite(bluepinnum, HIGH);
  delay(waittime);

  //turning off the above blue light and start with green same as above
  digitalWrite(bluepinnum, LOW);
  digitalWrite(greenpinnum, HIGH);
  delay(waittime);

  //repeat same for green light like above green light
  digitalWrite(greenpinnum, LOW);
  digitalWrite(yellowpinnum, HIGH);
  delay(waittime);

  //repeat the same for red light like above light
```

```
  digitalWrite(yellowpinnum, LOW);
  digitalWrite(redpinnum, HIGH);
  delay(waittime);

  //Finally turning off the red light followed by the wait time
  digitalWrite(redpinnum, LOW);
  delay(waittime);

}
```

Output:

Difference: The LED will turn on a little later when the time delay is set to 250 ms (i.e., 0.25 sec) than when it is set to 100 ms (i.e., 0.10 sec). Such is the difference. The only delay will occur when the LED turns on. Compared to 250ms, the LED will turn on quickly at 100ms.

4) Change the code so that for alternate rounds (of all 4 states), the duration is 250 ms and 100 ms.(i.e., for the first round of all 4 states the duration is 250 ms, then the next round the duration is 100 ms, then the next round the duration is 250 ms, then the next round the duration is 100 ms, and so on.) Provide the complete C code. Describe the difference in observation due to change of duration of each state.

C code for alternative rounds for 250ms and 100ms at each state:

```
// define the Pin numbers for led's:
// Pin variable name followed by the Pin number
int bluepinnum = 2;
int greenpinnum = 4;
int yellowpinnum = 6;
int redpinnum = 8;

// wait time in milliseconds
int waittimeone = 250;
int waittimetwo = 100;

//setup function definition which runs for one time during the startup of the
board
void setup() {

  //setting up the respective Pins as a OUTPUT mode to control the led's
  pinMode(bluepinnum, OUTPUT);
  pinMode(greenpinnum, OUTPUT);
  pinMode(yellowpinnum, OUTPUT);
  pinMode(redpinnum, OUTPUT);
}

// loop function definition which runs after the setup function
void loop() {

  //Round 1
  //tunring on the blue light followed by the delay with above mentioned wait
time
  digitalWrite(bluepinnum, HIGH);
  delay(waittimeone);

  //turning off the above blue light and start with green same as above
  digitalWrite(bluepinnum, LOW);
  digitalWrite(greenpinnum, HIGH);
  delay(waittimeone);
```

```
  //repeat same for green light like above green light
  digitalWrite(greenpinnum, LOW);
  digitalWrite(yellowpinnum, HIGH);
  delay(waittimeone);

  //repeat the same for red light like above light
  digitalWrite(yellowpinnum, LOW);
  digitalWrite(redpinnum, HIGH);
  delay(waittimeone);

  //Finally turning off the red light followed by the wait time
  digitalWrite(redpinnum, LOW);
  delay(waittimeone);

  // Round 2
  //tunring on the blue light followed by the delay with above mentioned wait
time
  digitalWrite(bluepinnum, HIGH);
  delay(waittimetwo);

  //turning off the above blue light and start with green same as above
  digitalWrite(bluepinnum, LOW);
  digitalWrite(greenpinnum, HIGH);
  delay(waittimetwo);

  //repeat same for green light like above green light
  digitalWrite(greenpinnum, LOW);
  digitalWrite(yellowpinnum, HIGH);
  delay(waittimetwo);

  //repeat the same for red light like above light
  digitalWrite(yellowpinnum, LOW);
  digitalWrite(redpinnum, HIGH);
  delay(waittimetwo);

  //Finally turning off the red light followed by the wait time
  digitalWrite(redpinnum, LOW);
  delay(waittimetwo);
}
```

Output:

Difference: The LED will turn on a little later when the time delay is set to 250 ms (i.e., 0.25 sec) than when it is set to 100 ms (i.e., 0.10 sec). Such is the difference. The only delay will occur when the LED turns on. Compared to 250ms, the LED will turn on quickly at 100ms. Every time the loop operates, this difference will be shown for the iterations.