

NOTEBOOK 2

NETAJI SUBHASH INSTITUTE OF
TECHNOLOGY, NEW DELHI
Rahmeen Habib, Akshita Aggarwal

ABSTRACT

The objective of this notebook was to put to application the basics of the design of digital systems on Arduino (open-hardware) that we learnt in the previous notebook numbered 1.

We learned to connect the Arduino with external input and output peripherals, obtained a higher-level system, learned about sensors, buzzers, LEDs, transistors and the like.

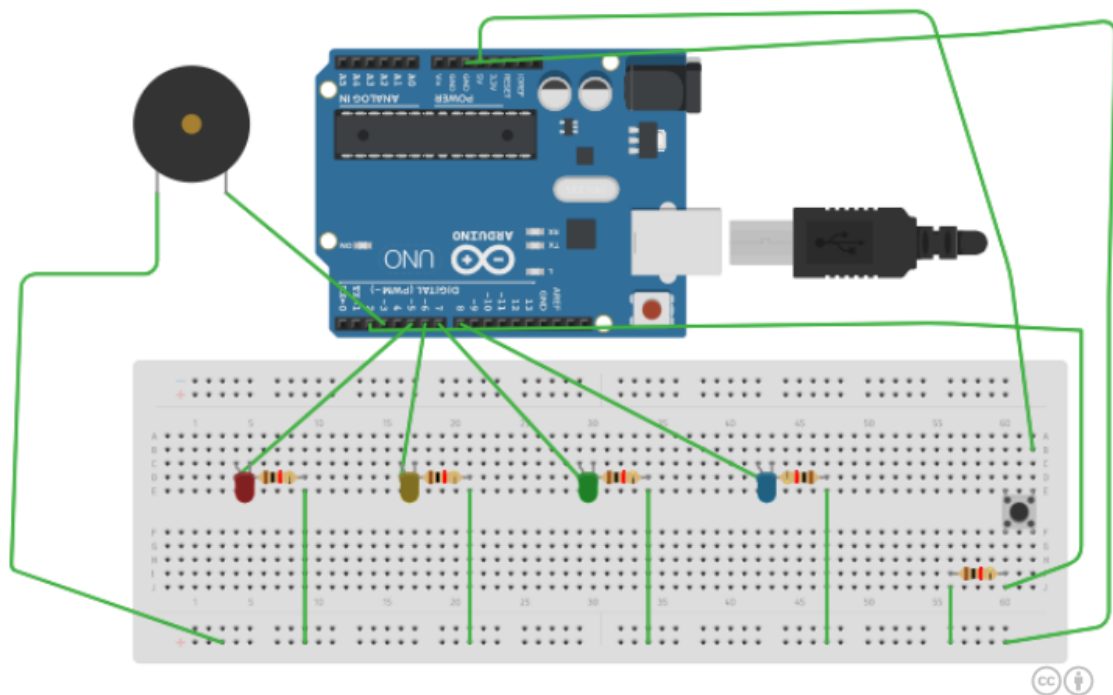
We learned to assemble the basic constituents into a real time application which in this case was a SMART TRAFFIC LIGHT SYSTEM.

TOOLS WE USED

The programs were supposed to be understood and tested by us. The best way to understand a piece of code is to rewrite it and test it on our own. TINKERCAD simulator was used by our team to test and run the programs. TINKERCAD is an online simulator powered by AUTODESK. Tinkercad is an easy, browser-based 3D design and modelling tool for all. Tinkercad allows users to imagine anything and then design it in minutes.

SMART TRAFFIC LIGHT SYSTEM

Our Design:



This circuit uses the following components on Tinkercad:

- Arduino
- Breadboard
- LEDs
- Buzzer
- Resistances

The code that simulates this is:

```
//SMART TRAFFIC LIGHT CODE BEGINS
int green=7;
int yellow=6;
int blue=8;
int red=5;
int inpin=2;
int buzzpin=3;
int val=0;
int length=15;
char notes[]= "ccggaagffeeddc";
int beats[]={1,1,1,1,1,1,2,1,1,1,1,1,2,4};
int tempo=300;

void playTone(int tones, int duration)
{
  for (long i=0; i < duration*1000; i+=tones*2);
  {
    tone(buzzpin,tones, duration);
  }
}

void playNote(char note, int duration)
{
  char names[]={ 'c', 'd', 'e', 'f', 'g', 'a', 'b', 'C' };
  int tones[]={1915, 1700, 1519, 1432, 1275, 1136, 1014, 956};
  for (int i=0; i < 8; i++)
  {
    if (names[i]==note)
    {
      playTone(tones[i], duration);
    }
  }
}

void setup()
{
  Serial.begin(9600);
  pinMode(green, OUTPUT);
  pinMode(yellow, OUTPUT);
  pinMode(red, OUTPUT);
}
```

```

pinMode(blue, OUTPUT);
pinMode(inpin, INPUT);
pinMode(buzzpin, INPUT);
}

```

```

void loop()
{
  digitalWrite(green,1);
  val= digitalRead(inpin);
  Serial.println(val);
  if (val==1)
  {
    delay(2000);
    digitalWrite(green, 0);
    digitalWrite(blue, 1);
    for (int i=0; i < 5;i++)
    {
      digitalWrite(yellow, 1);
      delay(500);
      digitalWrite(yellow, 0);
      delay(500);
    }
    digitalWrite(yellow, 1);
    delay(4000);
    digitalWrite(yellow, 0);
    digitalWrite(blue, 0);
    digitalWrite(red, 1);
    delay(4000);
    digitalWrite(red, 0);
    for (int i=0; i < length; i++)
    {
      if (notes[i]==' ')
      {
        delay(beats[i]*tempo);
      }
      else
      {
        playNote(notes[i], beats[i]*tempo);
      }
      delay(tempo/2);
    }
  }
}

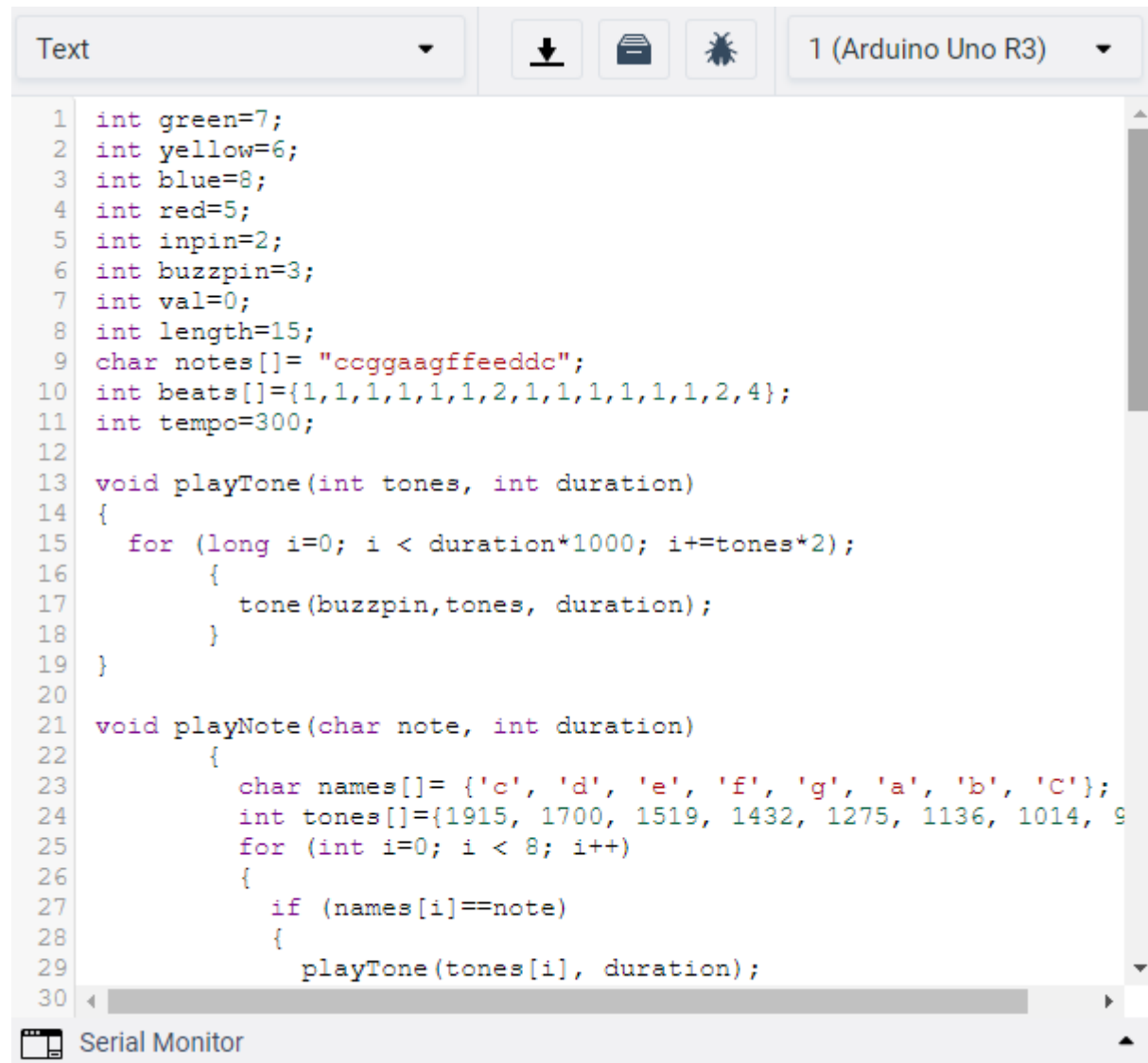
```

```

    delay(1000);
}
} //CODE ENDS

```

The screen shots from Tinker cad for the same are:



```

1  int green=7;
2  int yellow=6;
3  int blue=8;
4  int red=5;
5  int inpin=2;
6  int buzzpin=3;
7  int val=0;
8  int length=15;
9  char notes[]="ccggaagffeeddc";
10 int beats[]={1,1,1,1,1,1,2,1,1,1,1,1,2,4};
11 int tempo=300;
12
13 void playTone(int tones, int duration)
14 {
15     for (long i=0; i < duration*1000; i+=tones*2);
16     {
17         tone(buzzpin,tones, duration);
18     }
19 }
20
21 void playNote(char note, int duration)
22 {
23     char names[]= {'c', 'd', 'e', 'f', 'g', 'a', 'b', 'C'};
24     int tones[]={1915, 1700, 1519, 1432, 1275, 1136, 1014, 9
25     for (int i=0; i < 8; i++)
26     {
27         if (names[i]==note)
28         {
29             playTone(tones[i], duration);
30

```

Serial Monitor

Code

Start Simulation

Export

Share

Text

Download

Save

Run

1 (Arduino Uno R3)

```
29         playTone(tones[i], duration);
30     }
31 }
32 }
33
34 void setup()
35 {
36     Serial.begin(9600);
37     pinMode(green, OUTPUT);
38     pinMode(yellow, OUTPUT);
39     pinMode(red, OUTPUT);
40     pinMode(blue, OUTPUT);
41     pinMode(inpPin, INPUT);
42     pinMode(buzzPin, INPUT);
43 }
44
45
46 void loop()
47 {
48     digitalWrite(green, 1);
49     val = digitalRead(inpPin);
50     Serial.println(val);
51     if (val == 1)
52     {
53         delay(2000);
54         digitalWrite(green, 0);
55         digitalWrite(blue, 1);
56         for (int i=0; i < 5; i++)
57         {
58             digitalWrite(yellow, 1);
59         }
60     }
```

Serial Monitor

W


?


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1




 Code

 Start Simulation

Export

Share


Text



1 (Arduino Uno R3)

```
57 {
58     digitalWrite(yellow, 1);
59     delay(500);
60     digitalWrite(yellow, 0);
61     delay(500);
62 }
63 digitalWrite(yellow, 1);
64 delay(4000);
65 digitalWrite(yellow, 0);
66 digitalWrite(blue, 0);
67 digitalWrite(red, 1);
68 delay(4000);
69 digitalWrite(red, 0);
70 for (int i=0; i < length; i++)
71 {
72     if (notes[i]==' ')
73     {
74         delay(beats[i]*tempo);
75     }
76     else
77     {
78
79         playNote(notes[i], beats[i]*tempo);
80     }
81     delay(tempo/2);
82 }
83 delay(1000);
84 }
85 }
```

Serial Monitor



SEE IT WORK

<https://drive.google.com/file/d/1YgRxReT9FILqHLq2NUzovAFbjbVZnXLj/view>

TIME DEVOTED BY EACH GROUP MEMBER

Rahmeen Habib: 1.5 hours

Akshita Aggarwal: 1.5 hours

CONCLUSION

The assigned task of designing a Smart Traffic Light System gave us an opportunity to go beyond our way and increase our familiarisation with the in depth functionality of Arduino circuitry using simulators like Tinkercad. The team developed a deeper understanding of making circuits using Arduino components and controlling them.

The document provided to us was very informative, and it guided us wonderfully throughout the project completion. Our professor, Dr. Pinaki Chakraborty helped us in all possible ways and guided us throughout.

Our basic knowledge of the programming languages of C/C++ also helped us in accomplishing this task and in due course, we only learned both electronics and programming better!

