Ahsanullah University of Science & Technology
Department of Computer Science & Engineering
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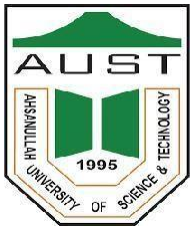

CSE3216
Microcontroller Based System Design Lab
Project Proposal

Project Name: *Four Way Traffic System*

Group No : 04

Submitted To

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Objective

The modern day traffic lights are very smart, comparatively. They not only monitor the traffic, but also alter their light switching timings as per the request of the pedestrians. For this particular project, we will form *a four way intersection*, based on Density of vehicles for each lane. This means that the light will not run according to the traffic volume. Hence, the lights will not be smart enough, but would definitely be cost saving. Traffic Lights will be used as lights and the logic and function will be performed by the Arduino alone. The code of the Arduino will be such that it will have the knowledge of when to switch on each light with respect to density of the vehicles.

Social Values

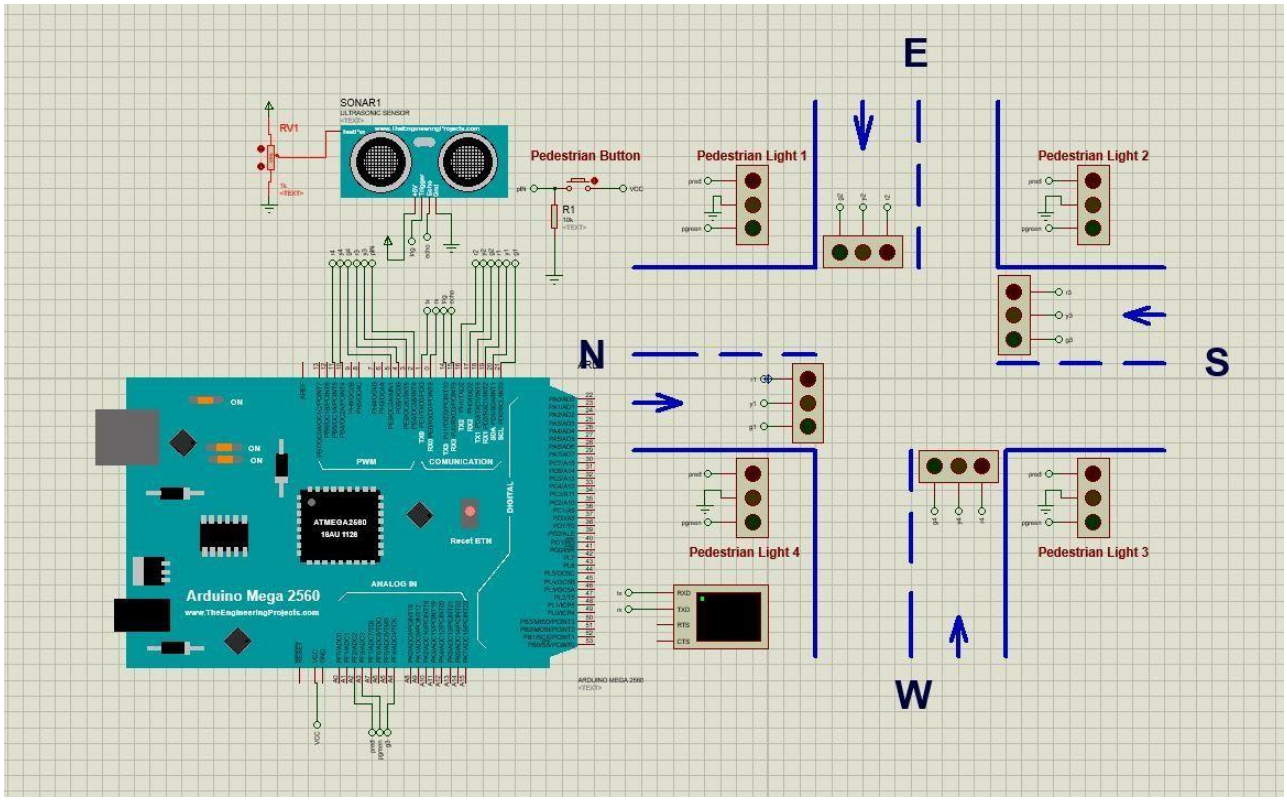
- With the number of vehicle users constantly increasing, the facility provided by the current system is limited and inefficient. A survey shows that an average person spends about four to six months of his/her entire life just waiting for the green light to be turned ON at a signal.
- It is also been identified that this inadequate facility and irrational distribution of signal control is leading to such traffic issues.
- Unnecessary waiting time in the signal can be avoided by determining in which side the green signal should stay longer during the traffic.
- The saving of fuel (petrol, diesel, natural gas), reduction in time of the operation of automobile engines, reduction in the emission of the harmful gases in the atmosphere.
- The proposed system aims to save the number of manhours wasted at the signals and hence making effective utilization of time.

Required Components

- Arduino Mega 2650
- Traffic lights (4 pieces)
- Pedestrian Traffic lights (4 pieces)
- Resistors: (330-1000 Ohm)
- Connecting wires

- Pedestrian Button (4 Pieces)
- Ultrasonic sensor

Design



Working Procedure

The basic components that react to the inputs are :

- Resistors: (330-1000 Ohm)
- Pedestrian Button
- Ultrasonic Sensor
- Servo Motor

The components that receive commands :

- Traffic lights(4 pieces)
- Pedestrian Traffic lights (4 pieces)

In that, first the Lane 1 gets its Green light turned on. Hence, in all the other

Lanes, their corresponding Red lights are turned on. After a time delay say 5 seconds, the Green light in the Lane 3 must be turned on and the Green light in the Lane 1 must be turned off. As a warning indicator, the Yellow light in Lane 1 is tuned on indicating that the red light is about to light up. Similarly, the yellow light in the Lane 3 is also turned as an indication that the green light about to be turned on. The yellow lights in Lanes 1 and 3 are turned for a small duration say 2 seconds after with the red light in the Lane 1 is turned on and green light in Lane 3 is also turned on. The green light in Lane 3 is also turned on and the process moves forward to Lane 4 and finally Lane 2. The system then loops back to Lane 1 where the process mentioned above will be repeated all overagain. This is the basic procedure.

This process will work differently when the ultrasonic sensor starts to measure the density and distance of the vehicles.

Like, The ultrasonic sensor moves 360 degrees and the transmitter of the ultrasonic sensor sends an ultra-violate ray to the lane and this ray collides with the vehicles of that lane and bounces back to the receiver of the ultrasonic sensor so it measures the vehicle densityof the lane and also measures the length of rush. If a huge amount of wave bounces back to the receiver it means there are a large number of vehicles. onthe other hand, If a less number of waves bounces back to the receiver it means there are fewer vehicles. so the ultrasonic sensor instructs the Arduinoto increase the timer for the green light of the crowded lane and decrease other lanes according to the bounced back waves and the process moves forward to next Lane.

There are pedestrian buttons for 4 lanes .they control the 4 pedestrian traffic lights .when the pedestrian button switches on the green lights of the pedestrian traffic light of 4 lanes turn on and red lights of vehicles traffic light of 4 lanes turn on. After a few moment when the pedestrian button switches of the red lights of the pedestrian traffic light of 4 lanes turn on and green and yellow lights of vehicles traffic light of 4 lanes turn on and the process gets back to the previous loop.

Budget

Equipment	Quantity	Budget (Tk)
Arduino Mega 2650	1	920
Traffic lights	4	80
Pedestrian Traffic lights	4	80
Resistors	24	500
Connecting wires	As Needed	200
Pedestrian Button	1	60
Ultrasonic Sensor	1	100
Total		2420 Tk

Code

```
const int TrigPin = 14;          // Trigger Pin of Ultrasonic Sensor
const int echoPin = 15;          // Echo Pin of Ultrasonic Sensor
const int g1 = 21;
const int y1 = 20;
const int r1 = 19;
const int g2 = 18;
const int y2 = 17;
const int r2 = 16;
const int g3 = A4;
const int y3 = 3;
const int r3 = 4;
const int g4 = 5;
const int y4 = 10;
const int r4 = 11;
const int pRed = A2;
const int pgreen = A3;
const int pIN = 2;

long microsecondsToInches(long microseconds)
{
   return microseconds / 74 / 2;
}

long microsecondsToCentimeters(long microseconds)
{
   return microseconds / 29 / 2;

}
void setup()

{
   pinMode (r1, OUTPUT);
   pinMode (y1, OUTPUT);
   pinMode (g1, OUTPUT);
   pinMode (r2, OUTPUT);
```

```
  pinMode (y2, OUTPUT);
  pinMode (g2, OUTPUT);
  pinMode (r3, OUTPUT);
  pinMode (y3, OUTPUT);
  pinMode (g3, OUTPUT);
  pinMode (r4, OUTPUT);
  pinMode (y4, OUTPUT);
  pinMode (g4, OUTPUT);
  pinMode (pRed, OUTPUT);
  pinMode (pgreen, OUTPUT);
  pinMode (pIN, INPUT);
  digitalWrite (r1, HIGH);
  digitalWrite (r2, HIGH);
  digitalWrite (r3, HIGH);
  digitalWrite (r4, HIGH);
  digitalWrite (pRed, HIGH);
  Serial.begin(9600);
}

void loop()
{


  long duration, inches, cm;
  pinMode(TrigPin, OUTPUT);
  digitalWrite(TrigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(TrigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(TrigPin, LOW);
  pinMode(echoPin, INPUT);
  duration = pulseIn(echoPin, HIGH);
  inches = microsecondsToInches(duration);
  cm = microsecondsToCentimeters(duration);
  Serial.print("Distance = ");
  Serial.print(inches);
  Serial.print("in, ");
```

```
Serial.print(cm);
Serial.print("cm");
Serial.println();
if(inches >= 200)
{
   int crossIn = digitalRead (pIN);
   if (crossIn == HIGH)
   {
      WalkCycle();
   }
   else
   {
      delay(100);
      digitalWrite (r1, LOW);
      digitalWrite(g1,HIGH);
      digitalWrite(r2,HIGH);
      digitalWrite(r3,HIGH);
      digitalWrite(r4,HIGH);
      delay(4000);
   }
   int crossIn2 = digitalRead (pIN);
   if (crossIn2 == HIGH)
   {
      WalkCycle();
   }
   else
   {
      digitalWrite(g1,LOW);
      digitalWrite(y1,HIGH);
      digitalWrite(r2,HIGH);
      digitalWrite(r3,HIGH);
      digitalWrite(r4,HIGH);
      delay(2000);
   }
   int crossIn3 = digitalRead (pIN);
   if (crossIn3 == HIGH)
   {
```

```
   WalkCycle();
}
else
{
   digitalWrite(y1,LOW);
   digitalWrite(r2,LOW);
   digitalWrite(r1,HIGH);
   digitalWrite(g2,HIGH); //2nd light
   digitalWrite(r3,HIGH);
   digitalWrite(r4,HIGH);
   delay(4000);
}
int crossIn4 = digitalRead (pIN);
if (crossIn4 == HIGH)
{
   WalkCycle();
}
else
{
   digitalWrite(g2,LOW);
   digitalWrite(y2,HIGH);
   digitalWrite(r1,HIGH);
   digitalWrite(r3,HIGH);
   digitalWrite(r4,HIGH);
   delay(2000);
}
int crossIn5 = digitalRead (pIN);
if (crossIn5 == HIGH)
{
   WalkCycle();
}
else
{
   digitalWrite(y2,LOW);
   digitalWrite(r3,LOW);
   digitalWrite(g3,HIGH);//3rd light
   digitalWrite(r1,HIGH);
```

```
   digitalWrite(r2,HIGH);
   digitalWrite(r4,HIGH);
   delay(4000);
}
int crossIn6 = digitalRead (pIN);
if (crossIn6 == HIGH)
{
   WalkCycle();
}
else
{
   digitalWrite(g3,LOW);
   digitalWrite(y3,HIGH);
   digitalWrite(r1,HIGH);
   digitalWrite(r2,HIGH);
   digitalWrite(r4,HIGH);
   delay(2000);
}
int crossIn7 = digitalRead (pIN);
if (crossIn7 == HIGH)
{
   WalkCycle();
}
else
{
   digitalWrite(y3,LOW);
   digitalWrite(r3,LOW);
   digitalWrite(r4,LOW);
   digitalWrite(g4,HIGH);              //4th light
   digitalWrite(r1,HIGH);
   digitalWrite(r2,HIGH);
   digitalWrite(r3,HIGH);
   delay(4000);
}
int crossIn8 = digitalRead (pIN);
if (crossIn8 == HIGH)
{
```

```
      WalkCycle();
    }
    else
    {
      digitalWrite(g4,LOW);
      digitalWrite(r4,LOW);
      digitalWrite(y4,HIGH);
      digitalWrite(r1,HIGH);
      digitalWrite(r2,HIGH);
      digitalWrite(r3,HIGH);
      delay(2000);
    }
    digitalWrite(y4,LOW);
    digitalWrite(r4,LOW);
    digitalWrite(r1,LOW);
  }
  else if(inches >= 300 )
  {
    int crossIn = digitalRead (pIN);
    if (crossIn == HIGH)
    {
      WalkCycle();
    }
    else
    {
      delay(100);
      digitalWrite (r1, LOW);
      digitalWrite(g1,HIGH);
      digitalWrite(r2,HIGH);
      digitalWrite(r3,HIGH);
      digitalWrite(r4,HIGH);
      delay(4000);
    }
    int crossIn2 = digitalRead (pIN);
    if (crossIn2 == HIGH)
    {
      WalkCycle();
```

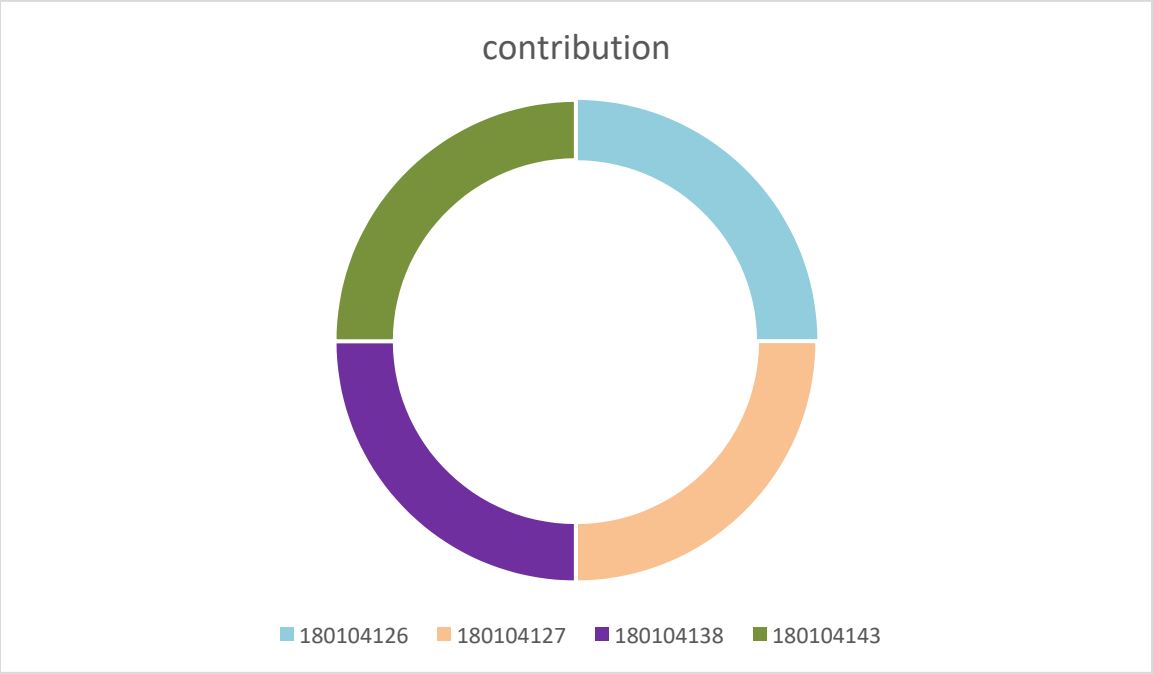
```
}
else
{
   digitalWrite(g1,LOW);
   digitalWrite(y1,HIGH);
   digitalWrite(r2,HIGH);
   digitalWrite(r3,HIGH);
   digitalWrite(r4,HIGH);
   delay(2000);
}
int crossIn3 = digitalRead (pIN);
if (crossIn3 == HIGH)
{
   WalkCycle();
}
else
{
   digitalWrite(y1,LOW);
   digitalWrite(r2,LOW);
   digitalWrite(r1,HIGH);
   digitalWrite(g2,HIGH);          //2nd light
   digitalWrite(r3,HIGH);
   digitalWrite(r4,HIGH);
   delay(4000);
}
int crossIn4 = digitalRead (pIN);
if (crossIn4 == HIGH)
{
   WalkCycle();
}
else
{
   digitalWrite(g2,LOW);
   digitalWrite(y2,HIGH);
   digitalWrite(r1,HIGH);
   digitalWrite(r3,HIGH);
   digitalWrite(r4,HIGH);
```

```
   delay(2000);
}
int crossIn5 = digitalRead (pIN);
if (crossIn5 == HIGH)
{
   WalkCycle();
}
else
{
   digitalWrite(y2,LOW);
   digitalWrite(r3,LOW);
   digitalWrite(g3,HIGH);                  //3rd light
   digitalWrite(r1,HIGH);
   digitalWrite(r2,HIGH);
   digitalWrite(r4,HIGH);
   delay(4000);
}
int crossIn6 = digitalRead (pIN);
if (crossIn6 == HIGH)
{
   WalkCycle();
}
else
{
   digitalWrite(g3,LOW);
   digitalWrite(y3,HIGH);
   digitalWrite(r1,HIGH);
   digitalWrite(r2,HIGH);
   digitalWrite(r4,HIGH);
   delay(2000);
}
int crossIn7 = digitalRead (pIN);
if (crossIn7 == HIGH)
{
   WalkCycle();
}
else
```

```
      {
         digitalWrite(y3,LOW);
         digitalWrite(r3,LOW);
         digitalWrite(r4,LOW);
         digitalWrite(g4,HIGH);//4th light
         digitalWrite(r1,HIGH);
         digitalWrite(r2,HIGH);
         digitalWrite(r3,HIGH);
         delay(4000);
      }
      int crossIn8 = digitalRead (pIN);
      if (crossIn8 == HIGH)
      {
         WalkCycle();
      }
      else
      {
         digitalWrite(g4,LOW);
         digitalWrite(r4,LOW);
         digitalWrite(y4,HIGH);
         digitalWrite(r1,HIGH);
         digitalWrite(r2,HIGH);
         digitalWrite(r3,HIGH);
         delay(2000);
      }
      digitalWrite(y4,LOW);
      digitalWrite(r4,LOW);
      digitalWrite(r1,LOW);

   }
}
void WalkCycle()
{
   delay(350);
   digitalWrite (g1, LOW);
   digitalWrite (g2, LOW);
   digitalWrite (g3, LOW);
```

```
  digitalWrite (g4, LOW);
  digitalWrite (y1, LOW);
  digitalWrite (y2, LOW);
  digitalWrite (y3, LOW);
  digitalWrite (y4, LOW);
  digitalWrite (r1, HIGH);
  digitalWrite (r2, HIGH);
  digitalWrite (r3, HIGH);
  digitalWrite (r4, HIGH);

  digitalWrite (pgreen, HIGH);
  digitalWrite (pRed, LOW);
  delay (3000);
  digitalWrite (pgreen, LOW);

  delay(250);
  for (int x = 0; x < 5; x++)    // Flash green Ped LED 5X
  {
    digitalWrite(pgreen, HIGH);
    delay(250);
    digitalWrite(pgreen, LOW);
    delay(250);
  }
  digitalWrite(pRed, HIGH);
}
```

Members Contribution



Difficulties

We had to face difficulties while trying to measure the perfect density of the vehicles for a more practical implementation.

Future Work

In future we will try to implement this practically using a servo-motor which will help to rotate the Ultrasonic Sensor in 90Degrees. Thus we can get the distance in perfect measure.

We can also use the image sensor or imager. It does it work by producing the image of the roads. It creates the image by converting the variable attenuation of light into signal that conveys the picture. Imagers used the both digital and analog electronics devices.

Conclusion

Traffic Lights or Traffic Signals are signaling devices that are used to control the flow of traffic. Generally, they are positioned at junctions, intersections, ‘X’ roads, pedestrian crossings etc. and alternate the priority of who has to wait and who has to go. The traffic lights will provide instructions to the users (drivers and pedestrians) by displaying lights of standard color. The three colors used in traffic lights are Red, Yellow and Green. The system must be used to control the traffic lights for smooth and safe movement of traffic. These control systems consists of electro mechanical controllers with clockwork mechanisms or modern solid state computerized systems with easy setup and maintenance.