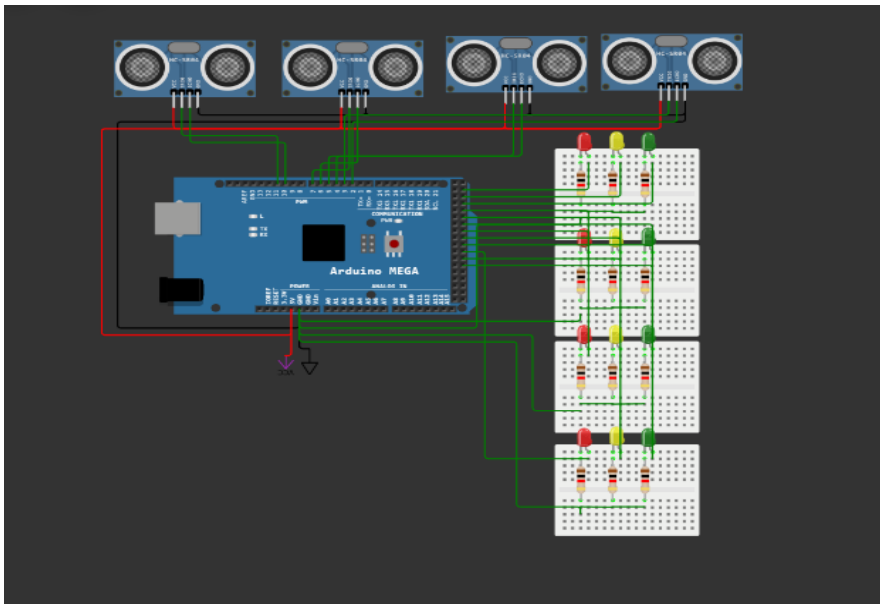
Project 10
Title: Traffic Management

Phase 3: Deploy IoT devices (e.g., traffic flow sensors, cameras) in strategic locations to monitor traffic conditions.
Develop a Python script on the IoT devices to send real-time traffic data to the traffic information platform.

Hardwares:

- Arduino
- Resistors
- HC-SR04
- Breadboard
- LEDs(Red,Yellow,Green)

Circuit:



Program:

```
#include<TimerOne.h>
int signal1[] = {23, 25, 27};
int signal2[] = {29, 31, 33};
```

```
int signal3[] = {35, 37, 39};
int signal4[] = {41, 43, 45};

int redDelay = 10000;
int yellowDelay = 2000;

volatile int triggerpin1 = 11;
volatile int echopin1 = 10;
volatile int triggerpin2 = 7;
volatile int echopin2 = 6;
volatile int triggerpin3 = 5;
volatile int echopin3 = 4;
volatile int triggerpin4 = 3;
volatile int echopin4 = 2;

volatile long time;                 // Variable for storing the time traveled
volatile int S1, S2, S3, S4;          // Variables for storing the distance covered

int t = 10;  // distance under which it will look for vehicles.

void setup(){
  Serial.begin(115200);
  Timer1.initialize(100000);  //Begin using the timer. This function must be called first.
"microseconds" is the period of time the timer takes.
  Timer1.attachInterrupt(softInterr); //Run a function each time the timer period
finishes.

  // Declaring LED pins as output
  for(int i=0; i<3; i++){
    pinMode(signal1[i], OUTPUT);
    pinMode(signal2[i], OUTPUT);
    pinMode(signal3[i], OUTPUT);
    pinMode(signal4[i], OUTPUT);
  }

  // Declaring ultrasonic sensor pins as output
  pinMode(triggerpin1, OUTPUT);
  pinMode(echopin1, INPUT);
  pinMode(triggerpin2, OUTPUT);
  pinMode(echopin2, INPUT);
  pinMode(triggerpin3, OUTPUT);
```

```
 pinMode(echopin3, INPUT);
 pinMode(triggerpin4, OUTPUT);
 pinMode(echopin4, INPUT);
}

void loop()
{
 // If there are vehicles at signal 1
 while (S1<t)
 {
  signal1Function();
 }
 if  (S1>t)
 {
  signal01Function();
 }
 // If there are vehicles at signal 2
 while (S2<t)
 {
  signal2Function();
 }
 if  (S2>t)
 {
  signal02Function();
 }
 // If there are vehicles at signal 3
 while (S3<t)
 {
  signal3Function();
 }
  if  (S3>t)
 {
  signal03Function();
 }
 // If there are vehicles at signal 4
 while (S4<t)
 {
  signal4Function();
 }
 // If there are NO BUSY vehicles at signalS
if  (S4>t)
```

```
 {
   signal04Function();
 }
}

// This is interrupt function and it will run each time the timer period finishes. The
timer period is set at 100 milli seconds.
void softInterr()
{
 // Reading from first ultrasonic sensor
 digitalWrite(triggerpin1, LOW);
 delayMicroseconds(2);
 digitalWrite(triggerpin1, HIGH);
 delayMicroseconds(10);
 digitalWrite(triggerpin1, LOW);
 time = pulseIn(echopin1, HIGH);
 S1= time*0.034/2;

 // Reading from second ultrasonic sensor
 digitalWrite(triggerpin2, LOW);
 delayMicroseconds(2);
 digitalWrite(triggerpin2, HIGH);
 delayMicroseconds(10);
 digitalWrite(triggerpin2, LOW);
 time = pulseIn(echopin2, HIGH);
 S2= time*0.034/2;

 // Reading from third ultrasonic sensor
 digitalWrite(triggerpin3, LOW);
 delayMicroseconds(2);
 digitalWrite(triggerpin3, HIGH);
 delayMicroseconds(10);
 digitalWrite(triggerpin3, LOW);
 time = pulseIn(echopin3, HIGH);
 S3= time*0.034/2;

 // Reading from fourth ultrasonic sensor
 digitalWrite(triggerpin4, LOW);
 delayMicroseconds(2);
 digitalWrite(triggerpin4, HIGH);
 delayMicroseconds(10);
```

```
  digitalWrite(triggerpin4, LOW);
  time = pulseIn(echopin4, HIGH);
  S4= time*0.034/2;

  // Print distance values on serial monitor for debugging
  Serial.print("S1: ");
  Serial.print(S1);
  Serial.print("  S2: ");
  Serial.print(S2);
  Serial.print("  S3: ");
  Serial.print(S3);
  Serial.print("  S4: ");
  Serial.println(S4);
}

void signal1Function()
{
  Serial.println("1");
  low();
  // Make RED LED LOW and make Green HIGH for 5 seconds
  digitalWrite(signal1[0], LOW);
  digitalWrite(signal1[2], HIGH);
  delay(redDelay);

  // if there are vehicels at other signals
  if(S2<t || S3<t || S4<t)
  {
    // Make Green LED LOW and make yellow LED HIGH for 2 seconds
    digitalWrite(signal1[2], LOW);
    digitalWrite(signal1[1], HIGH);
    delay(yellowDelay);
  }
}

void signal2Function()
{
  Serial.println("2");
  low();
  digitalWrite(signal2[0], LOW);
  digitalWrite(signal2[2], HIGH);
  delay(redDelay);
```

```
  if(S1<t || S3<t || S4<t)
  {
    digitalWrite(signal2[2], LOW);
    digitalWrite(signal2[1], HIGH);
    delay(yellowDelay);
  }
}

void signal3Function()
{
  Serial.println("3");
  low();
  digitalWrite(signal3[0], LOW);
  digitalWrite(signal3[2], HIGH);
  delay(redDelay);

  if(S1<t || S2<t || S4<t)
  {
    digitalWrite(signal3[2], LOW);
    digitalWrite(signal3[1], HIGH);
    delay(yellowDelay);
  }
}

void signal4Function()
{
  Serial.println("4");
  low();
  digitalWrite(signal4[0], LOW);
  digitalWrite(signal4[2], HIGH);
  delay(redDelay);

  if(S1<t || S2<t || S3<t)
  {
    digitalWrite(signal4[2], LOW);
    digitalWrite(signal4[1], HIGH);
    delay(yellowDelay);
  }

}
```

```
void signal01Function()
{
 Serial.println("01");
 low();
 digitalWrite(signal1[0], LOW);
 digitalWrite(signal1[2], HIGH);
 delay(3000);
 digitalWrite(signal1[2], LOW);
 digitalWrite(signal1[1], HIGH);
 delay(1000);
 digitalWrite(signal1[1], LOW);
 digitalWrite(signal1[0], HIGH);
 }

void signal02Function()
{
 Serial.println("02");
 low();
 digitalWrite(signal2[0], LOW);
 digitalWrite(signal2[2], HIGH);
 delay(3000);
 digitalWrite(signal2[2], LOW);
 digitalWrite(signal2[1], HIGH);
 delay(1000);
 digitalWrite(signal2[1], LOW);
 digitalWrite(signal2[0], HIGH);
}

void signal03Function()
{
 Serial.println("03");
 low();
 digitalWrite(signal3[0], LOW);
 digitalWrite(signal3[2], HIGH);
 delay(3000);
 digitalWrite(signal3[2], LOW);
 digitalWrite(signal3[1], HIGH);
 delay(1000);
 digitalWrite(signal3[1], LOW);
 digitalWrite(signal3[0], HIGH);
```

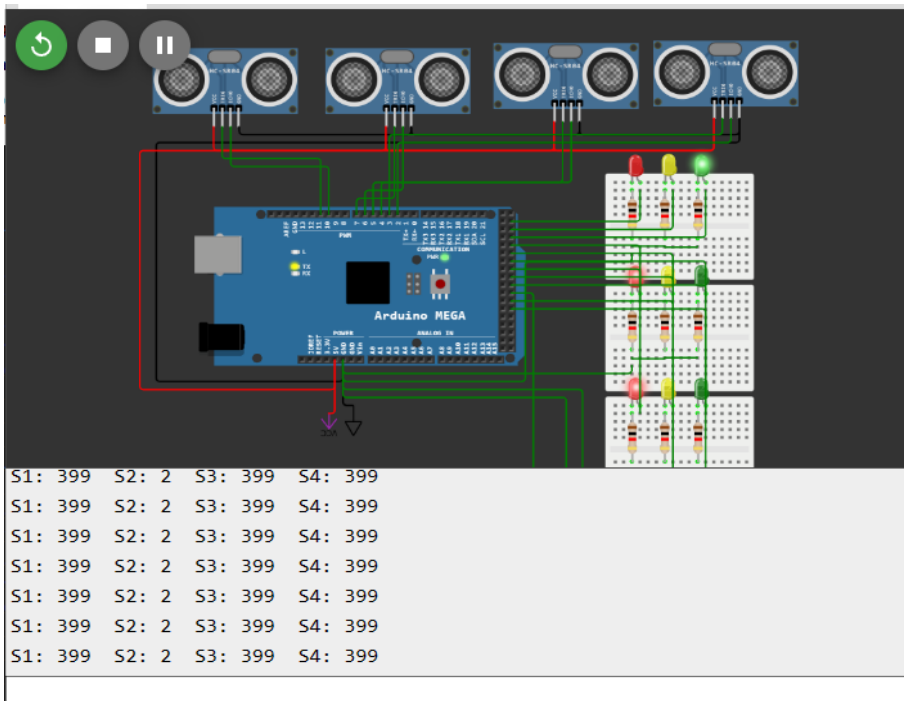
```
}

void signal04Function()
{
 Serial.println("04");
 low();
 digitalWrite(signal4[0], LOW);
 digitalWrite(signal4[2], HIGH);
 delay(3000);
 digitalWrite(signal4[2], LOW);
 digitalWrite(signal4[1], HIGH);
 delay(1000);
 digitalWrite(signal4[1], LOW);
 digitalWrite(signal4[0], HIGH);

 }

// Function to make all LED's LOW except RED one's.
void low()
{
 for(int i=1; i<3; i++)
 {
  digitalWrite(signal1[i], LOW);
  digitalWrite(signal2[i], LOW);
  digitalWrite(signal3[i], LOW);
  digitalWrite(signal4[i], LOW);
 }
 for(int i=0; i<1; i++)
 {
  digitalWrite(signal1[i], HIGH);
  digitalWrite(signal2[i], HIGH);
  digitalWrite(signal3[i], HIGH);
  digitalWrite(signal4[i], HIGH);
 }
}
```

Output:



- By, measuring traffic densities using HC-SR04 we can reduce the traffic congestion mainly in 4 way roads.
- If the traffic density is high in particular way then by detecting it, the traffic can be cleared as soon as possible.
- It works based on the program included in arduino which doesn't need any manual detection.
- The output can be accessed by web browser which takes immediate action based on the data received.