# Automated Traffic Signal Control System

## INTRODUCTION

The problem of traffic congestion isn't a foreign concept and is something that all of us have faced at some point or another. Initially, policemen would channel the traffic at junctions and main intersections to avoid traffic congestions, but this was seen to be cumbersome and a more convenient and modern solution had to be brought up.

That is when traffic signals came into picture. The signal works in a turn by turn method where the light turns green for a certain amount of time and once the tier goes off, another lane's green light goes off. This has been the system adopted and being used by us for a very long time now. Even though this has been an upgrade from the previous method, this hasn't completely solved the problem as we still face problems of having to stay in a lane for very long amounts of time even when the signal system is in a working condition. Sometimes, the signal system is switched to an aware state, making it the responsibility of the driver to take caution about crossing the junction. This also may lead to accidents.

To overcome these problems of the existing traffic signal systems employed in our country, I propose an automated signal system which changes the lights according to the existence and non-existence of vehicles in a particular lane. For this, we can use an IR sensor to detect whether or not there's an existing vehicle in a particular lane. Depending on that, the signal for that lane changes to green and if there is no vehicle, it shall remain red. This way, the vehicles that arrive at the junction get preference irrespective of the lane, thus avoiding having an extended wait time even though there are no other lanes with vehicles in them. This also eliminates the need to switch the signal system to the yellow light mode, as the signal changes according to the vehicle arriving.

## EXISTING SYSTEM

The existing system in India is either manually controlled or is present, this system  does  not Control the Indian traffic in an efficient way. Infact most of the traffic congestions happening in the major cities of India is because of Un-intelligent traffic systems, which fail to understand the traffic flow coming in from different directions.
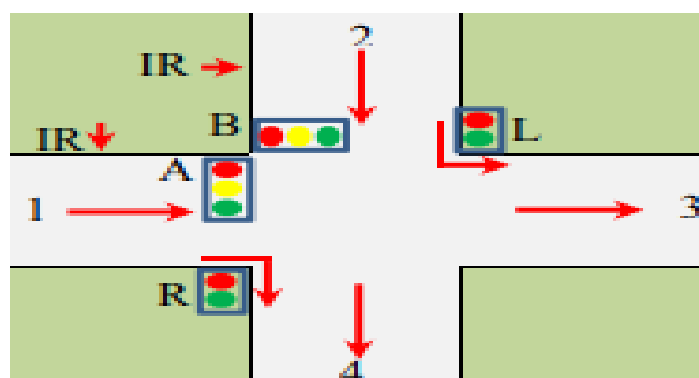
**PROPOSED SYSTEM:**

The proposed smart traffic system consists of a traffic light controller that manages the traffic lights of a "+" junction of mono directional roads. The system is capable of estimating the traffic density using IR sensors posted on either side of the roads. Based on this information, the time dedicated for the green light will be extended to allow large flow of cars in case of traffic jam, or reduced to prevent unnecessary waiting time when no cars are present at the opposite route. The system is complemented by portable controller for the emergency vehicles stuck in the traffic. By means of secure communication using XBee wireless system, the portable controller triggers the traffic master controller to the emergency mode and provides an open path until the stuck emergency vehicle traverses the intersection. The designed system is implemented, realized electronically, and tested to ensure complete validation of its operations and functions. The current design can be promoted by monitoring and controlling an intersection with double roads. Future improvements can be added such as pedestrian crossing button, delay timing displays, as well as car accident and failure modes. The integration of different traffic controllers at several junctions will be investigated in the future in order to accomplish a complete synchronization. To study the system performance, traffic data can be recorded and downloaded to computer platform where statistical data analysis studies could be applied to better understand the traffic flows between the intersections. Finally, traffic light controller could be powered by solar power panels to reduce grid electricity consumption and realize green energy operations.

**METHODOLOGY:**

Traffic light smart traffic light system, two configurations are presented: the first arrangement allows the flow of automotive from road 1 forwardly to road 3 as well as the turning to the right to follow road 4, while the second one permits the cars to move from road 2 directly toward road 4 or shift to the left to pursue road 3. The disposition of cars transitions between the roads takes into consideration the crossing of pedestrians. Table illustrates the states of the traffic lights labelled A, B, L, and R during the two configuration modes. The terminology adopted is formed of three fields: traffic light-colour lights states. For example, A-G ON designates that the green light of the traffic light A is illuminated. The phase I of the first configuration corresponds to the activation of the green light of the traffic light A and traffic R where the cars parking at road 1 are crossing the intersection. The phase II agrees with the warning for stop position where only the yellow light of the traffic light A is turning on for 5 s. During this configuration, the red lights of the traffic light B and L are ON. In the second configuration, the lights illuminations are reversed.

**RESULTS AND DISCUSSIONS:**

Automated Smart traffic system will be the one stop solution for the major traffic congestions happening in the urban cities. Smart traffic system makes the roads a much more connected and integrated system, which analyses the traffic patterns and gives intelligent and optimized way of handling traffic.

**CONCLUSION AND FUTURE WORK:**

The traffic light issue is obviously a critical problem that worries citizens and governments. The influence of low efficient conventional traffic system affects the economic, health, financial, and environmental domains. The transportation system trouble and the bad monitoring may cause car accidents, traffic jam, and roads congestion that put heavy loads on businesses and works. The advancement of technologies and the miniature of control devices, appliances and sensors have given the capability to build sophisticated smart and intelligent embedded systems to solve human problems and facilitate the life style. The smart traffic light control system endeavours to contribute to the scientific society to ameliorate the existing traffic light systems and manage the flow of automobiles at the intersections by implementing innovated hardware and software design systems.

**CODE:**

```
int r1=4;
int y1=3;
int g1=2;

int r2=5;
int y2=6;
int g2=7;

int r3=8;
int y3=9;
int g3=10;

int r4=11;
int y4=12;
int g4=13;

int pin1;
int analogpin1=A0;

int pin2;
int analogpin2=A1;

int pin3;
int analogpin3=A2;

int pin4;
int analogpin4=A3;

void setup() {

  pinMode(analogpin1,INPUT);
  pinMode(analogpin2,INPUT);
  pinMode(analogpin3,INPUT);
  pinMode(analogpin4,INPUT);

   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);

    digitalWrite(r1,LOW);
    digitalWrite(y1,LOW);
    digitalWrite(g1,LOW);

    digitalWrite(r2,LOW);
    digitalWrite(y2,LOW);
    digitalWrite(g2,LOW);

    digitalWrite(r3,LOW);
    digitalWrite(y3,LOW);
    digitalWrite(g3,LOW);

    digitalWrite(r4,LOW);
    digitalWrite(y4,LOW);
    digitalWrite(g4,LOW);

    Serial.begin(9600);
    delay(2000);


}

void loop() {
 pin1=analogRead(analogpin1);
 pin2=analogRead(analogpin2);
 pin3=analogRead(analogpin3);
 pin4=analogRead(analogpin4);
 if(pin1<300){

  digitalWrite(r1,HIGH);
  digitalWrite(y1,LOW);
  digitalWrite(g1,HIGH);

  digitalWrite(r2,LOW);
  digitalWrite(y2,HIGH);
  digitalWrite(g2,HIGH);

  digitalWrite(r3,LOW);
  digitalWrite(y3,HIGH);
  digitalWrite(g3,HIGH);

  digitalWrite(r4,LOW);
  digitalWrite(y4,HIGH);
  digitalWrite(g4,HIGH);

  delay(5000);
```

```
      digitalWrite(r1,HIGH);
      digitalWrite(y1,HIGH);
      digitalWrite(g1,LOW);

      digitalWrite(r2,LOW);
      digitalWrite(y2,HIGH);
      digitalWrite(g2,HIGH);

      digitalWrite(r3,LOW);
      digitalWrite(y3,HIGH);
      digitalWrite(g3,HIGH);

      digitalWrite(r4,LOW);
      digitalWrite(y4,HIGH);
      digitalWrite(g4,HIGH);

      delay(5000);

      digitalWrite(r1,HIGH);
      digitalWrite(y1,LOW);
      digitalWrite(g1,HIGH);

      digitalWrite(r2,LOW);
      digitalWrite(y2,HIGH);
      digitalWrite(g2,HIGH);

      digitalWrite(r3,LOW);
      digitalWrite(y3,HIGH);
      digitalWrite(g3,HIGH);

      digitalWrite(r4,LOW);
      digitalWrite(y4,HIGH);
      digitalWrite(g4,HIGH);

      delay(5000);

      digitalWrite(r1,LOW);
      digitalWrite(y1,HIGH);
      digitalWrite(g1,HIGH);

      digitalWrite(r2,LOW);
      digitalWrite(y2,HIGH);
      digitalWrite(g2,HIGH);

      digitalWrite(r3,LOW);
      digitalWrite(y3,HIGH);
      digitalWrite(g3,HIGH);

      digitalWrite(r4,LOW);
      digitalWrite(y4,HIGH);
      digitalWrite(g4,HIGH);
    }
    else if(pin2<500){

      digitalWrite(r1,LOW);
      digitalWrite(y1,HIGH);
      digitalWrite(g1,HIGH);
```

```
        digitalWrite(r2,HIGH);
        digitalWrite(y2,LOW);
        digitalWrite(g2,HIGH);

        digitalWrite(r3,LOW);
        digitalWrite(y3,HIGH);
        digitalWrite(g3,HIGH);

        digitalWrite(r4,LOW);
        digitalWrite(y4,HIGH);
        digitalWrite(g4,HIGH);

        delay(5000);

        digitalWrite(r1,LOW);
        digitalWrite(y1,HIGH);
        digitalWrite(g1,HIGH);

        digitalWrite(r2,HIGH);
        digitalWrite(y2,HIGH);
        digitalWrite(g2,LOW);

        digitalWrite(r3,LOW);
        digitalWrite(y3,HIGH);
        digitalWrite(g3,HIGH);

        digitalWrite(r4,LOW);
        digitalWrite(y4,HIGH);
        digitalWrite(g4,HIGH);

        delay(5000);

        digitalWrite(r1,LOW);
        digitalWrite(y1,HIGH);
        digitalWrite(g1,HIGH);

        digitalWrite(r2,HIGH);
        digitalWrite(y2,LOW);
        digitalWrite(g2,HIGH);

        digitalWrite(r3,LOW);
        digitalWrite(y3,HIGH);
        digitalWrite(g3,HIGH);

        digitalWrite(r4,LOW);
        digitalWrite(y4,HIGH);
        digitalWrite(g4,HIGH);

        delay(5000);

        digitalWrite(r1,LOW);
        digitalWrite(y1,HIGH);
        digitalWrite(g1,HIGH);

        digitalWrite(r2,LOW);
        digitalWrite(y2,HIGH);
        digitalWrite(g2,HIGH);
```

```
   digitalWrite(r3,LOW);
   digitalWrite(y3,HIGH);
   digitalWrite(g3,HIGH);

   digitalWrite(r4,LOW);
   digitalWrite(y4,HIGH);
   digitalWrite(g4,HIGH);

 }
else if(pin3<500){
 digitalWrite(r1,LOW);
 digitalWrite(y1,HIGH);
 digitalWrite(g1,HIGH);

 digitalWrite(r2,LOW);
 digitalWrite(y2,HIGH);
 digitalWrite(g2,HIGH);

 digitalWrite(r3,HIGH);
 digitalWrite(y3,LOW);
 digitalWrite(g3,HIGH);

 digitalWrite(r4,LOW);
 digitalWrite(y4,HIGH);
 digitalWrite(g4,HIGH);

 delay(5000);

 digitalWrite(r1,LOW);
 digitalWrite(y1,HIGH);
 digitalWrite(g1,HIGH);

 digitalWrite(r2,LOW);
 digitalWrite(y2,HIGH);
 digitalWrite(g2,HIGH);

 digitalWrite(r3,HIGH);
 digitalWrite(y3,HIGH);
 digitalWrite(g3,LOW);

 digitalWrite(r4,LOW);
 digitalWrite(y4,HIGH);
 digitalWrite(g4,HIGH);

 delay(5000);

 digitalWrite(r1,LOW);
 digitalWrite(y1,HIGH);
 digitalWrite(g1,HIGH);

 digitalWrite(r2,LOW);
 digitalWrite(y2,HIGH);
 digitalWrite(g2,HIGH);

 digitalWrite(r3,HIGH);
 digitalWrite(y3,LOW);
 digitalWrite(g3,HIGH);
```

```
    digitalWrite(r4,LOW);
    digitalWrite(y4,HIGH);
    digitalWrite(g4,HIGH);

    delay(5000);

    digitalWrite(r1,LOW);
    digitalWrite(y1,HIGH);
    digitalWrite(g1,HIGH);

    digitalWrite(r2,LOW);
    digitalWrite(y2,HIGH);
    digitalWrite(g2,HIGH);

    digitalWrite(r3,LOW);
    digitalWrite(y3,HIGH);
    digitalWrite(g3,HIGH);

    digitalWrite(r4,LOW);
    digitalWrite(y4,HIGH);
    digitalWrite(g4,HIGH);
}
else if(pin4<500){
digitalWrite(r1,LOW);
    digitalWrite(y1,HIGH);
    digitalWrite(g1,HIGH);

    digitalWrite(r2,LOW);
    digitalWrite(y2,HIGH);
    digitalWrite(g2,HIGH);

    digitalWrite(r3,LOW);
    digitalWrite(y3,HIGH);
    digitalWrite(g3,HIGH);

    digitalWrite(r4,HIGH);
    digitalWrite(y4,LOW);
    digitalWrite(g4,HIGH);

    delay(5000);

    digitalWrite(r1,LOW);
    digitalWrite(y1,HIGH);
    digitalWrite(g1,HIGH);

    digitalWrite(r2,LOW);
    digitalWrite(y2,HIGH);
    digitalWrite(g2,HIGH);

    digitalWrite(r3,LOW);
    digitalWrite(y3,HIGH);
    digitalWrite(g3,HIGH);

    digitalWrite(r4,HIGH);
    digitalWrite(y4,HIGH);
    digitalWrite(g4,LOW);

    delay(5000);
```

```
    digitalWrite(r1,LOW);
    digitalWrite(y1,HIGH);
    digitalWrite(g1,HIGH);

    digitalWrite(r2,LOW);
    digitalWrite(y2,HIGH);
    digitalWrite(g2,HIGH);

    digitalWrite(r3,LOW);
    digitalWrite(y3,HIGH);
    digitalWrite(g3,HIGH);

    digitalWrite(r4,HIGH);
    digitalWrite(y4,LOW);
    digitalWrite(g4,HIGH);

    delay(5000);

    digitalWrite(r1,LOW);
    digitalWrite(y1,HIGH);
    digitalWrite(g1,HIGH);

    digitalWrite(r2,LOW);
    digitalWrite(y2,HIGH);
    digitalWrite(g2,HIGH);

    digitalWrite(r3,LOW);
    digitalWrite(y3,HIGH);
    digitalWrite(g3,HIGH);

    digitalWrite(r4,LOW);
    digitalWrite(y4,HIGH);
    digitalWrite(g4,HIGH);
   }
  else{
   digitalWrite(r1,HIGH);
   digitalWrite(y1,HIGH);
   digitalWrite(g1,LOW);

   digitalWrite(r2,HIGH);
   digitalWrite(y2,HIGH);
   digitalWrite(g2,LOW);

   digitalWrite(r3,HIGH);
   digitalWrite(y3,HIGH);
   digitalWrite(g3,LOW);

   digitalWrite(r4,HIGH);
   digitalWrite(y4,HIGH);
   digitalWrite(g4,LOW);
  }
}
```