

# Traffic Signal Light Based on Density

**Sakshi Sanjay Powar<sup>1</sup>, Sejal Sanjay Soundade<sup>2</sup>, Rohin Sharma<sup>3</sup>, Prathmesh Vijay More<sup>4</sup>,  
Ajinkya Rajesh Koli<sup>5</sup>, Prof. P. A. Chougule<sup>6</sup>**

Student, B.Tech. Electrical Engineering, DKTE Society's Textile and Engineering Institute,  
Ichalkaranji, Maharashtra, India<sup>1-5</sup>

Assistant Professor, Dept. of Electrical Engineering, DKTE Society's Textile and Engineering Institute,  
Ichalkaranji, Maharashtra, India<sup>6</sup>

**Abstract:** Congestion is a serious issue because of vehicle traffic jams. The most common issue of traffic congestion is the time spend on waiting for the red light to change to green. The changing of traffic light is predetermined by timer and it does not depend on traffic volume. There is therefore need to simulate and optimize traffic control to better accommodate density-based traffic rather than time based. This system attempts to solve the problem caused by traffic lights which leads to congestion of vehicles.

This project, a density-based traffic control system is been implemented to solve this problem. The system entails programming an Arduino using Arduino integrated development environment (IDE) to enable traffic lights give the right of access to the road by selecting the lane with the high number of cars. The traffic lights are modified to control traffic congestion and maintain a steady flow of traffic. The sensor identifies an object and give signals to the Arduino to control the traffic lights for its individual path. Once there is no sign observed by any of the four sensors the traffic lights keep on dealing with the traffic flow. Further research is suggested to develop the device on a large scale to be deployed to all roads in the country.

**Key Words:** IR sensors; Arduino; Traffic control; Servo motor.

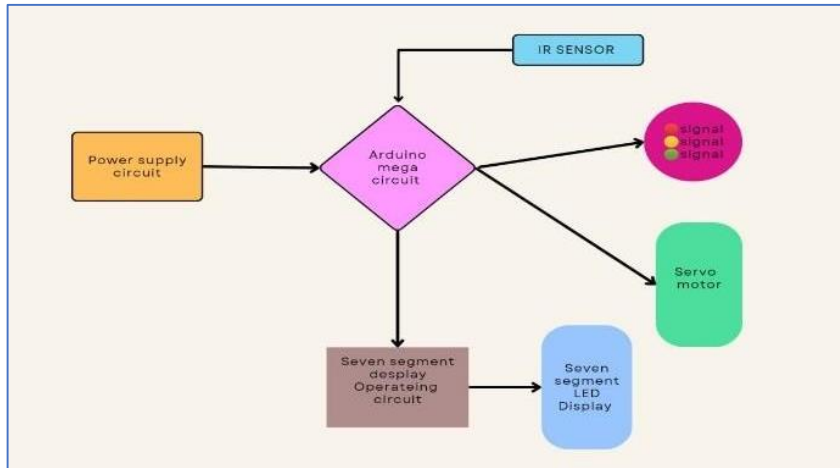
## I. INTRODUCTION

Nowadays, with developing technologies and adverse development in the metropolitan cities, traffic administration has become one of the most major fields to be dealt with. Traffic management in many cities is a major problem. A traffic light is a signaling device that controls a traffic flow at road intersections.

It has three basic lights which consist red, yellow and green. Red signal is used to stop the traffic from proceeding; yellow signal alerts vehicles to slow down for a stop, while green signal alerts vehicles to proceed in the indicated directions. Traffic congestion is a situation in which vehicles travel slower than usual due to the increased physical use of vehicles (traffic) on the road at that moment. Also known as traffic jams, traffic congestion may cause roads being blocked, rough roads, accidents on the road that may occur, lack of proper traffic light system to control vehicles, inappropriate driving by road users etc.

It will make the journey longer due to the slow movement of the traffic and increased queuing of vehicles. Urban communities started to make traffic tenets to reduce crashes, while traffic flags and cops were utilized to coordinate options to proceed at major urban convergences. Traffic control development in urban streets has aided easy movement and use of automobiles in big cities. Most of the roads have an proper traffic control system, it makes easy flow of vehicles.

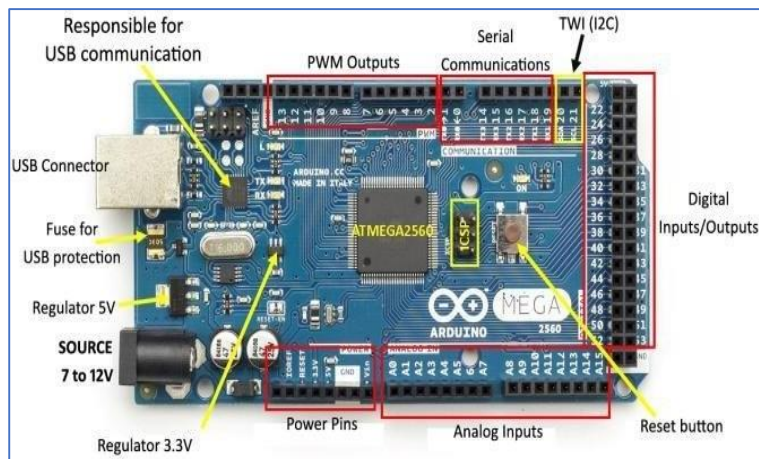
## 1.1 Block diagram



## 1.2 Hardware requirements

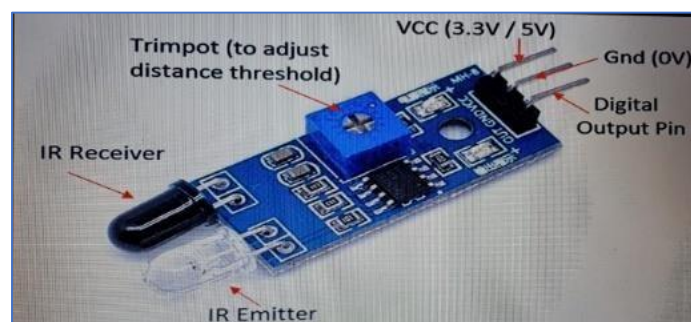
### a) Arduino Mega 2560

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller.



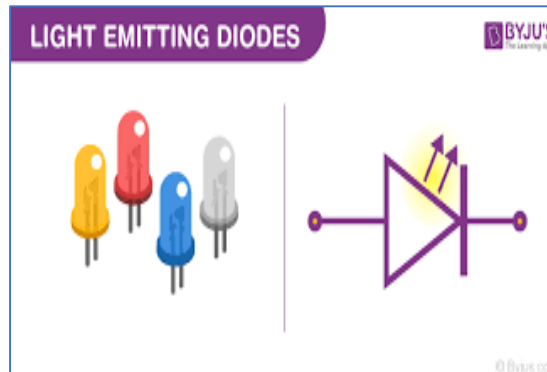
### b) IR Sensor Module

IR sensor is an electronic equipment which comprises of an IR light emitting diode, It consist of IR photodiode, an op-amp, couple of Resistors, & Capacitors. ICLM 393 op-amp is used as comparator. When IR receiver does not observe any of signal the potential at the input of comparator is high & output is low. If IR receiver detect some signals, the potential at the inverting terminal will be low. hence output is high.



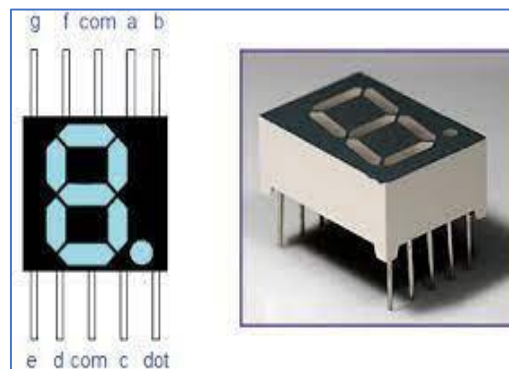
### c) Light Emitting Diode

LED is an electronic device, In comparison to general purpose diode except for its ability to emit light with different wavelengths. When potential difference applied to its terminals, electrons recombine with the holes. It provides the energy in the form of photons. These all phenomenon is known as Electroluminescence.



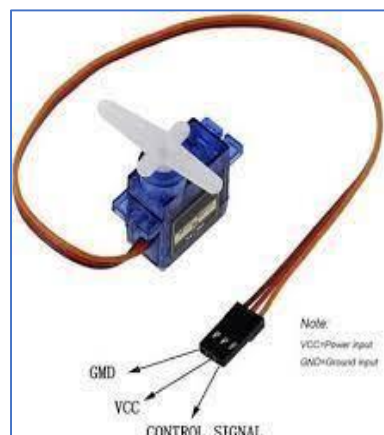
### d) Seven Segment Display

A seven-segment display is an electronic display device for displaying decimal number. The numbers from 0 to 9 are most common characteristics display on seven segment display.



### e) Servo Motor

A servo motor is having construction of linear or rotary actuator which provides fast precision position control for closed-loop position control applications. Servo motor is not used for continuous energy conversion. Servo motors have a high speed response because of low inertia and are designed with small diameter and long rotor length. Servo motors work on servo mechanism which has position feedback to control the speed and final position of the motor. Internally, a servo motor combines a motor, feedback circuit, controller and other electronic circuit.



## II. WORKING

This model works on the principle of changing of Traffic signals based on the density through a given section of the road. There are eight sensors which are placed at four sides of four-way road which will check the density of the area covered by the sensors.

Here we are using IR sensors to plan an intelligent traffic control system. For measuring the density of traffic on each side, IR sensors are kept on either side of the road at a particular distance. Each of the IR sensors includes of an IR transmitter and an IR receiver. As the name suggests, the IR transmitter transmits the IR rays and the receiver is responsible to receive the rays. The entire system is controlled by the Arduino. Arduino is interfaced with Serial to parallel IC (74HC595) and IR sensors. As the vehicle passes through these IR sensors, the IR sensor will detect the vehicle & will send the information to the Arduino. The total no. of IR sensors required are 8 and LEDs 12.

Three sets of LEDs i.e. Green, Yellow and Red are used to specify the 'GO' state, 'Ready to Go' state and 'WAIT' state. The traffic signal will be change with a default timing of 10 seconds of green light and all other signal will be red. After 10 seconds two signals will be yellow for 4 seconds and another two will be red. This condition will be followed till all the IR sensors receiving the signals or all the IR sensors are not getting signals. The LEDs G(green), Y(yellow) and R(red) glow in the following sequence:

G1-R2-R3-R4  
Y1-Y2-R3-R4  
R1-G2-R3-R4  
R1-Y2-Y3-R4.  
R1-R2-G3-R4  
R1-R2-Y3-Y4  
R1-R2-R3-G4  
Y1-R2-R3-Y4

i.e., time-based traffic signal will be automatically implemented when all the signals having same condition.

If the condition occurs, for example when first side traffic signal is green and at that time third side traffic signal's IR sensor receiving data then after first traffic signal it will automatically shifts towards third traffic signal without moving to second traffic signal.

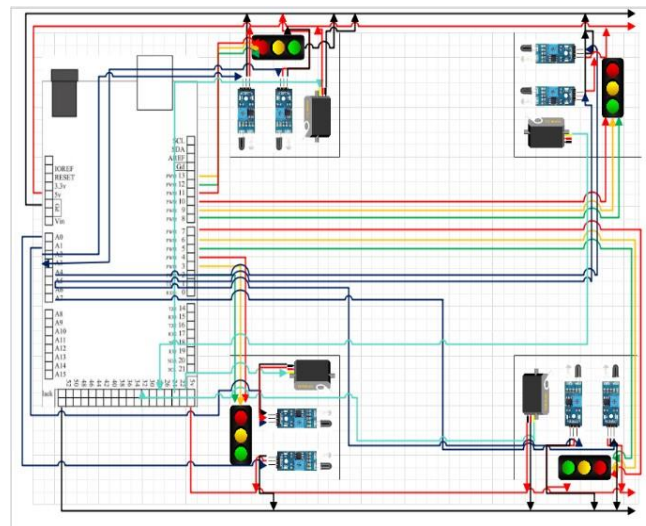
G1-R2-R3-R4  
Y1-R2-Y3-R4  
R1-R2-G3-R4

Similarly, let green light is On in the fourth traffic signal for 10 seconds and during that time second traffic signal's IR sensor receiving data then after green light it will take 4 seconds delay for yellow light or we can say that the delay for pedestrians to walk in order to confirm their safety and then it will automatically shifts towards second traffic signal.

R1-R2-R3-G4  
R1-Y2-R3-Y4  
R1-G2-R3-R4

Just taking into consideration the above conditions further and more let us consider after second signal again fourth signal's IR sensor receiving data then after 10 seconds and 4 seconds delay signal is green for fourth lane.

R1-G2-R3-R4  
R1-Y2-R3-Y4  
R1-R2-R3-G4



### III. RESULT

As per result it is observed that, for reducing the wastage of time and traffic congestion we can use the system which controls the traffic based on heavy flow of vehicles at any particular side the time delay in the traffic signal is set 10 second. From the experiments we have obtained the following results :

- Traffic can be cleared properly
- Time distribution is same at all intersections
- Effective time management can be obtained

#### Advantages:

- It provides the easy access in the traffic light.
- Avoid wastage of time due to the traffic.
- We can avoid unnecessary occurrence of traffic jams.
- This System is fully automatic.
- This requires low power consumption.

#### Limitations:

- The sensors which are used are very expensive.
- This system needs a lot of maintenance.

### REFERENCES

- [1] International Journal of Innovative Research in Science, Engineering and Technology Volume 3, Issue 3, March 2014 Density Based Traffic Signal System by K. Vidhya, A. Bazila Banu.
- [2] B. Prashanth Kumar, B. Karthik — Micro controller-based traffic light controller, Department of Electrical Engg
- [3] Road Traffic Congestion Monitoring and Measurement using Active RFID and GSM Technology by Koushik Mandal, Arindam Sen, Abhijnan Chakraborty and Siuli Roy, IEEE Annual Conference on Intelligent Transportation systems, 2011.