

# A Review Paper on “AUTONOMOUS SIGNAL SWITCHING”

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## ABSTRACT

*The rapid growth in usage of motor vehicle all over the world including India is the resultant of industrialization. It not only has lead India toward advancement but due to more number of user of vehicle it has cost us many precious life. India is a country of large population where accidents are reported on large scale, normally the accidents are caused due to peoples negligence toward traffic rules, heavy traffic density, and poor traffic management. In Nagpur this situation can be overcome by using smart signal ,where signal operates according to density so that no one needs to wait unnecessarily or break the signal The ‘AUTONOMOUS SIGNAL SWITCHING’ will monitor the density of traffic simultaneously and timing for signal will be allotted according to its density*

## INTRODUCTION

Roads are basically used by people for transportation and other purposes. Many cars ,truck ,semi weight motor vehicle, heavy vehicle all are seen on road, its difficult sometimes to

manage those vehicles, there are some vehicle driver who undoubtedly follow the traffic rules and prove to be a concern citizen while some on other hand take it for granted. Many sign and signal are provided on road for convenience of people so as to reduce the chances of accidents, As India is advancing toward the Hitech and advance India, there is urgent need of some new technologies that will ultimately reduce the chances of accident and help India to become a superpower.

## LITERATURE SURVEY

Traffic can be termed as movement of people, goods and vehicle from one specific point to the other. Modernization has ultimately led to the increase in use of private motor vehicle hence resulting increase in pollution and other life threatening event. Nagpur city is experiencing the problem of increasing in Road accident due to violation of traffic rules. This condition in Nagpur should be seriously looked upon. Various studies about Nagpur city traffic have proved that this situation must be seriously looked upon.

- Traffic Congestion Minimization Study for Hingna Area of Nagpur City, Maharashtra.

The study conducted by Gaurav Chaudhari, Ankit Kadwe, Nachiket Lonkar shows the reasons for traffic congestion in Hingna region and the possible solutions for the same. The reasons being narrow roads, No of signals at squares, irregular parking and proposed solutions are proper positioning of smart traffic signal and penalty to traffic law breakers. The study identifies the peak traffic hours and counts the number and types of vehicles passing through Hingna region.[1]

- The Nagpur Improvement Trust aims at the Comprehensive Mobility Plan for Nagpur City by incorporating a cost effective and sustainable plan for the transport sector and urban land use, The scope includes observing the existing traffic operation and improving the conditions

## AUTONOMOUS TRAFFIC CONTROL SYSTEM

The design and manufacturing of autonomous signal or smart signal is one of the topic researchers are very keen about. Studies have proved with proper traffic and management and new technologies in traffic control helps reduce accidents

.Smart signal control the Traffic congestion at an intersection and unnecessary waste of time. Thus, finding a multipurpose, innovative and profitable method to deal with this problem, many researches from different area of expertise are collaborating and providing us with new techniques, advance computer microchips ,recent manufactured devices and sensors, and innovative algorithms modeling, as much as possible to reduce the complication of traffic lights.

The laser diode sensors are employed in numerous traffic systems . The laser diode transmitter and the laser diode receiver are mounted on either sides of a road. When an automobile passes on the road between the laser diode sensors, the system is activated and the car counter is incremented. The analysis of the information collected about the traffic density of the different roads of a junction is done, In order to modify dynamically the change in green light at lane having more traffic volume

. The whole system could be controlled by 'Arduino Mega'.

Many theories on density measurement by image processing were proposed but it required high quality image and formation of fog on camera made this process little troublesome. Other researchers use sophisticated algorithms to model the various states of the traffic such as fuzzy logic and genetic algorithms

## SYSTEM DESIGN

Roads in the form of '+' are designed as 4 monodirectional intersection as shown in fig .1 . We first need to observe and investigate the existing traffic signals and look for the necessary changes that could be made. Now some improvising should be done by installing our smart signal technique at intersection of road . Various routing configurations, our next step will be an extension of the suggested traffic light system to a bidirectional "+" junction ,Main moto of our research targets management of traffic light system at bidirectional roads.



Fig. 1. Intersection of 4 monodirectional roads.

### *Traffic light configurations*

In the proposed smart traffic light system,3 set of photo diode laser and LDR receiver are used on each lane .i.e on lane 1,2,3,4 these laser and LDR are placed on particular distances, a min distance is left before the sensors for normal traffic to run as usual. The system activates when the signal is RED, as traffic crosses the first lane and maintain its position for 3 sec the first laser activates and consequatively the next two. Particular time period is allotted for each laser crossed and for the final *laser* standard maximum time of signal is provided.

## ELECTRONIC COMPONENTS

### A.Arduino Mega 2560 microcontroller

ATmega2560 (datasheet) based Arduino Mega 2560 is a microcontroller board is used. It has total 54 input and output pins out of which 14 are used as PWM output. Analog inputs are16, 4UARTs (hardware serial ports) are 4, a crystal oscillator of 16 Mhz, a USB connection, a power jack, an ICSP header, and a reset button. these are requirement for microcontroller to work another simple way is to connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. For the ArduinoDuemilanove or Diecimila, Mega is compatible with most shields designed

Arduino mega is replaced by Arduino 2560 which is an updated version.

**COMPONENT RATING:-**

Processor: ATmega2560

Clock Speed:16 MHz

Flash Memory:256 KB

RAM:8 KB

Operating Voltage5 V

GPIO:54

Analog Inputs:16

Connector:USB Type B

USB-to-Serial:ATmega16U2



Fig.2. Arduino Mega 2560 microcontroller.

**B. LASER Diode**

A Laser Diode is a semiconductor device similar to a *light-emitting diode (LED)* which also uses p-n junction to emit coherent light in which all the waves are at the same frequency and phase. A process termed as “Light Amplification by Stimulated Emission of Radiation” or ( LAZER ) by which this coherent light is produced by diode

*This device is named as laser diode as p-n junction is used to produce laser light*

**COMPONENT RATING:-**Threshold current( $I_{th}$ ): (30 – 60) mAOperating current(  $I_{op}$ ): (40 – 70) mAOperating voltage ( $V_{op}$ ) = (2.0 - 2.7 )V , $P_o=5mW$ 

Slope Efficiency (mW/mA) 0.4 0.5 0.7

Lasing wavelength (8 D): (630 – 645) nm,  $P_o=5mW$ 

Fig. 3. LASER Diode

### C. LDR Receiver

In many electronic circuits whenever there is necessity of detecting the presence of light, light dependent resistors are used. They can be described by a variety of names from light dependent resistor, LDR, photon or even photo cell, photocell or photoconductor. LDRs or photoresistors are a particularly convenient electronics component to use. Although other devices such as photodiodes or photo-transistor can also be used as alternative.

LDR provide large change in resistance for changes in light level In a variety of different applications LDR's are used because of their low cost, ease of manufacture. Earlier LDRs were used in photographic light meters and even now they are still used in a variety of applications where it is necessary to detect light levels.

#### COMPONENT RATING:-

Operating Temperature:-  $-10 \sim +40$  °C

Storage Temperature:-  $-15 \sim +85$  °C

Output power (Po):- 5 mW

Normal and maximum operating voltage is 2.2 and 2.7 respectively

Threshold current in minimum, normal and maximum condition are 15, 20 and 30mA

Operating current is 65 to 80mA

Beam Angle deviation:- For both parallel and perpendicular condition its between  $-3$  to  $3$  degree

Beam divergence:-

- For parallel condition it's between 8 to 12 degree
- For perpendicular condition it's between 23 to 32 degree



Fig. 4. LASER Diode Receiver

### FEATURES AND FUTURE SCOPE

The proposed idea could ultimately bring the various changes, with some calibration and precision in technology we will be able to create a 'no traffic congestion' society. As laser technology is used people will be self-aware and chances of breaking the signal is correspondingly minimized. The smart signal at every square will enable government to use a minimum of human efforts (eg Traffic Police) as all the work is taken care of by the advanced smart traffic signal.

### CONCLUSION

In the current situation, the level of noise pollution and air pollution is increased due to heavy traffic congestion. And also there is loss of precious human time due to unnecessary traffic congestion, the root cause of these problems is the old system used in traffic light. The implementation of the proposed idea could ultimately save ample of time lost due to

traffic congestion and also we can decrease the level of pollution which can be beneficial for environment as well as for human being .

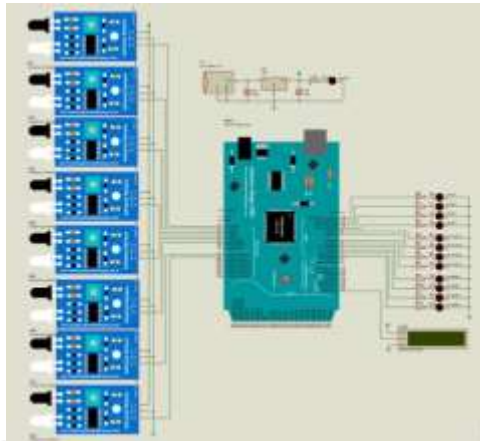


Fig. 3. Block diagram of the circuit of autonomous signal switching with LASER DIODE sensor and arduinouno

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