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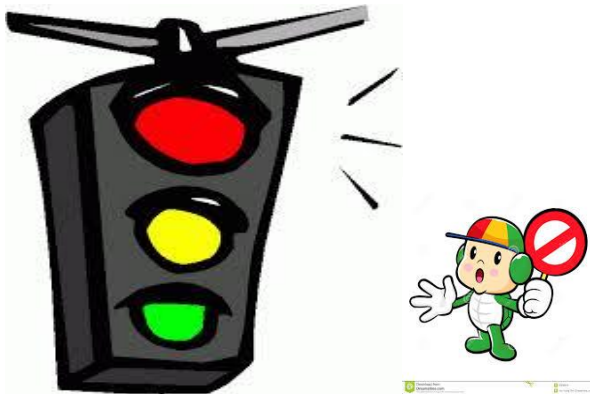
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# Smart Traffic Signal

Shri Guru Gobind Singhji Institute of Engineering  
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Maharashtra, India



Dept. of IT



## SMART TRAFFIC SIGNAL

STS

### ABSTRACT

Traditional traffic signal system only gives instructions to stop and not to vehicle driver. But if someone is breaking the signal then this system is not able to catch them and there are chances of taking bribe. Therefore to increase the security of traffic signal and to reduce human efforts and to avoid the bribery we are introducing smart traffic signal system through this MINI PROJECT.

By,

Rahul N Dhole and Ashish Deshmukh



Shri Guru Gobind Singhji Institute of Engineering and  
Technology, Vishnupuri, Nanded, Maharashtra, India

Dept. of IT

# Certificate

This is to certify that the project entitled “**Smart Traffic Signal**” being submitted by Rahul N Dhole and Ashish Deshmukh to Dept. of IT SGGs IE & T Nanded as a “**Second Year Second Semester Mini Project**” is a record of bonafide work carried out by both of them under our supervision and guidance.

Mr Satish R Pawale  
Lecturer  
IT Department

Mrs J V L Megha  
Asst. Prof and Head,  
IT Department

# ACKNOWLEDGMENT

I take this opportunity to express my sincere thanks to all those who have taken keen interest in directing my efforts towards a successful completion of the report work.

At the outset, I wish to register my deepest sense of gratitude and respect to my guide Mr Satish R Pawale for their constant support and guidance throughout the duration of the project. The critical analysis and timely suggestions have helped me in coming out with this fruitful result. I only for their support in future also.

I wish to thank head of department JVL Megha mam for his support and encouragement.

My earnest regards due to Dr Ravindra C Thool who were encouraging. One of the major factors in paving my way through all the difficulties has been their support and motivation.

I also wish to register my feeling towards my family members who have been so many encouraging and understanding.

Rahul N Dhole  
Ashish Deshmukh

# Abstract

Traditional traffic signal system only gives instructions to stop and not to vehicle driver. But if someone is breaking the signal then this system is not able to catch them and there are chances of taking bribe.

Therefore to increase the security of traffic signal and to reduce human efforts and to avoid the bribery we are introducing smart traffic signal system through this mini project.

Smart traffic signal based on the microcontroller & ultrasonic sensor, in which ultrasonic sensors are placed at one side of road in such a way so as to cover particular necessary area of road from where the vehicles are restricted to pass. If the signal is red and any vehicle is breaks the signal then ultrasonic sensor detect it and microcontroller take immediately action to buzzer alarm along with camera capture the image of that vehicle. It also make record of when, where, which vehicle breaking signal by saving image in particular folder as name of current date and time.

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# CHAPTER 1

# **INTRODUCTION**

## 1.1 What is Traffic Signal?

*A set of automatically operated colored lights typically red, amber and green for controlling traffic at road junctions, pedestrian crossings and roundabouts.*



*Fig 1.1: Traffic Signal Lights*

CHAPTER 2

# **LITERATURE SURVEY**

## 2.1 Problems Regarding to Traffic Signal

- *Accidents:*

*In India near about 4.40.123 accidents are happened per year and most of the accidents are happened at Traffic Signal.*

- *Deaths:*

*In India near about 1, 34, 834 people are dying per year only because of road accidents and most of the accidents are causes at Traffic Signal*

- *At Every 3 minutes an Indian loses life just only because of road accidents*
- *Bribe taking one another big issue found at Traffic Signal by Traffic Police then how can we recognized the irresponsible people.*



*Fig 2.1: Accident at road*

## *2.2 Why it is happened*

- No proper standing arrangement is there for vehicles
- Carelessness of traffic police and bribery of police which is shameful thing to our **Nation**.

Now a day there is important responsibility on traffic controller section of government. Traffic signal system in used is control the traffic but if any vehicle is passes during red signal then this system is not useful and as result there is chances of accidents and to avoid this it requires a traffic police at the every road of signal in these way human efforts is increase and it needs more manpower for controlling traffic in better way. Smart Traffic Signal device is essential to make the traffic signal robust, secure and safe, to reduce human efforts and to increase the efficiency of traffic signal for detecting the vehicles which are breaking the signal.

The proposed system involves detection of vehicles which are breaking traffic signal. It has central controller that is Arduino at junction which is connected to sensors are placed at every road of junction which detects the vehicles which might be inefficient when more than one peoples simultaneously go through that way but single person is allow because of particular arrangement of sensors[7],[8]. Consider if red signal is on and vehicle break signal then it will detect by sensors and this signal is sent to Arduino. The Arduino capture image of that vehicle using camera and save it as time and date format [7]. The cameras are set at every junction point is equal to the number of road meet at that junction.

CHAPTER 3

**CURRENT SOLUTION ON  
TRAFFIC PROBLEMS**

### 3.1 CURRENT SOLUTIONS



*Fig 3.1: Traffic Police Man*

- Traffic Lights are there to control the Traffic in Particular way but still there causes accidents
- Traffic police is there but there are very big chances of taking bribe from vehicle driver

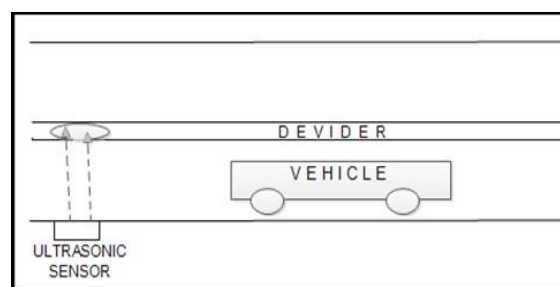
CHAPTER 4

# **PROPOSED STS SYSTEM**



## 4.1 Proposed System

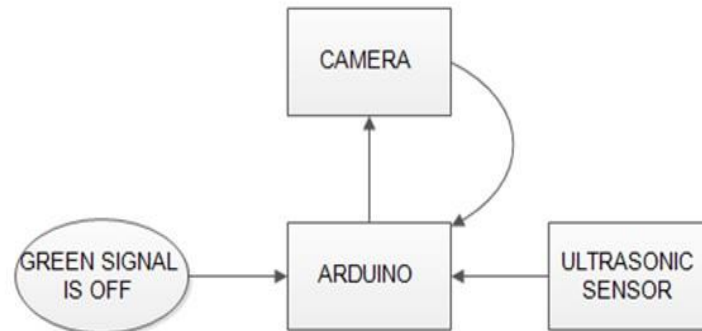
Smart traffic signal device is made of three basic things that are ultrasonic sensor for detecting the vehicle passing through when signal is on, microcontroller for examining the input coming from ultrasonic sensor and give instruction to camera to capture image. In STS two sensors are placed at one side of one road as shown in figure 4.1. That is if there are for road meet at one traffic signal then four STS should be placed at every road. Generally width of road in India is 20 foot. The ultrasonic sensor covers the maximum area 4 meters (13.1234 foot) means sensors on both sides are able to cover all area. The number of sensors on the both sides is increased for more accuracy. If only one sensor detect the obstacle then proposed system STS is not capture image because it may be human, animals etc. The length of vehicles is nearly about equal to distance between two sensors on one side. This same system is applied on the opposite side of road. Range of this two sensors are fixed as width of the road required to block with respect to signal. This whole process is controlled by Arduino board which get input from two or more ultrasonic sensors and capture image through camera and then save it as name and date as the name of the image to make it easier to understand whenever the vehicle paper size.



*Fig 4.1: Overview of STS*

## 4.2 Block Diagram of STS

To enable the system to detect vehicle and capture image with respect to RED, YELLOW and GREEN Traffic signal is the base STS.



*Fig 4.2: General block diagram of a task oriented smart traffic signal system*

Figure 4.2. Shows a general description of STS. The input to the system is provided by ultrasonic sensor signal for accomplishing a given task. This signal is received in terms of time in Arduino wherein the time signal is decoded into distance that are meaningful according to Syntax, Semantics and Pragmatics of the STS task. When the green signal is turned off the STS will start working ultrasonic sensor detects the vehicle passing through the signal and give input to the Arduino and it will capture image through camera and store it in the given memory.

CHAPTER 5

# **HARDWARE IMPLEMENTATION**

## 5.1 Ultrasonic Sensor

Specifications of Ultrasonic Sensor as follows:

Working Voltage	DC 5 V
Working Current	15mA
Working Frequency	40 KHz
Max Range	4 M
Min Range	2 cm
Dimension	45X20X15 mm

Table 5.1: Ultrasonic Sensor Specification



Fig 5.1: Ultrasonic Sensor

Generally ultrasonic sensor is used for robotics and automation purpose. For this research project HC-SR04 ultrasonic sensor is used and its specifications are shown in table1.

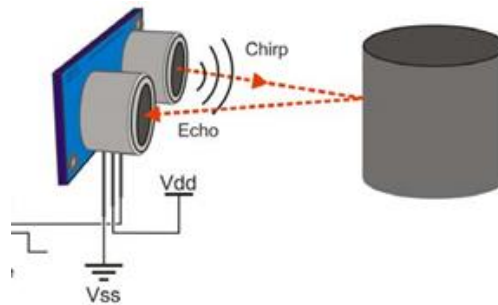


Fig 5.2: Reflection of Signal from Obstacle

The ultrasonic sensor sent the pulse through transmitter mode (T) and transmitted signals get reflected from obstacle, this is received by received mode ® having transmitting mode signals intensity of 40 KHz. If there is signals returning, through outputting high level and the time of high level continuing is the time of that from the ultrasonic transmitting to receiving.

$$\text{Distance} = (\text{high level time} * \text{sound velocity}(340\text{M/S}) / 2$$

## 5.2 Arduino

Arduino is a single-board microcontroller to make using electronics in multidisciplinary projects more accessible. The hardware consists of an open-source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller [7]. The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila, Duemilanove, and current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs. These pins are on the top of the board, via female 0.10-inch (2.5 mm) headers. Several plug-in application shields are also commercially available. Arduino has 328P microcontroller which is used to store and execute the program.



*Fig 5.3: Arduino Board*

The open-source Arduino environment makes it easy to write code and upload it to the I/O board. It runs on Windows, Mac OS X, and Linux [7]. The environment is written in Java and based on Processing, avr-gcc, and other open source software. The Arduino integrated development environment (IDE) is a cross-platform application written in Java programming, and is derived from the IDE for the Processing programming language and the Wiring projects. It is

designed to introduce programming to artists and other newcomers

unfamiliar with software development [7]. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click.

## CHAPTER 6

# **SOFTWARE IMPLEMENTATION**

## 6.1 Arduino IDE & code

```
vid = videoinput('winvideo', 1);
```

By using *videoinput()* function we can activate the camera and by using *getsnapshot()* function we will capture the image. *Im = getsnapshot (vid; ssa = datestr (now, 'dd-mm-yyyy HH-MM-SS');*  
*newName = 22print('%s.jpg', ssa); imwrite (rgbmap, newName);*  
The *datestr()* function we used to store the image as name of system date and *time.imwrite()* function used to write data into disk.



## 6.2 Ultrasonic Sensor Code

In STS both the ultrasonic sensor can take input as duration in microseconds by a little code written as follow ***Microseconds = pulseIn (7, HIGH);*** means that sensor calculate the duration in microseconds between the transmitting and receiving time of ultrasonic waves an then it will converted into centimeters by a formula:

$$\text{Centimeters} = \text{Microseconds} / 29 / 2;$$

And if this distance is always equal to road width whenever a vehicle will cross the road during red signal this distance is surely less than width of the road in this way it will detect vehicle.

## 6.3 MATLAB

For GUI we used here Matlab and sending all actions through Matlab itself. MATLAB is a numerical computing environment and fourth-generation programming language. Developed by Math Works, MATLAB allows us matrix manipulations, plotting of functions, data and graphs implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and Fortran[7]. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing capabilities, additional package, Simulink, adds graphical multi-domain simulation and Model-Based Design for dynamic and embedded systems

## 6.4 MATLAB Arduino Interfacing Code

Accessing Arduino through Matlab is quite easy, we have to download its required package, and burning package into the Arduino, we termed it as Matduino. After that we can directly access Arduino by using command prompt of Matlab.

***a=arduino ('COM6')***

“a” is a variable which open the Arduino which is connected to COM port number 6, when we execute this first it will check whether the Arduino is connected to COM port or not if it is not connected then it will display an error, if it is successfully connected then we can directly send command from command prompt of Matlab.

Syntax:

***digital Write (pin number, action) digitalWrite(13,1);***

Here, if we want to write some data then we can use digital Write() and send „1” to start and „0” for stop operation, in the same sense we can also read, write analog as well as digital values. For analog value we use analogRead (pin\_number).

For reading Sensor values on Arduino

Set up the basic Arduino program:

```
void setup() {  
  Serial.begin(9600); // set up the serial connection for  
printing  
} void loop() {  
  Serial.println(444); // print out the value 444  
}
```

## CHAPTER 7

# **CONCLUSION & RESULT**

Page 21

## 7.1 Conclusion

When the red signal at one road is turned on then traffic should be stop at that road and continue from other roads at that junction and same for yellow signal also. It is same as during green signal is turned off our STS needed to start working. This will be better understand from given table.

From the figure it is observed that the red signal is off at one road then that side of traffic will stop while continue at remaining roads.

RED SIGNAL IS OFF	YELLOW SIGNAL IS OFF	GREEN SIGNAL IS OFF
Sensor is off	Sensor is off	Sensor is on
Camera is off	Camera is off	Camera is on

*Table 7.1: Conclusion Table*

The proposed system for Smart Traffic Signal using ultrasonic sensor and Arduino is advantageous to many existing systems. The sensor creates a secure zone at road meet at junction and its interfacing with Arduino and MATLAB makes it easier to implement and especially at dense traffic areas. It is also cost inexpensive and does not require any system in the vehicles making it more practical than existing systems.

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