

# SMART TRAFFIC CONTROL

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## ABSTRACT:

The project is aimed at designing a density based dynamic traffic signal system where the timing of signal will change automatically on sensing the traffic density at any junction. In this project we are using IR sensors and ARDINO for controlling the traffic. Depending upon the density of vehicles on the particular junction, the traffic signal will vary. Present day traffic control system is purely based upon fixed time in changing signals. This may lead to inefficiency of traffic control when a road is empty. With the help of our project, we can optimize the problem of traffic control. We will be giving priority to emergency vehicle with the help of HC-05. We can also make a clear way to the ambulance in emergency situations.

**KEYWORDS:** *Traffic Control, Arduino, IR Sensors, Ambulance, HC-05.*

## I. INTRODUCTION:

The increasing industrialization, urbanization and population, there has been a tremendous growth in traffic. With growing traffic there is rise in problems which include traffic jams, accidents, etc. One of the major effects of these traffic jams are faced by

ambulances, fire brigades and other emergency vehicles. Ambulance service is greatly affected because of traffic jams. Delays in reaching the hospital may lead to the loss of life of a patient. These things need a speed response. Thus it is crucial and necessary to determine a direct, fast and efficient response technique. Although each and every vehicle passing through the traffic has its own purpose, importance should be given to ambulance and other emergency vehicles because if they have to wait longer time on the traffic there is an increase in the risk. Majority of the traffic signals work on simple timers.

Based on the traffic density at a particular intersection, the traffic light will cycle through red, yellow, and green at regular intervals to ensure a uniform traffic flow in all directions through the intersection. Timer-based signals are excellent for busy areas that have a uniform and heavy volume of traffic. Timer-based systems don't prove to be beneficial. To overcome all the above given situations a solution is proposed in this paper. This paper describes the solution to the problem of ambulance getting stuck in a traffic jam and can be addressed by ensuring that the way through which ambulance is travelling is cleared. This can be done by alerting the nearest traffic light control room whenever an ambulance is approaching. The paper also proposes a health monitoring system in which vital health parameters of the patient in ambulance are monitored and transferred to the hospital before the patient reaches the hospital.

For controlling the traffic an android application is created which can be used by both, the ambulance and the control room. The application can be viewed as a platform for the ambulance and control room to view the traffic conditions in the desired area. Whenever the ambulance driver notices a high density of traffic, on the app, on the route to the hospital, he can alert the traffic control room by sending a request signal. The control room can control the traffic signals on the route of the ambulance based on the ambulance's destination and the traffic conditions on the route. For monitoring the health of the patient, parameters like the heart rate and body temperature of the patient. Measured using heart rate sensor and LM35 temperature sensor, respectively, and are sent to the hospital through GSM using raspberries.

Following are the objectives of this project:-

1. The main objective of this project is to create a 'green corridor' for the ambulance so that the ambulance can reach the hospital without having to face many obstacles.
2. To enable the driver of the ambulance to view the traffic conditions so that he can decide the

best route to reach the hospital.

3.To allow the traffic control room to view and clear the traffic.

## **II. LITERATURE SURVEY:**

Saiba P A et al. advanced density based traffic control system using PIC microcontroller were three IR sensors are engaged in each road for the detection of the presence of the automobile and the density is identified in different levels such as low, medium and high. Based on the mass recorded, the duration of the green light is decided by the microcontroller. Pramod Sharma et al. advanced mass based intelligent traffic control system using IR sensors by ATMEL 89C51 Microcontroller were IR sensors are used for the vehicle detection and the control of the signals are taken over by the microcontroller. Sakshi Pandey et al. advanced mass based traffic control system using ATmega8 microcontroller where IR sensors are used to identify the level of vehicle density presenting each road at an intersection and in case of emergency vehicles, their approach was identified by proving a unique RFID card for the same.

Bilal Ghazal et al. advanced smart traffic light control system using PIC microcontroller and IR sensors but alienated the data from the IR sensors to the microcontroller using rf Tran receiver based on rf firmware. K. Vidhya et al. proposed a density based traffic control system using Raspberry Pi and concept of image converting. Under this, they examined the ways to obtain the vehicle count by acquiring the real time images of the vehicle densities and further reefing it into a series of grayscale, threshold, canny, erode and contour images. D. D. Pukale et al. proposed a density based traffic authority system using video processing. With the help of Arduino, the implementation is carried out by analyzing the video recordings and removing the frames using which the vehicle densities is found. Corresponding the density present, the time span for the specific control of the signal is decided.

## **III. SYSTEM ANALYSIS:**

### **a. EXISTING SYSTEM:**

The system uses ultrasonic sensors work by sensing out a sound wave at a frequency above the range of human hearing. the traffic volume and density flow through infrared sensors (IR Sensors), and changes the lighting transition slots.



## **b. PROPOSED SYSTEM:**

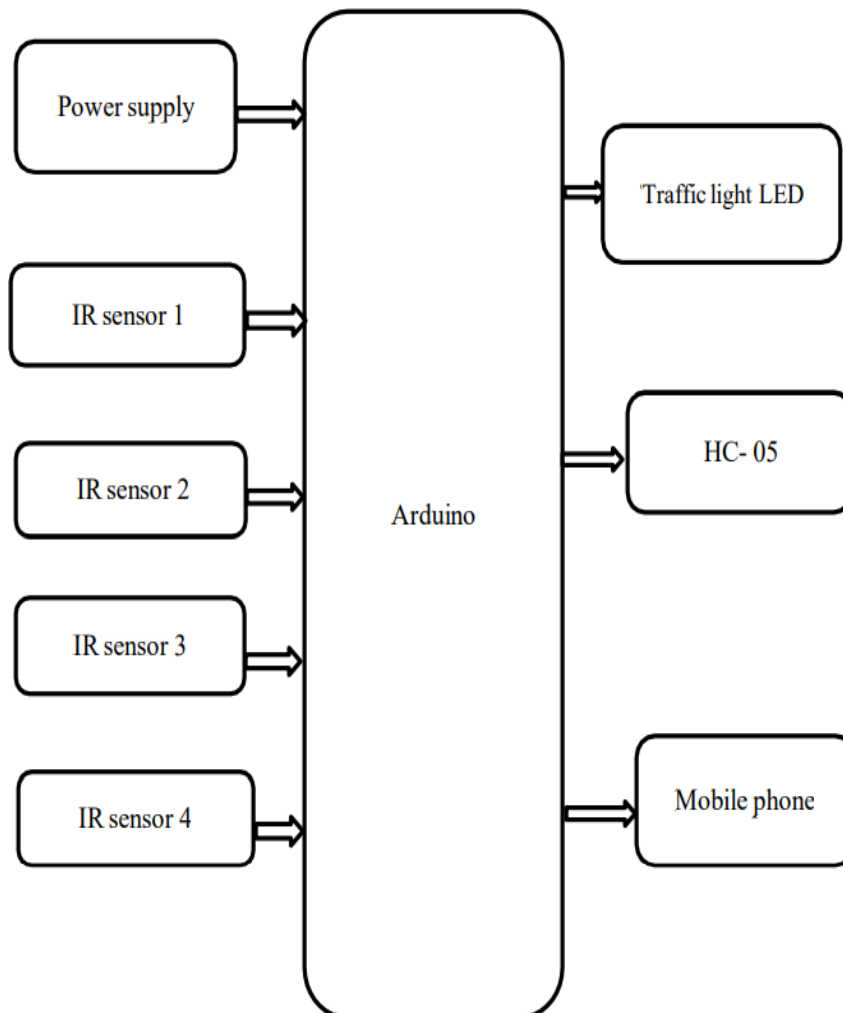
As compared to other countries with proper emergency systems, there is no single emergency system which could play a major role in managing medical emergency in India. There is a system in place to attend emergencies in the country, 108 is the emergency telephone number for ambulance services in parts of India. A typical problem such a system face is to get the location of the victim to send the is the help needed. Traffic signals in India has a fixed time period to switch the signals. No changes for emergency vehicles. There is no traffic control unit in ambulance. Whenever ambulance reaches a certain junction with a traffic signal, it has to wait for several minutes until clearance.

## **IV. METHODOLOGY:**

The following two systems are combined in this paper - Traffic Control and Health Monitoring. Both traffic controlling and health monitoring systems will work simultaneously. Patient's health parameters are monitored and at the same time driver of the ambulance can request the control room to manipulate the traffic signals. The ambulance first sends a request to the control room for traffic control. The request consists of the current location of the ambulance accessed using GPS and the location of the desired hospital is sent by the ambulance driver. This request is now sent to the AWS server. The server consists of all the requests of various ambulances that request for traffic control. Now, the server sends all the data of all ambulances that have requested for traffic control to the Control room.

The control room side of the application now displays the requests of all ambulances. The ambulances are displayed in order of their distances. The control room operator can now choose which ambulance it chooses to navigate by selecting it. Now a map is displayed which shows the current location of the ambulance as well as the location of the hospital. The route between the ambulance and the hospital and the live data of traffic is displayed on the map. Here, green represents less traffic, orange represents moderate traffic and red indicates high traffic. An option is also displayed which enables navigation on google maps. The shortest route between the ambulance and hospital is displayed as well as the traffic at various junctions. With the help of this data, the control room can control the traffic signals at various junction.

## BLOCK DIAGRAM



### ARDUINO:

The Arduino board is the most used board of all Arduino boards. The board contains 14 digital input/ output pins in which 6 are analog input pin, one power jack, USB connector, one reset button, ICSP header, and other components. All these components are attached in the Arduino UNO board to make it functioning and can be used in the project.

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices.



## **IR SENSOR:**

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor.



## **TRAFFIC LEDS:**

LED, in full light-emitting diode, in electronics, a semiconductor device that emits infrared or visible light when charged with an electric current.

Based on the semiconductor material used and the amount of doping, an LED will emit a colored light at a particular spectral wavelength when forward biased. As shown in the figure, an LED is encapsulated with a transparent cover so that emitted light can come out.



### **HC-05(BLUETOOTH):**

HC-05 is a **Bluetooth module which is designed for wireless communication**. This module can be used in a master or slave configuration. Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth. It is used to bring Bluetooth module in AT commands mode.



### **V. RESULTS AND DISCUSSIONS:**

The principle of an IR sensor working as an Object Detection Sensor can be explained using the following figure. An IR sensor consists of an IR LED and an IR Photodiode; together they are called as Photo – Coupler or Op to – Coupler. When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of the reception by the IR receiver, the output of the sensor is defined. It consists of an IR LED, a photodiode, a potentiometer, an IC Operational amplifier and an LED. IR LED emits infrared light. The Photodiode detects the infrared light. An IC Op – Amp is used as a voltage comparator. The potentiometer is used to calibrate the output of the sensor according to the requirement.

When the light emitted by the IR LED is incident on the photodiode after hitting an object, the resistance of the photodiode falls down from a huge value. One of the input of the op – amp is at threshold value set by the potentiometer. The other input to the op-amp is from the photodiode's series resistor. When the incident radiation is more on the photodiode, the voltage drop across the series resistor will be high. In the IC, both the threshold voltage and the voltage across the series resistor are compared. If the voltage across the resistor series to photodiode is greater than that of the threshold voltage, the output of the IC Op – Amp is high. As the output of the IC is connected to an LED, it lightens up. The threshold voltage can be adjusted by adjusting the potentiometer depending on the environmental conditions.

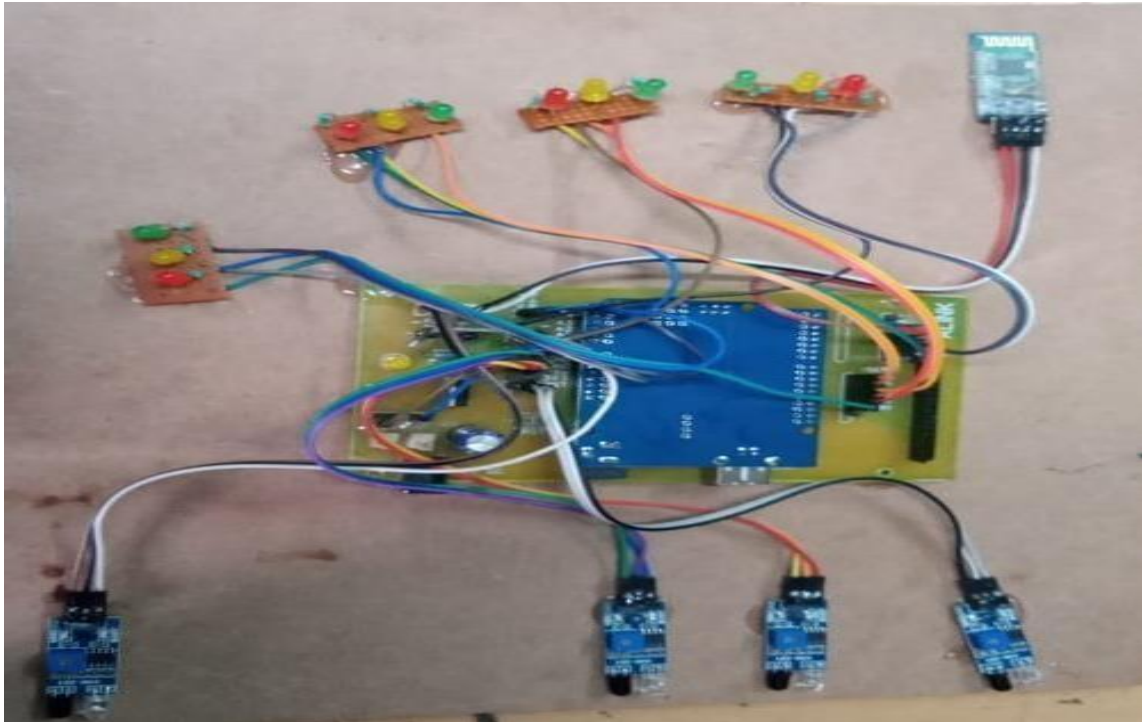
The positioning of the IR LED and the IR Receiver is an important factor. When the IR LED is held directly in front of the IR receiver, this setup is called Direct Incidence. In this case, almost the entire radiation from the IR LED will fall on the IR receiver. Hence there is a line of sight communication between the infrared transmitter and the receiver. If an object falls in this line, it obstructs the radiation from reaching the receiver either by reflecting the radiation or absorbing the radiation. Distinguishing Between Black and White Colors It is universal that black color absorbs the entire radiation incident on it and white color reflects the entire radiation incident on it. Based on this principle, the second positioning of the sensor couple can be made. The IR LED and the photodiode are placed side by side.

When the IR transmitter emits infrared radiation, since there is no direct line of contact between the transmitter and receiver, the emitted radiation must reflect back to the photodiode after hitting any object. The surface of the object can be divided into two types: reflective surface and non reflective surface. If the surface of the object is reflective in nature i.e. it is white or other light color, most of the radiation incident on it will get reflected back and reaches the photodiode. Depending on the intensity of the radiation reflected back, current flows in the photodiode.

If the surface of the object is non-reflective in nature i.e. it is black or other dark color, it absorbs almost all the radiation incident on it. As there is no reflected radiation, there is no radiation incident on the photodiode and the resistance of the photodiode remains higher allowing no current to flow. This situation is similar to there being no object at all. The pictorial representation of the above scenarios is shown below. The positioning and enclosing of the IR transmitter and Receiver is very important. Both the transmitter and the receiver must be placed at a certain angle, so that the detection of an object happens properly. This angle is the directivity of the sensor which is +/- 45 degrees. The directivity is shown below. In order to



avoid reflections from surrounding objects other than the object, both the IR transmitter and the IR receiver must be enclosed properly. Generally the enclosure is made of plastic and is painted with black color.



## **VI. CONCLUSION:**

As India meets with 384 road accidents every day. To reduce this congestion and unwanted time delay in traffic an advanced system is designed here in this project.

With field application of this technology, the maddening chaos of traffic can be effectively channelized by distributing the time slots based on the merit of the vehicle load in certain lanes of multi junction crossing. This technology also paves way for emergency vehicles movement.

We have successfully implemented the prototype at laboratory scale with remarkable outcome. We believe that this may bring a revolutionary change in traffic management system on its application in actual field environment.

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