

**“INTELLIGENT TRAFFIC SIGNAL CONTROL SYSTEM”**¹Dinesh Mandava, ²Sunad Rasane, ³Swaroop Honrao, ⁴S.R PawarStudent¹, Student², Student³, Assistant Professor⁴*1Electronics & Telecommunication Department, Savitribai Phule Pune University**2Electronics & Telecommunication Department, Savitribai Phule Pune University**3Electronics & Telecommunication Department, Savitribai Phule Pune University**4Electronics & Telecommunication Department, Savitribai Phule Pune University*

Abstract - Traffic congestion problem is a phenomenon which makes a huge impact to the transport system. This problem is quite common amongst the cities all around the globe. Our basic idea behind this project is to develop a density based adaptive traffic signal system. The signal duration automatically changes in accordance with the number of vehicles on that particular road unlike the conventional traffic light system. So there is a need for longer green signal duration as compared to signal which have been used as of now, when more traffic density is at one side of the junction as that of the opposite side of the intersection. This can be achieved by using IR sensors to sense the density of traffic on each road and then sending these signals to the microcontroller to dynamically assign the signal timings. A traffic light controller is designed to address the normal as well as emergency situations. This system was designed to operate when it received signal from emergency vehicles based on radio frequency (RF) transmission and used the microcontroller to change the sequence back to the normal sequence before the emergency mode was triggered. This system will not only reduce traffic jams but it will also reduce accidents which often happen at the traffic light intersections because other vehicles had to huddle in a hurry for making way for emergency vehicle.

Keywords: Traffic ,Emergency vehicles, Microcontroller, Transportation, Accidents ,Traffic Density..

I. INTRODUCTION

Traffic congestion makes a huge impact to the transport system. This problem is the most common amongst the cities all around the country. Traffic monitoring and controlling is a difficult task. The main objective of our project is to ensure smooth flow of traffic. The flow of the traffic constantly changes depending on the time of the day, day of the week and time of the year. Many countries in the world are facing the problem at traffic light intersection that causes accident between emergency vehicles and other public vehicles. The traffic control system in India specifically has not been equipped with appropriate method when emergency case occurs unlike the systems in the foreign countries. Moreover the traffic systems are adaptive in the foreign countries according to flow or density of the traffic the system will accordingly adjust the signal timings thereby reducing the traffic jams or long queues of the vehicles. But the orthodox Traffic system is not equipped well enough to deal with these kind of situations which will cause the emergency vehicles such as ambulances to find their way to the hospital within the stipulated time. Moreover, the situation is getting worse when emergency vehicles have to wait for other vehicles to give way at intersections with traffic lights. This causes a delay of time and may affect the emergency case. In recent times, the number of deaths of people in ambulances is increased at an alarming rate due to ever increasing traffic & no optimized traffic control systems. All these difficulties faced by emergency vehicles can be avoided using this adaptive control system based on RFID and Internet Of things.

II. OVERVIEW OF THE SYSTEM

The basic overview of the system consists of four modules i.e Traffic Density detection module, Emergency vehicles detection module and Centralized microcontroller and IOT module.

To build an intelligent traffic signal control system that automatically detects the density of the vehicles on all the roads of the intersection and also detect the emergency vehicles which are of paramount importance. In the current proposed system the traffic on all the roads are monitored continuously with minute details by the Traffic density detection module and emergency vehicle detection module.

These modules send the data to a Centralized Microcontroller. If an emergency vehicle approaches the intersection then the RFID(Radio Frequency Identification) receiver will detect that vehicle on which the RFID tag is placed. This detection will generate a signal pulse that is sensed by Emergency vehicles detection module and it will subsequently transmit data to main microcontroller which will turn that particular road's signal green and provide a dedicated free pathway for emergency vehicle to pass through the intersection.

The traffic density detection module consists of Infrared Sensors which are placed on all the roads of the intersection. Each road consists of 2 IR sensors which are placed about 20 to 80 meters apart. This setup is installed in a same way on all the four roads. Initially all the signals will be following a fixed schedule of operation and when the Traffic density of any road increases, then the IR sensor of that road becomes active and it will send out a signal to PIC Microcontroller which will then make that road's green signal ON for a longer period than the other roads, thereby clearing the extra rush of vehicles of that roads and ultimately avoiding traffic jams or long queues of vehicles. Finally the IOT module is used for effectively and manually overriding the system if in case the system cannot handle the high workload in addition to it is also of great importance to coordinate with these types of systems which are placed elsewhere.

TECHNICAL APPROACH

A crucial program is written to collect the vital information from traffic density module and emergency vehicle detection module in the core with PIC18F4550 Microcontroller.

The received data from both the modules is analyzed , processed and subsequent action is initiated by the main control system which will control the Traffic signals according to the requirements of the modules and real time scenarios.

The IOT module also helps in effective operation of the whole system which will take inputs from the microcontroller and also give outputs

III. SYSTEM ARCHITECTURE

The hardware design of Core Traffic Controller is based on PIC microcontroller. But it has many important modules which are very important, which literally form the eyes and ears of the system without which the system is nothing . Microcontroller is connected to Traffic Density module, Emergency Vehicles Detection Module and IOT module. Sets of IR sensors and RFID modules are used for successful implementation of the Intelligent Traffic Signal Control System.

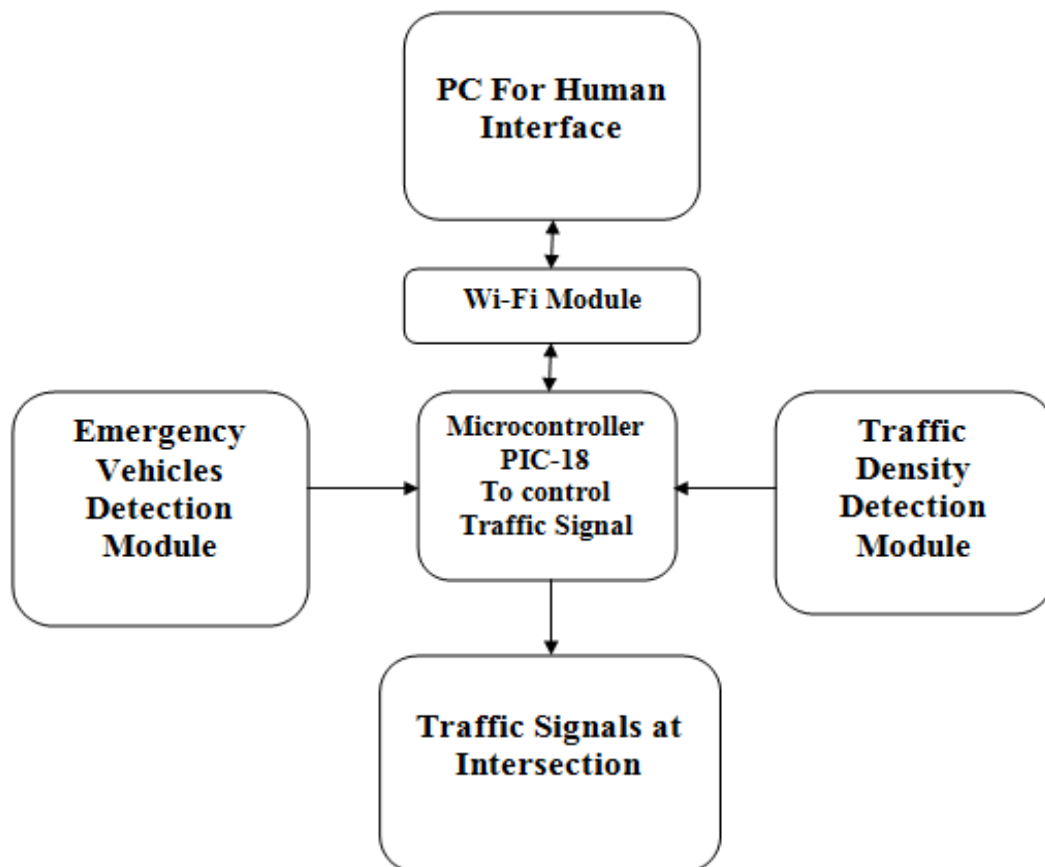


Fig.1: Basic Block Diagram of Intelligent Traffic Signal Control System

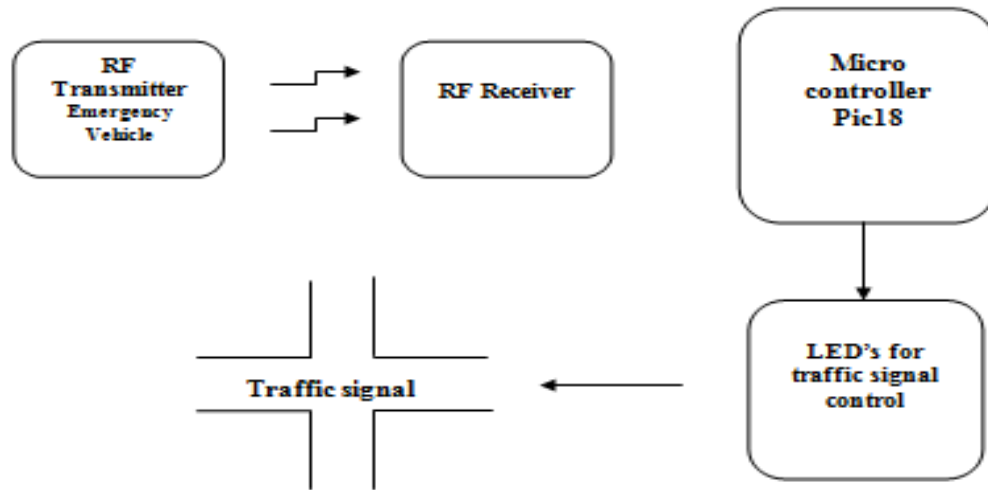


Fig: Block Diagram Of Emergency Vehicles Detection Module

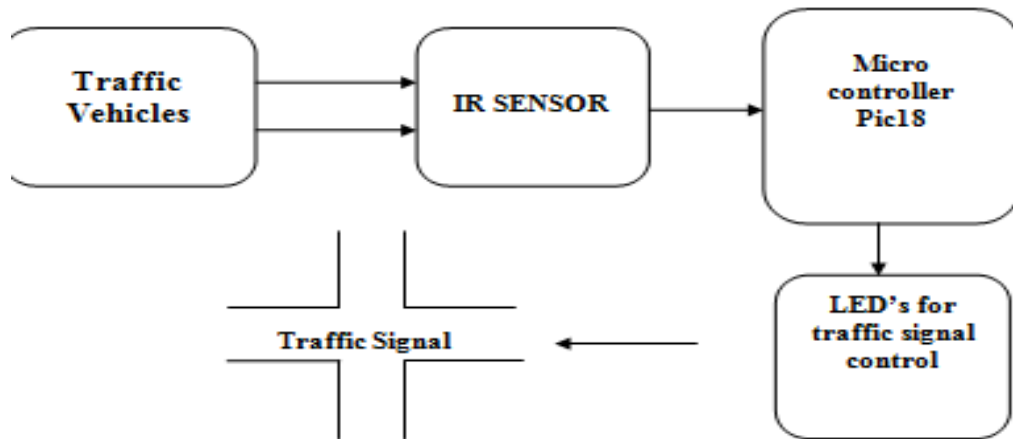


Fig: Block Diagram for Traffic Density Detection Module

IV. HARDWARE MODEL

The system is designed in such a way that the parent microcontroller obtains input from the two modules namely- Emergency Vehicle Detection Module and Traffic Density Detection module. The inputs of both these modules are integrated in such a way so as to obtain the control signal for the Main Traffic signal controller. The inputs from the IR sensors & RF sensors are integrated and processed. The results are sent through the data lines to a host computer i.e PIC Microcontroller, which stores the data, controls the signals and also transmit the data via Wi-Fi to the IOT module which keeps a close eye on the entire processes.

A) INFRARED SENSOR

An **infrared or IR transmitter** transmits IR waves i.e. waves having frequency in IR range. The wave propagation is line of sight. Therefore an IR receiver is placed exactly opposite to the IR transmitter to receive the signal transmitted by transmitter. Thus an IR Trans-receiver pair is used to detect any obstacle between transmitter and receiver. When the voltage at the IR receiver is below the threshold level, an obstacle is said to be detected. When no obstacle is present, a known voltage will be detected at the receiver end.

2 IR sensors per road are placed at about 80 Meters apart to detect the volume of the vehicles on the road.

If the IR signals get obstructed by the vehicles then it will give a logic '1' signal or else it will give logic '0'.

B) RFID MODULE

Radio-frequency identification (RFID) consists of a RFID tag and RFID detector. If a tag is shown to the detector then only the current is passed and the device gets operated. These devices use a power source (9V) and emit radio waves (electromagnetic radiation at radio frequencies). The RFID module used in this project is EM-18 module; its distance is about 5m and has a storage capacity of about 20 bytes. Unlike IR devices, the RF transmitter does not need to be within line of sight of the receiver. Whenever an emergency vehicle with an RFID tag embedded on it approaches an intersection, then the RFID receivers which are placed before the intersection will detect these RFID tags placed on the Vehicles, as

soon as the vehicles is detected it will send a distress signal to the main microcontroller which will make that particular road's signal green and every other road red, thereby providing a free and dedicated pathway for emergency vehicles.

2.3 IOT MODULE

The IOT module basically consists of a EP-8266 wireless wifi module which is connected to the PIC Microcontroller and the data received by the microcontroller is transmitted through the wifi module to a hotspot i.e a webpage on the computer which is connected to a central hub.

The computer is connected to a wifi via wireless Local area Network(LAN),in this centralized hub the current situation are monitored continuously if at all there arise a need of human intervention, it has a provision of giving commands to the microcontroller and it manually overrides the signal and the traffic vehicles are routed according to situational demands.IOT is very important in the context of the project because it combines human brains with Machines which together form aa deadly combination in the history of traffic management systems. This state-of-the-art mechanism can change the fate of the Indian Traffic if implemented correctly.

V. EXPECTED RESULT

The system combines the various inputs of the real time situations gathered with the help of Infrared Modules and Radio Frequency identification modules. And initiates necessary control action for smooth flow of vehicles and an easy passage of emergency vehicles as and when they arrives.

It also provides a provision of manually overriding the signals in the worst case scenario and also provides an opportunity to link up with the centralized hub of microcontrollers which are then used to effectively route the vehicles through the paths which have very low traffic which is of utmost use during the critical cases of ambulances.

This can also be called as life-saving combination because the IOT provides the boost to the system and ambulances may just fly away through the empty roads if they are routed properly with high care.

VI. CONCLUSION

- We have designed a system to control the flow of traffic based on its density and we have given priority to the emergency vehicles when they arrive at the traffic intersection.
- This system will ultimately reduce traffic jams and also save precious lives of the people

VII. FUTURE SCOPE

- Presently this system is being implemented for only a single traffic signal intersection , we can upgrade it to control the whole network of Traffic System of City in near future.
- We can add the facility of vehicles tracking and sending the information to the concerned authority incase of Emergencies
- We can also find the stolen vehicles by integrating the CCTV's

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