

# Embedded System to Prevent Traffic Congestion by Creating Traffic Light Delays

*Nisarga G. C, Sheethal R, Yashodamma S, Vani H V, Sudha T*

Department of EEE, SJMIT, Chitradurga, Karnataka, India

E-mail: [hvv.eee@sjmit.ac.in](mailto:hvv.eee@sjmit.ac.in)

## **Abstract**

*Increase of vehicles has been created traffic congestion and traffic jams which is a serious threat for the ambulance to reach its destinations in time. We as engineers have to consider this serious problem and duty to make an easy go for the ambulance during emergency. In a solution to solve this threat to prevent further threat to lives we are going to systemize the sensors which optimizes the traffic light operated by microcontroller which is powered by solar panel. This system reduces the traffic jam and congestion up to certain extent. Microcontroller used here is 89S52 which belongs to MCS-51 family. IR Transmitter and Receiver are placed on either side of the road. When vehicle passes in between IR Transmitter and Receiver, IR System is activated. IR System is controlled by microcontroller and it counts the number of vehicle passing on the road and keeps in memory. When vehicle count exceeds the limit microcontroller create the traffic light delays. Based on vehicle count, microcontroller defines different ranges for traffic light delays and update accordingly. At user pre-defined recording interval it records the vehicle count on a real time base. This recorded data is used to analyze traffic conditions in future. This data could be downloaded through communication between the microcontroller and the computer which is done by the computer administrator (access the traffic condition) on a central computer station access the traffic condition and reduce the congestion by creating traffic light delays.*

**Keywords:** 89S52, MCS-51, IR transmitter, microcontroller

## **INTRODUCTION**

Traffic research has the goal to optimize traffic flow of people and goods. As the number of road users constantly increases,

and resources provided by current infrastructures are limited, intelligent control of traffic will become very important issue in future. However, some

limitations to the usage of intelligent traffic control exist. Avoiding traffic jams for example is thought to be beneficial to both environment and economy, but improved traffic-flow may also lead to an increase in demand. There are several models for traffic simulation. In our project we focus on optimization of traffic light controller in a city using IR sensor and developed visual monitoring using microcontroller 89V52RD2 [1, 2]. Traffic light optimization is a complex problem. Even for single junction there might be no obvious optimal solution. With multiple junctions, the problem becomes even more complex, as the state of one light influences the flow of traffic constantly changes, depending on the time of day, the day of the week, and the time of year. Roadwork and accidents further influence complexity and performance. In this project, we propose two approaches, the first approach is to take data/input/image from object/subject/vehicle and in the second approach is to process the input data by Computer and Microcontroller and finally display it on the traffic light signal to control the Closed Loop System.

This project is designed for the cities with heavy traffic. For example: In Bangalore, the roads are full jammed every time. Most of the time, traffic will be present at least

for 100 meters. In this distance the traffic police cannot hear the siren from the ambulance. Then the ambulance has to wait till the traffic is left. Some times to clear the traffic, it takes at least 30 minutes. So by this time anything can happen to the patient. So this project avoids these disadvantages. According to this project if any ambulance at emergency comes to any traffic post, the traffic signals automatically stop the signals and give green signal for this ambulance. Normally, we will have the traffic signal lights programmed for a particular time intervals. But, here we will generate the traffic light signals based on the traffic, on the particular time [3–5].

## PREVIOUS WORK

- ✓ Sarika B. Kale, Gajanan P. Dhok. Design of Intelligent Ambulance and Traffic Control. *International Journal of Innovative Technology and Exploring Engineering (IJITEE)* ISSN: 2278-3075. 2013; 2(5).

Gajanan P. Dhokhi's main aim is at saving a large amount of man-hours caused by traffic problems and accidents, where prevention can save lives and property. It is able to manage priority emergency tag vehicles. It offers a valuable detailed database records and preference to planner and

investigators. The proposed work considers not only the priority of the vehicles but also the density of the vehicles on the road and controls the traffic light sequence efficiently and more accurately.

- ✓ Ms Promila Sinhmar. Intelligent traffic light and density control using IR sensors and microcontroller. International Journal of Advanced Technology and Engineering Research (IJATER).

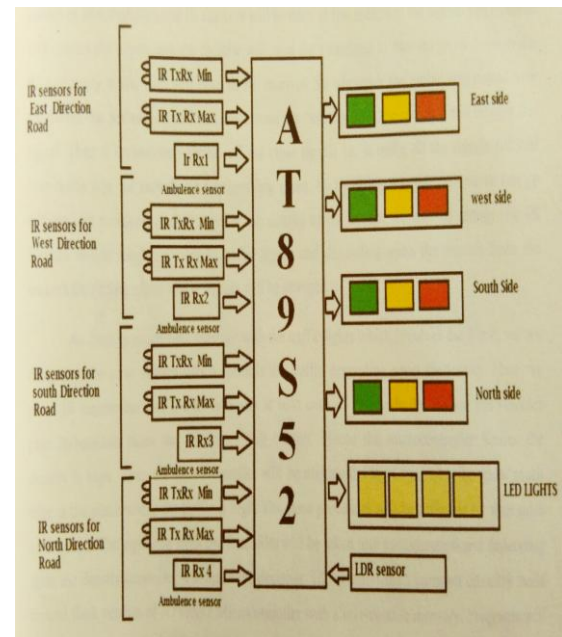
Ms Promila Sinhmar has studied the optimization of traffic light controller in a city using IR sensors and microcontroller, by using this system configuration we tries to reduce the possibilities of traffic jams, caused by traffic lights, to an extent and we have successfully gets the results. No. of passing vehicle in the fixed time slot on the road decide the density range of traffics and on the basis of vehicle count microcontroller decide the traffic light delays for next recording interval.

- ✓ Y. Guohao, T. Jun, C. Guochong. Automatic Street Lighting System for Energy Efficiency based on Low Cost Microcontroller” RF Controller Development and Its Application in Intelligent Transport System. Proc. of the IEEE International Workshop on Anti-counterfeiting, Security,

Identification. ISBN: 1-4244-1035-5. 2007; 113–116p.

According to Y. Guohao automatic street lighting system was presented. As a conclusion, around 77%-81% of power consumption can be reduced by using this system towards providing a solution for energy saving. Furthermore, the minimal components including the low cost controller and LED module produce the better saving in term of cost. On top of that, the lifetime, better illumination and low power consumption of LED are other criteria for reducing the operational and maintenance cost after installation compare to high pressure sodium lamp and others.

**BLOCK DIAGRAM**



**Fig. 1: Block Diagram.**

## PROPOSED METHODOLOGY

The Figure 1 shows block diagram of smart ambulance with power saving mechanism. When the ambulance at emergency comes to any traffic post the traffic signals automatically stop the signals and give green signal for this ambulance. The ambulance carries an IR transmitter and IR receiver will be there at few meters at the signal. The receiver will receive the signal and the module will send the command to turn on green through the RF and every traffic post will have an RF receiver. So, whenever, the ambulance come near the traffic, the ambulance will transmit a code say “emergency” the receiver will receives this signal [6].

Then, it immediately switch off the other signals, i.e., it make all the signals red and later make way for ambulance by signaling green. So, by doing this the ambulance can go without any problem. And to monitor the density of the traffic, we, will be setting few IR sensors beside roads i.e., near to traffic signal and depending upon the signals from the sensors the timing of the traffic signals will be changed.

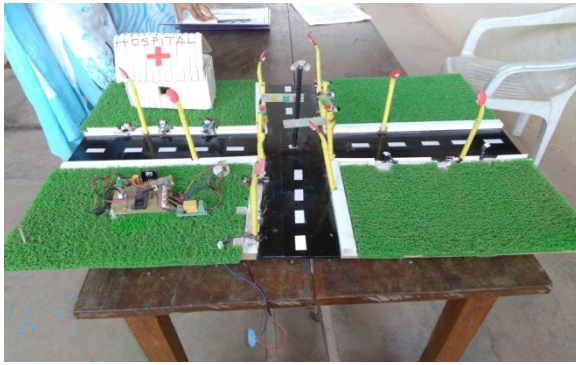
As there is much time wastage with the traffic lights which involves the Time; we are designing the new system which controls the traffic depending upon the

density. Here, we place IR transmitter and IR receiver at both ends of the roads. Whenever, the vehicles pass in between them the continuity will be lost.

Hence the microcontroller senses the density is high. Then the microcontroller will be making the light (green) to be glow much time at the place where the traffic is high. The same procedure will be followed by four sides upon the density controller will make the decision [7, 8]. The system uses a compact circuitry build around flash version of AT89S52 Microcontroller with a non-volatile memory. Programs will be developed in EMBEDDED C language. FLASH MAGIC is used for loading of programs into microcontroller.



*Fig. 2: Solar Panel Giving Supply for Sensors along the Roads.*



*Fig. 3: Layout Setup for Smart Ambulance System.*



*Fig. 4: Smart Ambulance.*

## CONCLUSION

The project “Smart ambulance with power saving mechanism system” has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of unit. Secondly, using highly advanced IC’s and with the help of growing technology the project has been successfully

implemented. In our project, the automatic street lighting system was presented. As a conclusion, around 77%-81% of power consumption can be reduced by using this system towards providing a solution for energy saving. Furthermore, the minimal components including the low cost controller and LED module produce the better saving in term of cost. On top of that, the lifetime, better illumination and low power consumption of LED are the other criteria for reducing the operational and maintenance cost after installation compare to high pressure sodium lamp and others. Hence, it helps in further improves the energy efficiency and quality of lighting level.

The proposed framework is capable of providing its customizable best route identification based on multiple possible optimization factors such as travel time, fuel cost and distance. The dynamic time management scheme operates in real time and emulates the judgment made by a traffic policeman on duty. This system aims at saving a large amount of man-hours caused by traffic problems and accidents, where prevention can save lives and property. It is able to manage priority emergency tag vehicles. It offers a valuable detailed database records and preference to planner and investigators.

## FUTURE SCOPE

This project can be enhanced in such a way as to control automatically the signals depending on the traffic density on the roads using sensors like IR detector/receiver module extended with automatic turn off when no vehicles are running on any side of the road which helps in power consumption saving. Number of passing vehicle in the fixed time slot on the road decide the density range of traffics and on the basis of vehicle count microcontroller decide the traffic light delays for next recording interval. The recorded data can be downloaded to the computer through communication between microcontroller and the computer. The Administrator sitting on computer can command system to download recorded data, update light delays, erase memory, etc.

Thus, administrator on a central station computer can access traffic conditions on any approachable traffic lights and nearby roads to reduce traffic congestions to an extent. In future this system is done through radio. Data transfer between the microcontroller and computer can allow the operator to gather the recorded data form a far end to his home computer without going there. In ambulance system, the data of the patient in the ambulance

can be sent to the Hospitals via GSM technology. Thus, it can provide early and fast treatment of the patient.

## REFERENCES

1. Sarika B. Kale, Gajanan P. Dhok. *International Journal of Technology and Exploring (IJITEE)*. 2013; 2(5).
2. Promila Sinhmar. *International Journal of Advanced Technology and Engineering Research (IJATER)*.
3. International Journal of Electrical, Electronics and Computer Engineering. ISSN No. (Online):2277-2626. 2014; 2(2): 66– 72p.
4. Y. Guohao, T. Jun, C. Guochang. RF controller development and its application in intelligent transport system. *Proc. Of the IEEE International Workshop on Anti-counterfeiting, Security, Identification*. ISBN: 1-4244-1035-5. 2007; 113 – 116p.
5. Highway traffic model-based density estimation. IEEE paper by Morarescu, Nancy Univ., France published in American Control Conference (ACC); 2011.
6. W. Wen, C.L Yang. A dynamic and automatic traffic light control system for solving the road congestion problem.

7. Jianye Li. Iterative learning based Freeway density control. *Information Engineering and Computer Science (IECS)*. 2<sup>nd</sup> International Conference.
8. M. Kim, J. Park, J. Oh et al. Implementation of national traffic information collection systems in ubiquitous environments. *Proc. Of the IEEE Globecom, Global Telecommunications Conference*. ISBN: 978-1-4244-2324-8. 2008; 1– 3p.

Sheethal. R., U.G Student, EEE Department, SJMIT Chitradurga, Karnataka, India.



Vani H.V. Presently working as Associate Professor in Department of EEESJMIT, Chitradurga Karnataka, India.

Completed B.E (EEE) in the year 2001 from UBDTCE and M.Tech (power system power electronics) in 2010 from UBDTCE. Areas of interest are power system, power electronics, advanced control system.

## BIOGRAPHY



Nisarga. G.C., U.G Student, EEE Department, SJMIT Chitradurga, Karnataka, India.



Yashodamma. S., U.G Student, EEE Department, SJMIT Chitradurga, Karnataka, India.



Sudha T. Presently working as Assistant Professor in Department of EEE SJMIT, Chitradurga, Karnataka, India

Completed B.E (EEE) in the year 2009 from NMIT and M.Tech (digital electronics) in 2015 from sit mangalore. Areas of interest are digital electronics, power electronics, advanced control system.