

# Accident Detection and Prevention System using GSM & GPS with Traffic Clearance for Ambulance

K. SaiKumar<sup>1\*</sup>, K. Dineshwar<sup>2</sup>, K. Upender<sup>3</sup>, Ms. S. Preethi<sup>4\*</sup>, U. Poorna Lakshmi<sup>5</sup>  
Student<sup>1,2,3</sup>, Assistant Professor<sup>4-5</sup>, Department of Electronics and Communication Engineering,

**Abstract:-** The main purpose of this work is to identify automatically the position of the vehicles which met with accidents. The vehicle's position and status are transmitted as latitude and longitude values through GSM and GPS with the mobile authorization two parameters i.e., latitude and longitude will describe the location anywhere on the Earth. The co-ordinates data will be acquired by the GPS receiver which will be fed to the microcontroller to display in the LCD. Whenever the vehicle is collided, location of the vehicle information will be transmitted to the concerned mobile automatically. Bumping sensor is used in collision sensing. Based on those signals, the controller collects the longitude & latitude data from GPS receiver and transmits to the concern mobile through GSM module. The experimental setup was installed in the ambulance which would control the traffic at signals until the vehicle crosses the crowded-areas. As often the ambulance has to wait until the normal traffic is cleared, and causes inconvenience to the patient life and who needs immediate treatment, to overcome this issue we designed a system which would be very helpful while the vehicle crosses junction or cross-roads. Therefore the proposed system could by-pass the existing signaling system for some-time.

## I. INTRODUCTION

This project is introduced to rescue the life while the accidents are occurred and also for the people who were in a critical situations while shifting to the hospitals in an ambulance. As of now nearly 2.3 millions of deaths are occurred due to road accidents and delay in shifting to the hospital while patient in a critical situations. While any kind of accidents which are occurred outside of the city or a town or in a less populated area the information passing to a emergency team will be delay in this situation the persons who were in a critical situation have to struggle for their life even the hospitals are very far away from that place it will be another crucial thing. To avoid this kind of situations accident detection device are came in to picture to rescue the live where the information is automatically transfer to emergency number in the SMS format. In that SMS where the accident is happen and exact coordinates of the accident occurred, the information will be transferring in the for latitude and longitude. Then according to that information the

ambulance are reached to incident where it was occurred. Till then it was fine but in the time of emergency situation if ambulance has to enter in to the any city hospital major problem traffic will be coming in to the picture. As we know that how a metropolitan cities are being suffered from the threat known as traffic, to travelling a very minimum distance also need an hour to reach the destination. In that scenario of heavy traffic roads clearing way for ambulance is very challenging, even though everyone is keeps trying to provide a way for the ambulance after listening to siren but it even very difficult to reach the hospital. To overcome from this situation this device was developed. The device is mainly developed by the microcontrollers, also GSM and GPS modules are implemented in it.

This work has carried-out in two phases, primary thing of the work is detecting the accident where it was occurred latitude and longitude coordinates are passed to the emergency service center, and then it will alert the ambulance nearby the place of incidence. Then our second phase when ambulance comes into the picture where it needs to travel into the city, at the city junctions it takes much time to cross those junctions. In that case to pass a ambulance in between those halting vehicles which will be very difficult. To overcome those issues a device is installed at the traffic signals, this installed device clears the way for ambulance in the way it is passing and holds other sides of the junction. A switch is installed in the ambulance which controls the traffic signal unit at the junctions. But at the junctions new method of traffic signal are introduced one is for general purpose of traffic signal another is for this kind of emergency purpose usages. As public also get the awareness about the situation if another traffic signal section is in action everyone understands that in that way an emergency vehicle passes.

To communicate with the junction signals RF network is established in ambulance and at the junctions which works as RF transmitter and receiver. After ambulance passes away from the junction, signals are reset to the original state. Inside the ambulance RF transmitter device is fixed in which it consists of 5 different keys. For four way junction signals those switches or keys are ambulance driver is aware which key he has to used while passing that junction. 5<sup>th</sup> key is used to reset the traffic signals into its original state.

## II. LITERATURE REVIEW

A. S. Titarmare et al. [1] proposed a system which can transmit the information regarding the exact location of the vehicle when it meets with an accident to the vehicle owner, family members and rescue team simultaneously. Using mobile application, SMS or web application the information is transferred to the end users.

T. P. Chikaka et al. [2] developed a robust automatic vehicle detection and alert system. This system detects the vehicle titling and crashing using accelerometer and transmits the GPS location of the vehicle accident location to the family members, medical team and police team. Therefore the proposed system achieves faster response than the conventional rescue system with these features and hence saves more lives using the current technology.

Kishwer Abdul Khaliq [3] proposed a test bed to provide a solution of traffic safety and management using vehicular ad-hoc network and IoT. With the help of on-board unit it detects and estimates the severity of the accident. When an accident occurs, it immediately sends an SMS to the control room, it will find the exact location of the vehicle accident and passes the information to the nearest hospital and rescue team. Finally in order to clear that route for the ambulance to the incident location, the application in the ambulance generates alert messages. In [4], an efficient monitoring of real-time traffic scene clearance for an emergency service vehicle using IoT was developed.

## III. TECHNOLOGIES USED

### A. RF Remote Technology

Radio waves are the part of electromagnetic waves, it is the result of two energies one is electric and another is magnetic which rapidly effects the changing of the electric currents. radio waves will not be visible to the eyes but radio waves similar to the velocity of light waves that travel over a 186000 miles per second. Both, the light waves and radio waves are electromagnetic waves only. sound also produces some waves but these waves are not a part of electromagnetic waves. The sound waves travel slower speed of the 1100 feet per second than the electromagnetic waves. So, this is the reason why the light is found initial and the sound is found bit later than the light.

In the digital communication system, signals are processed so that it can also represented as the successors of all distinct messages and coming to analog communication the frequency and wavelength are denoted as the complete cycle of the radio wave.

Radio wave frequency is defined as number of complete cycles achieved by a radio wave for one second. A unit for the life cycle is hertz, from the Heinrich hertz the unit is defined and Heinrich hertz discovered the radio waves. If radio waves goes over a frequency of millions of hertz then they are defined as megahertz. The wavelength is defined as distance travelled by the wave over one complete cycle. In every communication system there will be a fixed frequency

to stop interfering with neighboring stations and it is like a constant within the authorized limits basically it is to avoid disturbances in the communication. Every transmitting station has a radio frequency which is called as carrier wave, which can travel in long distances with the speed of light. Human ear cannot hear these types of frequencies. If the radio waves are used for carrying information or message then radio waves can be used to communicate in the line by passing some information to them. The process which the data is imposed on the carrier is called as modulation. In radio relay the frequency of message or information is 20Hz to 20,000Hz which is very low frequency. These low frequencies are audible to human so these type of frequencies which are in that range are known as audio frequencies. But here we want to convey the digital data so the information signal is transferred in the form of bits.

Analog or digital cannot travel longer distances by themselves but depending on the carrier frequency they can travel same distance as the carrier modulating radio wave is the leading attribute in the radio wave it can be a different of amplitude and frequency over the carrier wave. Amplitude modulation means amplitude of the carrier wave varied in a line with the variation of amplitude modulating signal which is known as audio frequency. Frequency modulation means. Frequency of the carrier wave varied in a line with the variation of amplitude modulating signal.

In transmitting module the carrier generator produces 433 MHz, according to activated key in the microcontroller the information produced in the form of digital data it is super imposed on the carrier and transmitted as pitch (counter waves). In the project work we have used RF module (transmitter and receiver), these both are readymade. Because, transmitter is producing very large frequencies like 433 MHz which is difficult to construct and handle in the normal electronic labs. If receiver is synchronized with the transmitter then it is called as receiver is tuned with the transmitter. If the receiver perfectly tuned then the communication is done easily. Radio waves are send in different directions through antenna by transmitting it. Transmitting antenna is nothing but radio wave signals are leaving through the conductor and the receiving signals are collected by conductor of same length is known as receiving antenna. The range is very less in the project so only 20 CM's of copper wire is used in antenna

### B. General Description About Way Clearing Technology For Ambulance

Nowadays if an ambulance is going in traffic with lights and the siren activated then many of the people should clear the way so, that the ambulance can go fast and the patient who is in emergency can get help and they will be saved from dying, but most of the people in the traffic doesn't respond quickly to it. So that it may get delayed for emergency. In many cities like Hyderabad and others there is severe traffic and crowded with many vehicles and full of traffic so, in order to clear the traffic we implemented high end automated technology. Motion detection is a part of real time operating systems, motion detection means we have to take decisions in

short span of time. Many of them tried to implement this 'motion detection' system to clear the signal at where the traffic is full and the place ambulance is there and make the way for emergency service without any problems.

Nowadays there is no efficient way for emergency services, which is the best solution for it, and helps to save precious time and save many of the lives. In our day to day life, if ambulance get stuck in the traffic, people has many thoughts they are confusing for them they might have an intention of making a separate space for the ambulance but there is no place to move vehicle and if wanted to go front the stop signal is there by observing all these they move a little bit by taking a few minutes but those few minutes are also important for saving the life. Those precious few minutes could make a life and death situation for the patient who is in emergency. Now the present traffic junctions are operated by the 'PLC's which provide some interfaces for the communication. so that it would be easier. To communicate with the junction we can make use of 'wireless communication', we can also write some code for path in which the ambulance is travelling. Do that we can provide the signal based upon the received signal. The advantage of PLC is, it interrupts and used for design. Design is not much expensive than the PLC. Just we need to write the code for PLC according to the requirement and the rest is hardware design. Hence, it is an efficient solution in overcoming the problems.

#### *C. Intelligent Traffic Control System For Ambulance*

In this technology it use GPS (Global Positioning System) along with the data transmitter installed in the ambulance so that it send the position of ambulance continuously to the processing unit where traffic signal are supreme. GPS Installed in mobile vehicle can get the position using the satellites this data is in the form of latitude and longitude values. Whenever the GPS comes near to the junction then the PLC controls the traffic lights acquires the data. The PLC is pre-programmed to identify the position of ambulance and the way ambulance is travelling, accordingly signals are hold back.

GPS gives the signals to appliances on the ground and receive the signals from satellite they don't transmit. GPS receivers require a clear view and lighting so, they are used in outdoors and they don't perform good in forest areas and large buildings. GPS has atomic clock which is used in U.S because they have accurate time reference. GPS transmits the data that selects the location and current time.

The signals which operate the light arrived at GPS receiver but all the satellites are at same distance some of them may at longer distances so they arrive in different timings. The distance for the GPS satellites is given by calculating the time taken for signal to reach the receiver can calculate the position in three dimensions because it can calculate the distance of four satellites, at that moment there would be atleast twenty four GPS satellites running around the clock.

#### *D. Determining Position*

The receiver contains location of different satellites so, the data is used in the transmission of satellite. By evaluating the distance of the satellite receiver also knows that it's is located on surface of imaginary sphere centered in satellite. The proposed work "RF network used to clear the way for ambulance" is aimed to clear the way for ambulance at junctions. The extract position of the ambulance from which route it is approaching the junction, information should be transmitted from the ambulance to the remote end system from where the traffic lights are curbed. Therefore the corresponding traffic lights will be curbed automatically, according to the information received. The proposed system forms a wireless communication network using RF modules and aims to communicate with the control circuit. The main advantage usage of this technology is allows to take patient to the nearest hospital quickly. As the designed system has power constraint issues, it operates with a less range upto 60 foot. However for real-world applications high power transmitter is used so that the approaching ambulance information can be transmitted at least one kilometer away from the junction, by which the way will be cleared for the ambulance by the time it reaches to the junction.

The designed system was successfully for confirming it a prototype model and the generated results were satisfactory. In this work, the RF modules are brought from the market they are working well and good. By trial and run method the transmitter range could transmit information over 60 foot in open air. The constructed demo module with small signal was able to control 4 sides of traffic for this method at junction roads are simulated over wooden plank. The signal post consists of 16 indicators of which 8 indicators are for normal signaling and in which 4 are red and 4 are green indicators. With these 8 indicators normal function of traffic signaling system is performed based on timings data programmed on the controller. Other 8 Signals are used for ambulance which catches the emergency signal in traffic.

Depending up on the data transmitted from the ambulance, all three sides' traffic will be held up except the way from where the ambulance is approaching.

## **IV. IMPLEMENTATION**

The main aim of this work is to get the location where the vehicles are collided; that location coordinates was transfer to the emergency services by the help of GPS and GSM. With the help of GPS (global positioning system) we will get exact location where the incident is occurred. GSM (global system for mobile communication) in which it send a alert message along with the latitude and longitude coordinates. In GSM module we can set the emergency contacts where messages has to be sent and also alert format as what you in that alert message along with that location coordinates. Until this it was the initial phase of the project, after that traffic clearance for the ambulance will take the lead. In which RF transmitter and receiver circuit is installed in the ambulance and junctions. Data transmitting circuit is installed in the ambulance in with 89C2051 microcontroller is used to transmit the data to junction signals. In the

ambulance 5 keys are installed in data transmitting unit 4 keys indicate 4 way junction and the 5th key is reset key. Driver handles with those keys those 4 keys in which way he want to clear the traffic to move ahead those are used and the 5th key is to reset the traffic signals into original state this how this system starts working. While testing the project the junction signals response from a distance of 60meters. It means 60meters before reaching the junction driver can operate the junction signals has he required.

## V. RESULTS

To save the struggling lives while they were struck in a heavy traffic this project mostly useful. The project implemented successfully and passed all the tests. When the accident alert switch is activated automatically within seconds the message is sent to the number which are mentioned in the transmitter code in which it carries an alert message and latitude, longitude coordinates. By copying those coordinates from the maps we get the location of the accident. In ambulance and at the junction signals RF system was installed. While ambulance reaching nearby junction before that it can operate the traffic signals and clear the way which they want and finally press the reset key to change the signals into original position.

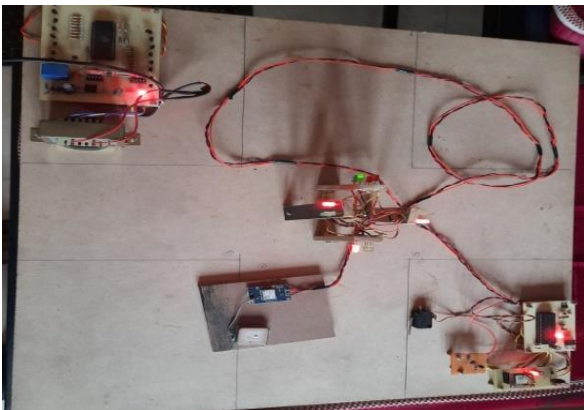


Fig 1:- Upper traffic lights indicates actual traffic signals

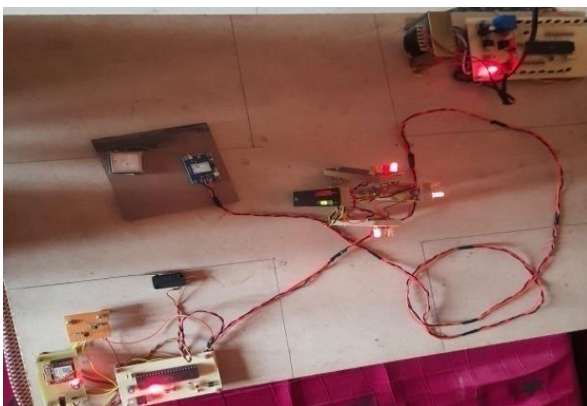


Fig 2:- Lower traffic lights indicates emergency purpose traffic signals

## VI. CONCLUSION

The proposed system is designed and developed successfully for confirming it a prototype model is build and the results are satisfactory. In this system the RF modules are in good working conditions. By trail and run method the proposed system was able to transmit and control the signals over 60 feet in open air. A demo module was constructed to control four sides of a junction road are simulated over wooden plank. The signal post consists of 16 indicators of which 8 indicators (4 red and 4 green indicators) are for normal signaling. With these 8 indicators normal function of traffic signaling system is performed based on timings data programmed on the microcontroller. The other 8 signals are used for ambulance which catches the emergency signal in traffic. Depending up on the data transmitted from the ambulance, all three sides' traffic will be held up except the way from where the ambulance is approaching.

## REFERENCES

- [1]. A. S. Titarmare and M. M. Khanapurkar, "Accident Detection & Rescue Information System for vehicles," 2019 9th International Conference on Emerging Trends in Engineering and Technology - Signal and Information Processing (ICETET-SIP-19), 2019, pp. 1-4.
- [2]. T. P. Chikaka and O. M. Longe, "An Automatic Vehicle Accident Detection and Rescue System," 2021 IEEE 6th International Forum on Research and Technology for Society and Industry (RTSI), 2021, pp. 418-423, doi: 10.1109/RTSI50628.2021.9597212.
- [3]. Kishwer Abdul Khaliq, Syed Muddasar Raza, Omer Chughtai, Amir Qayyum, Jürgen Pannek, Experimental validation of an accident detection and management application in vehicular environment, Computers & Electrical Engineering, Volume 71, 2018, Pages 137-150, ISSN 0045-7906.
- [4]. Gowtham, P., Arunachalam, V.P., Vijayakumar, V.A. et al. An Efficient Monitoring of Real Time Traffic Clearance for an Emergency Service Vehicle Using IOT. Int J Parallel Prog 48, 786–812 (2020).