Automatic Accident Detection, Ambulance Rescue And Traffic Signal Controller

Vignesh.M
Assistant Professor
Department of Electronics & Communication Engineering
Pollachi Institute of Engineering & Technology, Coimbatore

M.Ishwarya Niranjana
Assistant Professor
Department of Electronics & Communication Engineering
Pollachi Institute of Engineering & Technology, Coimbatore

Manikandan.R
UG Student
Department of Electronics & Communication Engineering
Pollachi Institute of Engineering & Technology, Coimbatore

Suganthan.S
UG Student
Department of Electronics & Communication Engineering
Pollachi Institute of Engineering & Technology, Coimbatore

Malayandisamy.P
UG Student
Department of Electronics & Communication Engineering
Pollachi Institute of Engineering & Technology, Coimbatore

Abstract

Traffic accidents are one of the leading causes of fatalities in all places. An important indicator of survival rates after an accident is the time between the accident and when emergency medical personnel are dispatched to the scene. One approach to eliminating the delay between accident occurrence and first responder dispatch is to use in-vehicle automatic accident detection and notification systems, which sense when traffic accidents occur and immediately notify emergency personnel. This project aims at finding the occurrence of any accident and reporting the location of accident to the nearest ambulance, so that immediate help can be provided by ambulance. And the ambulance reach the traffic signal the ambulance driver controls the signal. Intimating the traffic control section regarding the direction of ambulance GSM technology is used to intimate the vehicle position in the form of latitude and longitude coordinates through internet. The location spot is retrieved using Global Positioning System which is a navigational system using a network of satellites orbiting the earth. Sensors such as vibration and airbag detect signal in case of an accident occurrence and send a signal to the connected microcontroller. This paper describes the accident detection and intimating the incident to ambulance services spontaneously and these in vehicle systems, however, are not available in all cars and are expensive to retrofit for older vehicles. This project provides the result by Smartphone accident detection system to prevent false positives.

Keywords: Ambulance, GPS, GSM, Microcontroller, Traffic control, Vibration Sensor

I. INTRODUCTION

In our daily life we are facing a lot of problems; main thing is traffic congestion which becomes more serious day after day. It is said that high tome of vehicles, the scanty infrastructure and the irrational distribution of the development are the main reasons for augmented traffic jam. The major cause leading to traffic jam is the large number of vehicles which is caused by the most population and the development of economy. India is the second most populous country in the world and is a fast growing economy. It is seeing terrible road congestion problems in its cities. Infrastructure growth is slow as compared to the growth in number of vehicles, due to space and cost constraints. Also, Indian traffic is non-lane based and Chaotic. It needs a traffic control solutions, which are different from the developed Countries. To unravel this problem, government should encourage people to use public transport or make use of vehicles with small size as bicycles or make tax on personal vehicles. Particularly in some Asian countries like Vietnam, the local authorities passed a law limiting the number of vehicles for each family. The methods mentioned above is really efficient in the fact that inadequate infrastructure cannot handle the issue of traffic congestion. The public conveyance is available and its quality is very bad, mostly in the establishing countries. Besides, the highway and roads are incapable of meeting the requirement of increasing number of vehicles. Instead of working on the roads to accommodate for the growing traffic various techniques have been devised to control the traffic on roads like embedded controllers that are installed at the junction.
II. EXISTING SYSTEM

A. Manual Controlling

Manual controlling the name instance it require man power to control the traffic. Depending on the countries and states the traffic polices are allotted for a required area or city to control traffic. The traffic polices will carry sign board, sign light and whistle to control the traffic. They will be instructed to wear specific uniforms in order to control the traffic.

B. Automatic Controlling

Automatic traffic light is controlled by timers and electrical sensors. In traffic light each phase a constant numerical value loaded in the timer. The lights are automatically getting ON and OFF depending on the timer value changes. While using electrical sensors it will capture the availability of the vehicle and signals on each phase, depending on the signal the lights automatically switch ON and OFF.

III. PROPOSED SYSTEM

In proposed system if a vehicle has met accidents, immediately an alert message with the location coordinates is sent to the Control center. From the control center, a message is sent to the nearby ambulance. Also signal is transmitted to all the signals in between ambulance and vehicle location to provide RF communication between ambulance and traffic section. The vehicle accident observed using vibration sensor and in the control section it is received by the microcontroller and then the nearby ambulance is received from the PC and controller sends the message to the ambulance. The signal to Traffic signal section is transmitted through RF communication. Also if any fire occurs, it is detected using fire sensor and an alarm message is directly sent to the fire station.

IV. BLOCK DIAGRAMS

A. Block Diagram of Vehicle Unit

If a vehicle has met accident, vibration sensor or fire sensor gives the electric signal to microcontroller through Signal conditioner. Then GPS provides latitude and longitude information about vehicle location to control section through GSM.

![Block diagram of vehicle unit](image)

**Fig. 1:** Block diagram of vehicle unit

B. Vibration sensor

According to our system, every vehicle should have a vehicle unit. The vehicle unit consists of a vibration sensor, Microcontroller, a user interface, GPS system and a GSM module. There is need to process the low level voltage signal properly given by vibration sensor. We can use multiple sensors for detection of accident to avoid any error in detection. These sensors can be installed in vehicle body at most vibration sensitive locations. A central system can be implemented inside vehicle to process the signal coming from sensors and to detect the accident from the signals coming from multiple sensors.
The predefined data i.e. Peak voltage level or crash waveform data are used to decide whether an accident is occurred or not. The vibration sensor used in the vehicle will continuously sense for any large scale vibration in the vehicle. The sensed data is given to the controller GPS SYSTEM inside the vehicle. The GPS SYSTEM finds out the current position of the vehicle (latitude and the longitude) which is the location of the accident spot and gives that data to the GSM MODULE. The GSM MODULE sends this data to the control unit whose GSM number is already there in the module as an emergency number. We can also use this vehicle unit for health monitoring of the patient using different sensors.

**GPS (Global Positioning System)**

It stands for “Global positioning system”. It is having 24 satellites it will transmit the coded information. These 24 satellites will rotate one time over the earth in every 12 hours. In order to provide the information about velocity, time etc… GPS will help us identify the distance between the two different places on the earth and it will show the route to reach the required destination. Figure 2 shows the GPS module. There are three different segments in GPS they are:

1) Space segment
2) Control segment
3) User segment

When satellites transmit information and each satellite will have a different code and it also transmit information at different frequencies so that the GPS can discriminate with the different signal received by the different satellites. This condition will help to calculate the time taken to travel the distance between the satellite and the GPS receivers and then the travel time is multiplied by the light speed gives the distance between the satellite and the GPS receiver. The control segment will identify the satellite and it will guide with the proper orbit and proper time taken by the satellite to reach the GPS.
It is having four unmanned station with single master control station. These unmanned stations will receive the information from different satellites and this information is send to the master station and this is send to the GPS satellite. The user segments consist of users and the GPS receivers. Working of GPS: When a GPS receiver is started to work, firstly it will start to download the orbit information about each and every satellite to download this information it will take around 12.5 min once this information is completely downloaded it will be stored in the receivers in order to use further. The GPS knows the exact location of the satellite but still it needs to know the exact distance between the satellite and the receiver. This distance can be calculated by the receiver, by multiplying the time taken by the signal to reach the receiver and the velocity of the transmitted signal. But the receiver already knows the velocity which is 18600 miles/sec.

**D. Block Diagram of Ambulance/Control Unit**

![Block Diagram of Ambulance/Control Unit](image)

In control section GSM modem receives message about accident and send it to PC. PC identifies the nearest ambulance and ambulance is instructed to pick up the patient. Control section transmits the control signal to all the signals in between ambulance and vehicle by RF transmission.

**E. Block Diagram of Traffic Unit**

![Block Diagram of Traffic Unit](image)

Whenever the ambulance reaches near to the traffic signal(approximately 100m), the traffic signal will be made to green through RF communication. Thereby the ambulance is recommended to reach the hospital in time.

**V. System Implementation**

Our system consists of three main units, which coordinates with each other and makes sure that ambulance reaches the hospital without any time lag. Thus our system is divided into following three units,

1) The Vehicle Unit
2) The Ambulance/control Unit
3) Traffic unit

**A. Vehicle Unit**

The vehicle unit installed in the vehicle senses the accident and sends the location of the accident to the Controller. According to our system; every vehicle should have a vehicle unit. The vehicle unit consists of a vibration sensor, controller, siren, a user interface, GPS system and a GSM module. The vibration sensor used in the vehicle will continuously sense for any large scale vibration in the vehicle. The sensed data is given to the controller GPS SYSTEM inside the vehicle. The GPS SYSTEM finds out the current position of the vehicle (latitude and the longitude) which is the location of the accident spot and gives that data to the
GSM MODULE. The GSM MODULE sends this data to the control unit whose GSM number is already there in the module as an emergency number.

B. Ambulance unit

The controller finds the nearest ambulance to the accident spot and also the shortest path between the ambulance, accident spot and the nearest hospital. The controller then sends this path to the ambulance. Also using this information the controller controls all the traffic signals in the path of ambulance and makes it ready to provide free path to ambulance, which ensures that the ambulance reaches the hospital without delay. At the same time, the ambulance unit turns ON the RF transmitter. This will lead to communicate with the traffic section.

C. Traffic unit

Whenever traffic signal section receives the information about accident, the RF receiver in this section is turned ON to search for ambulance nearing the traffic signal. Whenever the ambulance reaches near to the traffic signal(approximately 100m), the traffic signal will be made to green through RF communication. Thereby the ambulance is recommended to reach the hospital in time.

D. RF Transmitter and Receiver

In generally, the wireless systems designer has two overriding constraints: it must operate over a certain distance and transfer a certain amount of information within a data rate. The RF modules are very small in dimension and have a wide operating voltage range i.e. 3V to 12V.

![RF Transmitter and Receiver Pin Diagram](image)

Fig. 6: Pin Diagram of RF Transmitter and Receiver

Basically the RF modules are 433 MHz RF transmitter and receiver modules. The transmitter draws no power when transmitting logic zero while fully suppressing the carrier frequency thus consume significantly low power in battery operation. When logic one is sent carrier is fully on to about 4.5mA with a 3volts power supply. The data is sent serially from the transmitter which is received by the tuned receiver. Transmitter and the receiver are duly interfaced to two microcontrollers for data transfer. Figure 3 shows the Pin Diagram of RF Transmitter and Receiver.

VI. METHODOLOGY (FLOWCHART)

![Methodology Flowchart](image)

Fig. 7: Methodology (Flowchart)
Automatic accident detection using sensors, location tracking using GPS, sending location coordinates to ambulance, finding exact spot of accident using GPS viewer application, starting of rescue operation and traffic signal monitoring using RF transmitter and receiver all these steps are executed according to response of the circuit.

VII. Simulation results

Automatic Accident Detection and Ambulance Rescue with Intelligent Traffic Light System are simulated using PROTEUS SOFTWARE and their results are presented here. The circuit model of the above system is shown and sensors are connected to measure output result in normal condition the vibration sensor will be less than the present value. If a vehicle has met accident, vibration sensor gives the electric signal to microcontroller through signal conditioner. Then GPS provides latitude and longitude information about vehicle location to control section through GSM. If a vehicle has met accident, fire sensor gives the electric signal to microcontroller through signal conditioner. Then GPS provides latitude and longitude information about vehicle location to control section through GSM. Before ambulance reaching the traffic signal junction, the signal will be red. Control section transmits the control signal to all the signals in between ambulance and vehicle by RF transmission. After ambulance reaching the traffic signal junction the signal will turn into green with the help of the RF signal.

![Simulation output](image)

Fig. 8: simulation output

VIII. Conclusion

In this paper, a novel idea is proposed for controlling the traffic signals in favor of ambulances during the accidents. With this system the ambulance can be maneuvered from the ITLS can be proved to be effectual to control not only ambulance but also authoritative vehicles. Thus ITLS if implemented in countries with large population like INDIA can produce better results. The ITLS is more accurate with no loss of time. But there may be a delay caused because of GSM messages since it is a queue based technique, which can be reduced by giving more priority to the messages communicated through the controller. INDIA can produce better results. The ITLS is more accurate with no loss of time. But there may be a delay caused because of GSM messages since it is a queue based technique, which can be reduced by giving more priority to the messages communicated through the controller.

REFERENCES

[3] Mr. Sahl Gadroo Mr. Pinkesh Jodhwani Mr. Gunveer Singh Mr. A. D. Londhe “Automatic accident detection and ambulance rescue system” International journal of scientific &engineering research-2015


