International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 08 | Aug 2020 www.irjet.net p-ISSN: 2395-0072

Automatic Accident Detection and Rescue System Using GPS Point Location

Ramanna Havinal[1], Sanjay K K [2], Sadhana B J[3], Shashank B M[4], Pavan B[5]

[1]Professor Electronics and communication Engineering Dept, Maharaja Institute of Technology Musore , India
[2,3,4,5]Student, Electronics and communication Engineering Dept Maharaja Institute of Technology Musore, India

---

Abstract: *The advent of technology has increased the traffic hazards. Road accidents are increasing due to various factors. The death rates are also increasing because of delay in medical help, lack of ambulance services and negligence. An automated system is required to resolve the issue. The proposed study developed a system to detect vehicle accident and send the accident location information to the nearest hospital or to the ambulance or rescue team through message service. The message contains information about the longitude and latitude value of accident location. This helps the rescue team to trace the location of the vehicle where accident has occurred to help injured victim. Most of earlier developed systems are costlier, because of multiple sensors are incorporated to detect the accident. The proposed model is incorporated with only one crash sensor which minimized the cost and interfacing complexity*

Key Words: accident; detection system; human rescue*; GPS; GSM*.

1. INTRODUCTION

Accident detection systems can be used to reduce fatalities due to accidents by minimizing response time of emergency service. Accident detection and alert system are extensively studied over the past several years. Automobile production rates and number of vehicles movement are increasing rapidly, leading to injuries and many traffic hazards. People's lives are at high risk. According to the World Health Organization (WHO), more than one million road accident death occurs globally and about fifty to sixty million are injured every year, this condition prevails only because there is a shortage of emergency facilities and poor contact to the emergency team[1].

Most of the accident deaths are due to non availability of medical assistance We need a system to provide medical assistance to the accident area to reduce the fatality. Therefore we need an alert system to sense the accident location and automatically send an information to the concerned for medical aid to the accident area. Most of the accidents result in deaths as ambulance is not called immediately and people do not inform the ambulance to avoid police interrogation. The accident might occur at an isolated location where people are not present to report the accident. Recent technologies in vehicles have inbuilt hardware modules to spot and report accidents. Such systems are expensive and non-portable. Not all vehicles have such systems, only luxury cars have such facility.

In the course of addressing this problem, the proposed study seeks to provide an effective solution and reduce as much as possible the loss of lives. The proposed study identify traffic incidents in a relatively reduced amount of time and pass the basic information quickly to the emergency team covering the geographical coordinates where the vehicle has experienced an accident. The emergency team (ambulance) and the registered telephone number will receive a warning message within a short time span. The reset button will be provided to the user in the system to avoid sending false messages in case of minor impact; to the rescue team. If the victim hits the reset button so the rescue team does not receive the emergency aid call. If the victim does not turn the reset button off within 15 to 20 seconds, then message will be sent to the emergency team. This technology in real time saves a great many precious lives. The message would be sent via the GSM module where the incident has occurred[2][3]. The basic concept is to locate the vehicle location by receiving the vehicle's real-time location via GPS and sending the information through SMS. The primary goal of the study is to develop automated accident detection and rescue mechanism for human beings. In fact, the cost of implementing this device in the vehicles is very less and the device will be useful and affordable

The paper is organized as follows. Section II explains the related work. Section III describes proposed methodology Part IV illustrates the result and discussion finally, section V contains conclusion

2. LITERATURE SURVEY

S.Sonika, et.al[1] proposed a model for smart accident detection program. It uses traffic signal control to find the shortest path. This study would reduce the time gap between the location of an accident and information to the hospital.

Namrata H[2]. Sane, et.al developed a model for the detection and tracking of accidents in real-time, using GSM and GPS. It senses by push on switches. The GPS provides the details; the location of the vehicle that met an accident. The message will indicate longitude values and latitude values.

Arsalan khan et.al [3] built a model for Accident Detection and Smart Rescue Device with Real-Time Location Monitoring using Android smartphones.. The model detects accidents and generates emergency alerts by using an accelerometer sensor on board.

Frahim Wadud Taj et.al[4] developed a system to detect the accident which used vibration sensor adopted the GPS and GSM technology. Krishna Chaitanya Varma et.al [8] proposed a method to detect accident location and send the message automatically to the emergency team. It reduced the time required to send the information to the rescue team

R.Monisha et.al [9] is designed an accident intimation system using GPS and GSM. It sends vehicle's number along with GPS co-ordinates of the location to the emergency contacts.. S.Sonika et.al proposed [10] a model to minimize the time gap to send information to the concerned. It used RF technologies. Nitin Thakre et.al [11] developed a model which provide longitude and latitude information which can be used to find the location .B.Sulochana et.al [12] developed system to automatically send the message to the resue team along with the accident location.

Literature study shows various types of accidents scenarios such as Rear-end collisions, Side-impact, Sideswipe collisions, Vehicle rollover, Head-on collisions, Single-Vehicle collision, Multivehicle collision, Hit-and-run. A key challenge [7] to design a model to detect collisions is the lack of integration between the hardware/software and the vehicle.

Accident Detection Methods

The work carried out by the researchers have proposed various methods [5][6] for automatic detection of accidents. Some of the technique are accident detection using advanced mobiles, GSM and GPS technologies, VANET

A. Using Smart phones

Automatic detection of accidents is incorporated in costly vehicles. Figure1 illustrates automatic accident information system having built in technology.

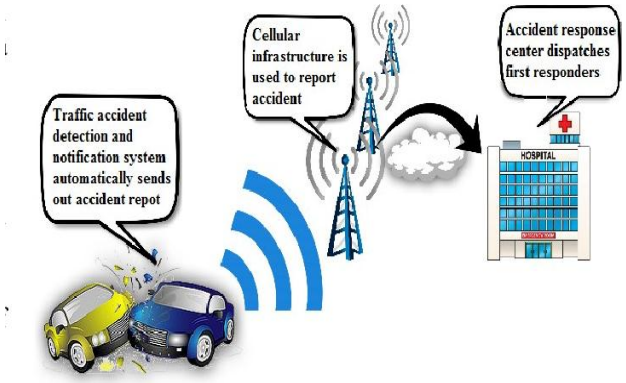

Figure 1 Traditional accident detection system

Built-in automatic accident detection and notification system are adopted in costly vehicles.The technology adopted in such vehicles use accelerometer sensors and airbag deployment. These devices are used to monitor and find accident and sends information to rescue services using built in radios. But most vehicles do not have automatic collision notification system.

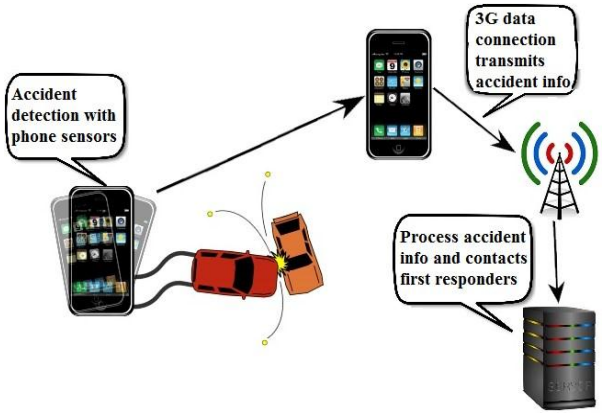

Figure 2 Smart phone based accident detection system

Now in place of this system, smart phone is used to detects the accidents and send messages to the concerned.

B. Using GSM and GPS

..

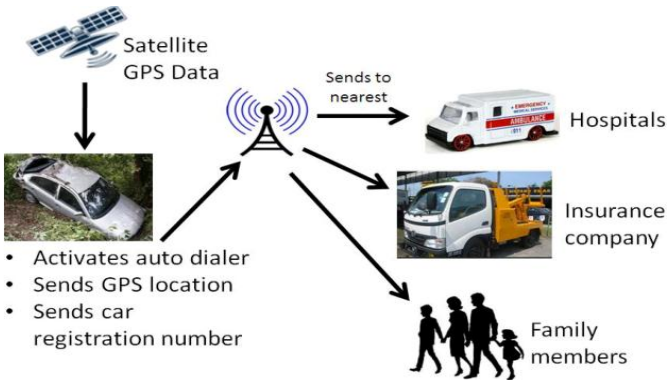

Figure 3 GPS based accident detection system

GSM and GPS technologies are being used for automatic accident detection and messaging system. GPS satellites are used to determine the accident location, vehicle speed time and direction.

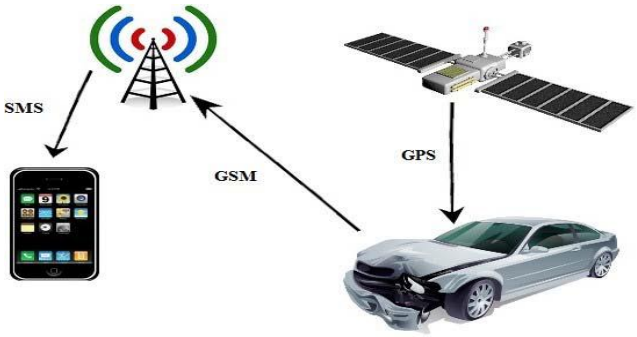

Figure 4 GSM and GPS based accident detection system

GSM and GPS technology based accident detection system is shown in figure 4.It determines longitude and latitude of a position of accident location and the sends a message to the emergency service..

C. Using Vehicular Ad-hoc Network (VANET)

Accident detection can also be done through VANET. It contains two sensors, a crash sensor and an airbag system.

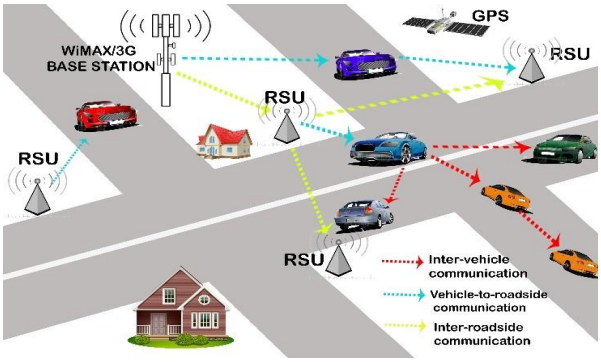

Figure 5 Architecture of VANET

Accident location is sensed by the sensors and GPS and GPS are used to find the location. Then it will sends information to concerned using GSM. The VANET architecture is shown in figure 5

3. PROPOSED WORK

The block schematic of the proposed study to automatically detect the accident using GPS point location is shown in figure 6 .The proposed study aims to detect the accident location. In this system we use Arduino UNO open source micro controller board based.

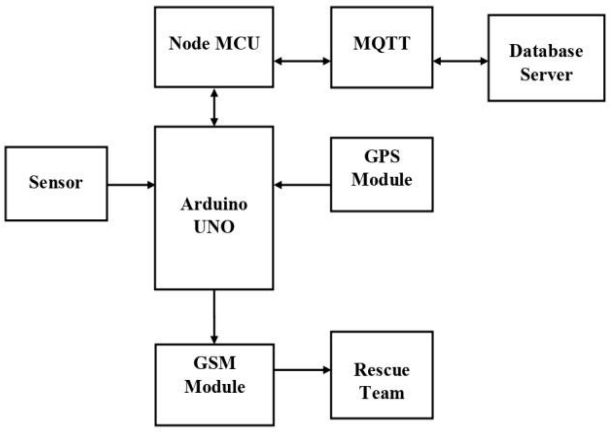

Fig 6 Proposed system block diagram

The board consists of sets of digital and analog input/output(I/O) pins which can be interfaced to the various expansion boards and other circuits. The Arduino GSM shield allows an Arduino board to connect to the internet, to send and receive SMS using GSM Library.GPS is used to detect the Latitude and Longitude of any location with exact UTC time (Universal Time Coordinated). Whenever there is an occurrence of an accident, GPS Receiver used for detecting coordinates of the vehicle, and GSM module is used to send the coordinates to rider's emergency service stations by SMS

Arduino kit is also interconnected with a switch. It plays major role in determining whether accident is major or minor. It operates when accident is occurred, if accident is major then accident victims will be unable to touch. Then within few seconds the major accident message will be sent to emergency service else if switch is pressed within a prescribed time then no message is sent to the emergency service.

Proposed model use an accident detection unit consists of crash sensor which will be fitted inside the bonnet of vehicle. In case of accident, crash sensor senses obstacles and send signal to interrupt pins of aurdino. Once aurdino gets signal from crash sensor, it will get the coordinates from the GPS modem then it will send this information to the NODEMCU, after NODEMCU gets the latitude and longitude value it will send that values to the MQTT server. The database server will fetch the data from the MQTT server, here the nearest rescue team location is calculated by using shortest distance algorithm. The phone numbe of the nearest rescue team is uploaded back to MQTT server. NODEMCU will fetch the number from MQTT server and it will send to the aurdino. GSM Technology is used to send this information to the nearest rescue system which includes the location of the accident spot which help the rescue team to provide medical treatment to the victim.

4. HARDWARE IMPLEMENTATIONS

The interfacing of hardware components is done by connecting its following pins as mentioned below.

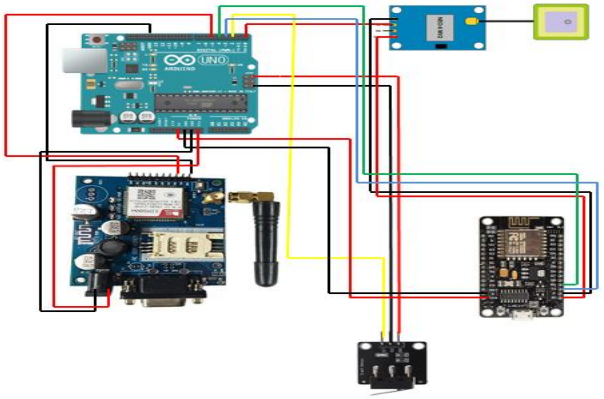

Figure 7 Circuit diagram of automatic accident detection

Connections of other hardware components with Arduino are as follows:

Crash Sensor: This device indicates weather a physical impact has occurred. These sensors usually have a binary output

a. *Interfacing of crash sensor with Arduino:*

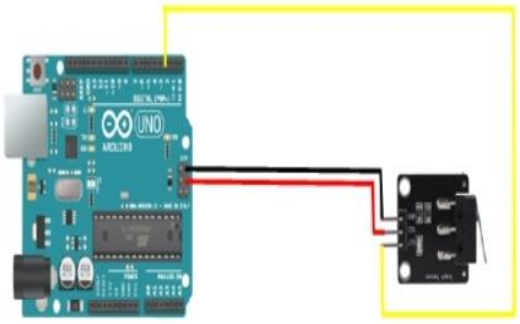

Figure 8 Crash sensor interfacing

b. Interfacing of GSM Module with Arduino:

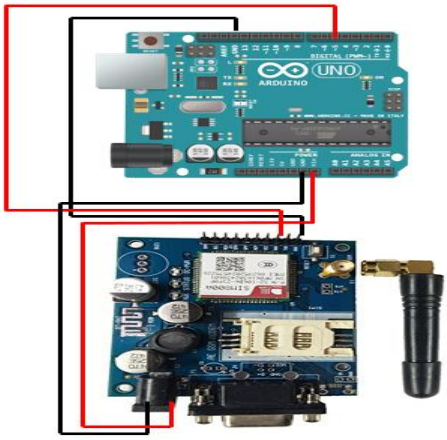

Figure 9: GSM Interfacing.

GPS Module. The NEO-6MV2 is a GPS module, used for navigation purposes. The module inspects its location on Earth and provides output data which is its position's longitude and latitude. When the accident is identified, the latitude and longitude values of that location are given.

c. *Interfacing of RTC Module With Arduino:*

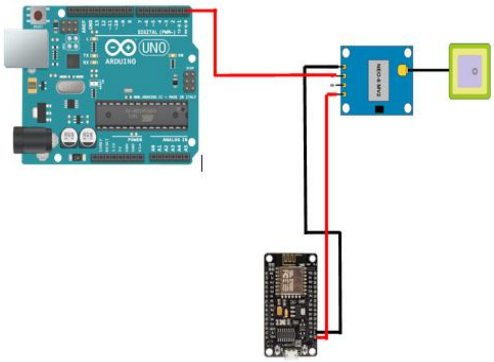

Figure 10 GPS interfacing

NODE MCU: It is an open source IoT platform.it initially included firmware running on Espress if Systems' ESP8266 Wi-Fi SoC, and ESP-12 module based hardware**.**

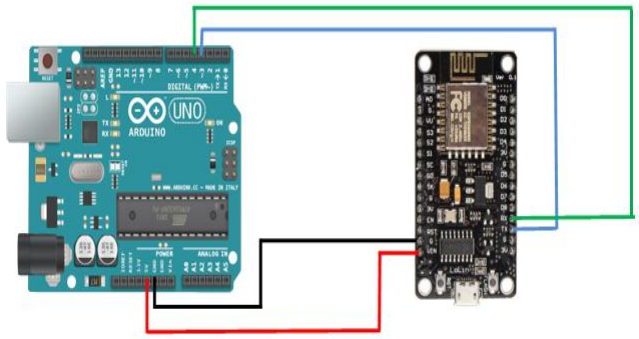

Figure 11: NODE MCU interfacing

5. SOFTWARE IMPLEMENTATION

An Integrated Development Environment (IDE) is a software framework that provides the software development programmers with wide-ranging conveniences.

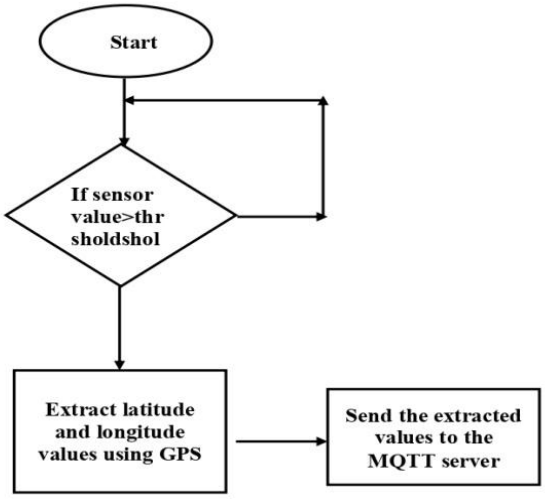

Figure 12 Flow diagram

An IDE typically consists of an editor for source code; install software for automation and a debugger. Most modern IDEs have smart code filling out.The project's software specifications allow uses of version Arduino IDE 1.8.2. Arduino is an open resource, computer hardware and software business project, and user group that designs and produces microcontroller kits for the creation of digital devices and interactive objects capable of sensing and controlling objects in the physical world. Products of the project are distributed as open-source hardware and software, licensed under the GNU Lesser General Public License (LGPL) or GNU General Public License (GPL), which enables any person to produce Arduino boards and assign software

A. Accident Detection System

Flow diagram shown in figure 12 describes how the system is implemented in the proposed work

a. Crash sensor, GPS and NODEMCU are been initialized
b. When the threshold value of the sensor exceeds by any physical impact.
c. The GPS module will provide the location of the accident.
d. After getting the latitude and longitude value the NODEMCU will send that values to the MQTT server.

B. Searching for the nearest hospital:

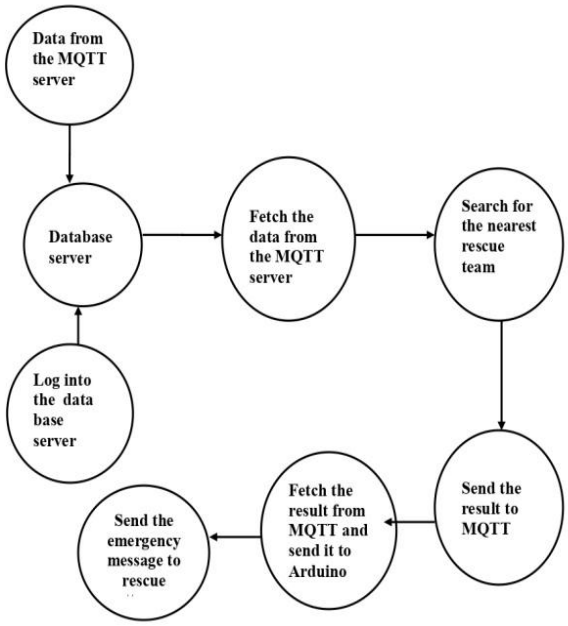

Figure 13 Sending message to rescue system

a. The password will be predefined in the programming.
b. When the user wants to access the database server, user should enter the password. then the user can add or remove the data stored in the data base.
c. The server will fetch the data from the MQTT server and will calculate the nearest rescue team.
d. After finding the nearest rescue team the server will send the location to the MQTT server.
e. From the MQTT server the NODEMCU will fetch the result and it will send to the aurdino.
f. From the GSM that is connected to the aurdino, will send the emergency message which includes the location of the accident.

C. Sequence Diagram

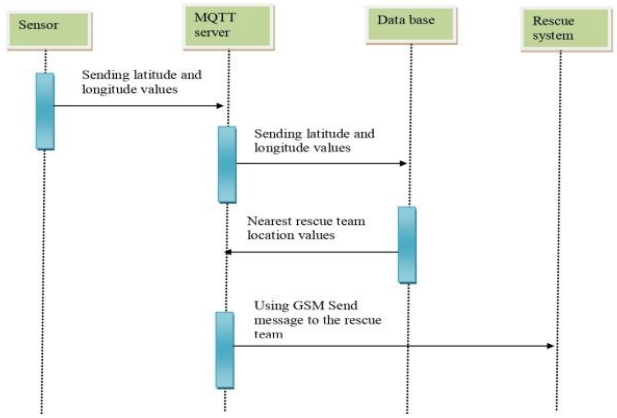

Figure 14 sequence diagram

The sequence diagram is used to display the interactions that occur between objects in the sequential order of those interactions

Figure 15 briefs the Administration Section function of the proposed model

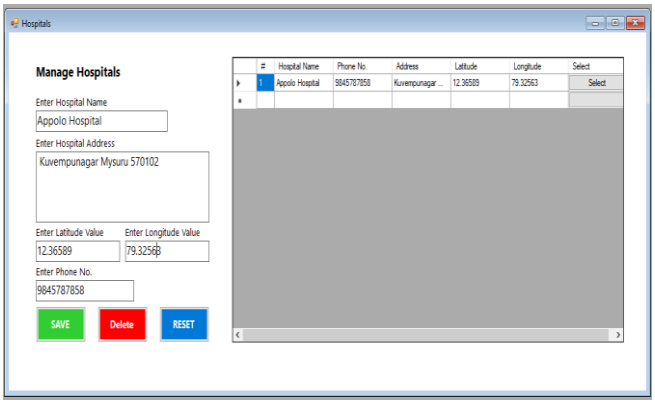

Figure 15 Administration Section
Figure 16 shows the message received by the rescue team

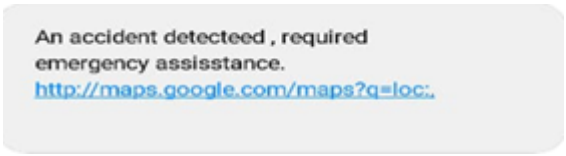

Figure 16 Message received by the rescue team

When any changes are to be made the admin must access the registry using a login process that requires username and password, enabling the current lists to either remove or add a new list of police stations and hospitals. It also consists of two choices where Start Service begins the entire process and Stop Service finishes the entire process.

6. RESULT

The primary sensor used in the accident monitoring unit is the crash sensor. It detects the collision and, within milliseconds, transforms it into functional signals. Two repositories have been developed where the information is stored in the Database system and the MQTT system helps to collect the incident location information. Using nodeMCU the MQTT server gathers the accident location information and stores it in queue form. It then posts the data to the other site and subscribes to the database server.

7. CONCLUSION

This proposed model provides timely information to emergency services team about the accident location Accident location can be identified automatically and accurately, thereby avoiding the waste of time in the search for the accident site. The system determines the exact latitude and longitude of theaccident spot and sends the information to the nearest hospital or police stations and to the concerned. This proposed model contains only one crash sensor so it eliminates the expense of multiple sensors and the interfacing difficulty. The crash sensor must turn on when the accident happens. However, the challenge is to find accident location with the appropriate technology which needs extensive research efforts.

Future Scope:

We can add some modules to let the device know about the traffic information as well and then determine which node would take less time to reach from the spot of the accident. This system should be interfaced with the car airbag system, so that incidents can be quickly detected

REFERENCES

[1] S. Sonika, Dr.k.sathiyasekar,s.jaishree, “Intelligent accident identification system using GPS, GSM modem,”International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 2, February 2014

[2] Namrata H. Sane, Damini S. Patil, Snehal D. Thakare, Aditi V. Rokade, “ Real Time Vehicle Accident Detection and Tracking Using GPS and GSM”International Journal on Recent and Innovation Trends in Computing and Communication, Volume: 4 Issue: 4 April 2016

[3] Arsalan Khan, Farzana Bibi, Muhammad Dilshad, Salman Ahmed, Zia Ullah ,Haider Ali, “ Accident Detection and Smart Rescue System using Android Smartphone with Real-Time Location Tracking” International Journal of Advanced Computer Science and Applications, Vol. 9, No. 6, 2018

[4] Frahim Wadud Taj, “Automatic Accident Detection and Human Rescue System” Innovations in Science, Engineering and Technology (ICISET) 27-28 October 2018,

[5] Usman Khalil,Tariq Javid, AdnanNasir Conference Paper "Automatic road accident detection techniques: A brief survey·" DOI: 10.1109/ISWSN.2017.8250025 Nov 2017

[6] Automatic accident location detection system (AALDS 4th World Congress on Information and Communication Technologies (WICT 2014)

[7] Chris Thompson, Jules White, Brian Dougherty, Adam Albright, and Douglas C. Schmidt Vanderbilt " Using Smartphones to Detect Car Accidents and Provide Situational Awareness to Emergency Responders" University, Nashville, TN USA

[8] Sri Krishna Chaitanya Varma, Poornesh, Tarun Varma, Harsha, "Automatic Vehicle Accident Detection And Messaging System Using GPS and GSM Modems". International Journal of Scientific & Engineering Research, Volume 4, Issue 8, August-2013.

[9] R.Monisha, Jessen Joseph Leo, B.T.Tharani Sri Sakthi, "Car Authentication and Accident Intimation System Using GPS and GSM". International Journal of Innovative Research in Computer and Communication Engineering Vol.2, Special Issue 1, March 2014.

[10] S.Sonika, Dr.K.Sathiyasekar, S.Jaishree, "Intelligent accident identification system using GPS, GSM modem"International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 2, February 2014

[11] Nitin Thakre, Prof. Nitin Raut, Prof. Abdulla Shaik, Design and Development of Automatic Vehicle Accident detection & Localization of Automobile Using Bluetooth Technology". International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 3, March 2014.

[12] B.Sulochana1, B.A.Sarath Manohar Babu, "Monitoring and detecting vehicle based on accelerometer and MEMS using GSM and GPS techniques" International Journal of Computer Science Trends and Technology (IJCST) – Volume 2 Issue 4, July-Aug 2014.

Authors Profile

Ramanna Havinal pursued his Bachelor of Engineering and Master of Engineering degree from Karnataka University, Dharwad, India in 1991, 2000 respectively. He obtained his Ph.D from Jawaharalal Nehru Technological University Anantapur, India in 2017. Presently he is working as Professor in Department of Electronics and Communication Eng of Maharaja Institute of Technology Mysore, India. He is having more than 28 years of teaching experience and 10 years of research experience .His main research work focuses on Wireless Communications and Wireless Networks, Digital Signal and Image Processing. He has presented/published more than 20 papers in national, international conferences and Journals.