Review on Advanced Vehicle Security System with Theft Control and Accident Notification

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ABSTRACT

With the development of Science and Technology, the number of motor vehicles has increased to a large extent. But now a days the road accidents have increased to uncertain level. So, it is therefore necessary that we adopt some measures to minimize these road accidents. This system is composed of a GPS receiver, Microcontroller and a GSM Modem. This system contains single-board embedded system that is equipped with GPS and GSM modems along with Microcontroller that is installed in the vehicle. During vehicle motion, its location can be reported by SMS message. The use of GSM and GPS technologies allows the system to track vehicle and provides the most up-to-date information about the vehicle.

Keywords — AVR Microcontroller (ATMEGA32), GSM MODULE (SIM300), GPS MODULE and VIBRATION SENSOR.

1. OBJECTIVE

To minimize the risk involved in vehicle stealing and providing accident notification to reduce the loss of lives.

2. INTRODUCTION

We have gone through many research papers regarding this topic of Advanced Vehicle Security System with Theft Control and Accident Notification. In all these research papers the authors have clearly described about the working of the particular work together with its advantages and disadvantages. So in this review paper of ours we are putting a brief overview of the same works that are implemented by various authors in different ways.

We are focusing this review paper for people who are involved in the technical background. For instance, if the reader wants to know as to how the security system works in this project, he should have sufficient knowledge about microcontrollers, sensors, GSM modules and so on. Fig-1 shows the block diagram of advanced vehicle security system.
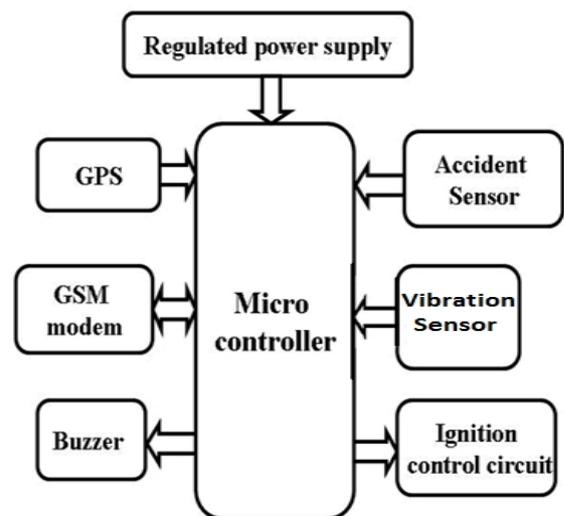

Fig-1: Block diagram of Advanced Vehicle Security System

For preparing this review paper, we have gone through various research papers and the reason why we studied those papers are ; Firstly, as we know, nowadays the road accidents in modern urban areas are increased to uncertain level. The loss of human life due to accident is to be avoided. Traffic congestion and tidal flow are major facts that cause delay to ambulance. The main theme behind this project is to provide a

smooth flow for the emergency vehicles like ambulance to reach the hospitals in time and thus minimizing the delay caused by traffic congestion [1].

Moreover, though with the increase in science and technology, communication system have improved a lot, but at the same time the number of accidents have also increased to a large extent. So, in these research papers we studied, steps are being taken as to how to minimize the loss of life and property despite poor emergency facilities. The authors have also aimed at giving an overview of implementing safety and security services in vehicular systems of today and future development.

2.1 A Brief Review

In the various Research Papers, we found out that the authors have given a logical view of the circuits used in the various works.

For instance in the research paper the author have used the project in order to locate vehicles and also to stop the vehicle if stolen and this is done with the help of Global Positioning System (GPS) is commonly used as a space-based global navigation satellite system [2]. The location information provided by GPS systems can be visualized using Google Earth.

In some papers related works related to accident notifications, instead of implementing a circuit in the car, the use of traffic signal control are done where the three important parameters: cycle, split and offset are used for the smooth traffic stream . So as a whole in all the research papers, the authors have put a logical way as to how accidents and stealing of cars can be prevented by this type of security system.

Here are a few papers presented regarding their contribution to this project:

1. Vehicle Accident Automatic Detection and Remote Alarm Device by Varsha Goud**,** V.Padmaja.

In this paper, the authors have explained as to how the use of ARM microcontroller, GSM, GPS module, MEMS and vibration sensors has been implemented to realise this project. Message goes to any emergency centre when accident occurs. The message is sent with the help of the GSM module and the co-ordinates of the accident site is given by the GPS module. It is with the help of the vibration and MEMS sensors, that when a particular accident occurs it immediately senses it and sends information to the GPS module [3].

2. Arm 7 Based Theft Controls, Accident Detection & Vehicle Positioning System by M.S. Joshi, Deepali V. Mahajan.

In this paper, the use of ARM 7 microcontroller, GSM and GPS module together with an accelerometer and temperature sensor is done. As referred in the earlier papers, the microcontroller together with the GSM and GPS module is

being used for the same purpose. The additional component that is being added is the accelerometer which basically comprises of the MEMS sensor featuring a low pass filter and is basically used for Shake Detection, Orientation Detection, and Tap Detection. The use of temperature sensor is also being done in order to obtain the vehicle engine temperature which converts the value of temperature into electrical signal.

3. Automatic accident detection and ambulance rescue with intelligent traffic light system, by Mr.S.Iyyappan, Mr.V.Nandagopal.

This project is also similar to the other two works described but the only addition to this project is the Intelligent traffic light system(ITFS) .It is a system which is being introduced in this project that helps in saving of human lives while they are being taken to a hospital and comes across heavy traffic. So this concept of ITFS controls mechanically the traffic lights in the path of ambulance.

2.2 Methods

It is seen that before most of the accidents take place particularly in remote areas and it is impossible to trace the vehicle sometimes. So, if one can locate the accident vehicle, it will be helpful for one to get to the accident site and save the victims.

The authors in their research papers have described various ways by which these problems can overcome. In some works, this system the accident alarm system based on ARM, GPS, GSM and VIBRATION SENSOR. Fig-2 shows the security system block when the accident occurs, vehicles location as well as alarm locations will be transmitted to a particular emergency center. After receiving information about the location, the center will display this information on its map and so the staff of that emergency center that is nearest to the scene of the accident in time will reach the accident site [4].
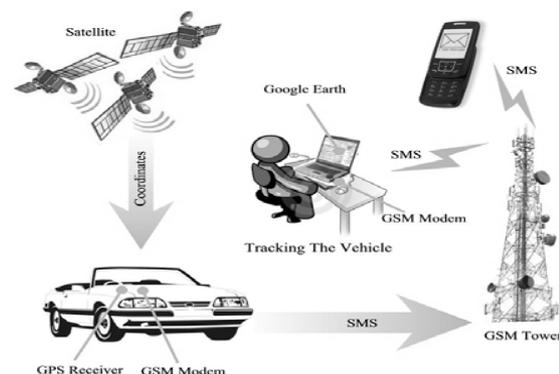

Fig- 2: Security System Block

ARM is the microcontroller which is implemented in the project. Instead of ARM, the other microcontrollers used are PIC microcontrollers etc. In all those works the microcontroller plays the role of the Microcontroller processes the GPS information and transmits it to the user using GSM

modem by SMS when the user asked that from the system by sending SMS contains code. In some works microcontroller also gets the speed of the vehicle and sends it to user/owner as additional feature.

As GSM and GPS are important components of the project, so the authors in their papers have described the functions of these components broadly. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. GSM modem works on AT commands. The AT commands are given to the GSM modem with the help of computer. The GSM module consists of GPS coordinates, vehicle status. The GSM module transfers the information to the microcontroller and analyzes it and sends the information package to another GSM Module at the recipient station.

Vibration sensor or fire sensor gives the electric signal to microcontroller through signal conditioner. Vibration Sensor is used to trigger the effect of various vibration, theft alarm, intelligent car, earthquake alarm, motorcycle alarm, etc.

It has the following features:

- The comparator output, signal clean, good waveform, driving ability is strong, for more than 15 mA.
- The working voltage of 3.3V to 5V.
- It has a fixed bolt hole, convenient installation.
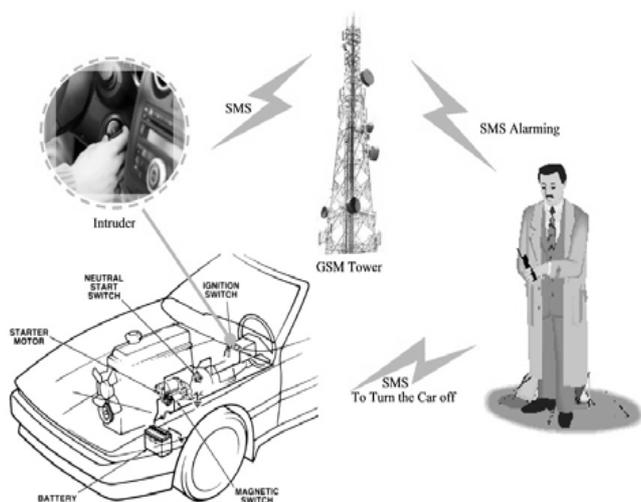- It uses the LM393 wide voltage comparator.

Fig- 3: Remote Access System

Fig-3 describes the remote access system this system helps to locate the accident spot accurately, realizing the automation of accident detection and information transmission. Comparison among the research papers are shown in table -I.

TABLE-I

COMPARISON AMONG VARIOUS RESEARCH PAPER

PAPER NAME	AUTHOR NAME	WORK CONTENT
Automatic accident detection and ambulance rescue with intelligent traffic light system	Mr.S.Iyyappan Mr.V.Nandagopal	In this paper, a scheme called ITLS (Intelligent Traffic Light system) is introduced where an idea is proposed for controlling the traffic signals in favor of ambulances during the accident
Vehicle accident Automatic Detection and Remote Alarm Device	Varsha Goud V.Padmaja	This paper provides the design which has the advantages of low cost, portability, small size and easy expansibility. The platform of the system is ARM along along with MEMS, Vibration sensor, GPS and GSM. This system can overcome the problems of lack of automated system for accident location detection.
Automatic Vehicle Accident Detection System Based on ARM &GPS	NiravThakor TanmayVyas Divyang Shah	This system can shorten the alarm time greatly and locate the accident spot accurately, realizing the automation of accident detection and information transmission. Consequently, it will save the rescuers form wasting their time in search.
Advanced vehicle security system with theft control and accident notification	Divya Jadhav B. Mounika Smitha Panchl S. Sirisha	This system is similar to that of the previous paper where it overcomes the problems of lack of automated system for accident location detection.
Intelligent Anti-Theft and Tracking System for Automobiles	Montaser N. Ramadan Mohammad A.Al-khedher Sharaf A. Al-Kheder	In this paper, a low-cost vehicle tracking and monitoring system is presented. The application included a transmitting module which contains an embedded system to combine.
Arm 7 Based		In the above paper the system is used for theft control as well as accident detection and prevention system. Initially to

Theft Control, Accident Detection &	M.S. Joshi,	on the car owner or driver must enter specific code.
Vehicle Positioning System	Deepali V. Mahajan	If code is correct then message is send to owner for accessing of car. If anybody enter wrong code for three times then a message is send to owner and police station along with coordinates of location about illegal access of car.

3. ANALYSIS OF THE VARIOUS RESEARCH PAPERS

While going through a couple of research papers we have come across various works which have got some disadvantages. Like in one paper, even though a good system is being built regarding the accident notification, but usually the main problem occurs when there is heavy traffic. So in order to eliminate this problem, the same project has been modified with the addition of Intelligent Traffic Light System in one paper which minimizes the risk of delay in taking a victim to the hospital.

Secondly, as the GSM and GPS module both play an important role in tracking and monitoring vehicles, but still it is found that there are some security gaps where these technologies fail to prevent a vehicle from getting stolen and also may not permit users to know the status of their vehicles.

Thirdly, it can also be seen that in some research papers, the whole project is implemented by using a vibration sensor. Though it is a good sensor in sensing the vibrations during accident, but if a MEMS sensor is also incorporated in the system, it will be able to provide the user information's regarding angle of rolls of the car which will finally help the user to have a better knowledge about the status of his/her vehicle.

Lastly, this particular system can also be used for other critical situations like if the victim has a heart attack in which case a particular switch incorporated in the system if pressed will send a message to the emergency centre through the GSM module and will give the location of the vehicle by GPS module. From the whole analysis the flowchart of the system is shown in Fig-4.

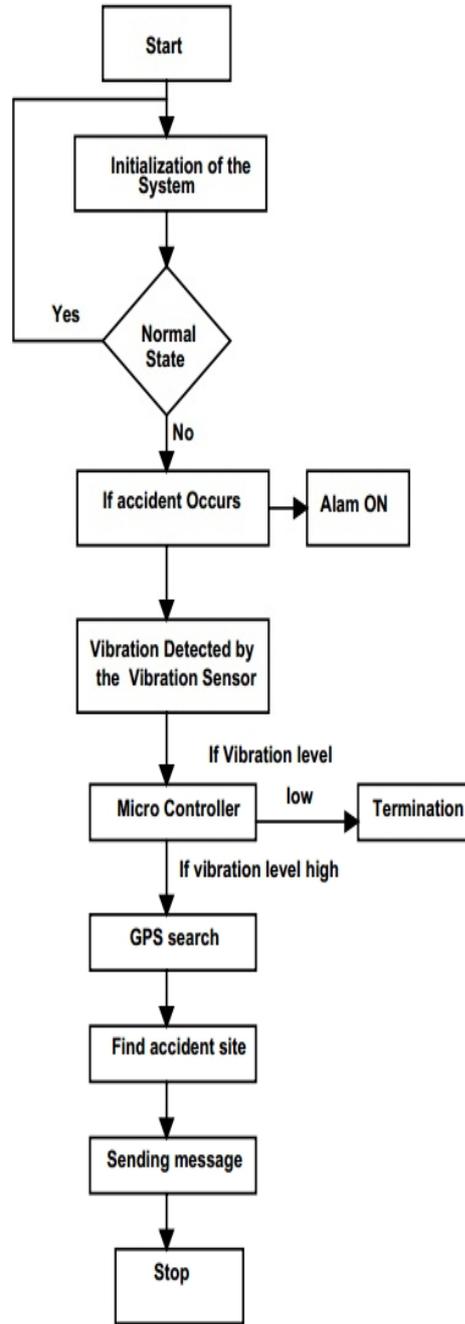**Flow Chart of the Whole System As Represented In Various Research Papers**

Fig- 4: Flow Chart of Vehicle Accident Automatic Detection and Remote Alarm Device

4. RESULTS

We found that in all the works the main aim was to build a system whose cost would be minimum that would be affordable for common man. The efficiency of the system will also play an important part based on the frequency band of the GSM modules, the sensibility of the various sensors used like vibration sensor, MEMS sensor. The more is the efficiency of the system; the better would be the performance of the system.

5. CONCLUSION

By a brief study of all the research paper, we can come to the conclusion that this project is indeed helpful to the common people. Road accidents are common in India as well as in whole over the world. Usually accident occurs in areas which are far away from the emergency centers. So the risk of deaths increases. So with the help of this system/project the risk of deaths can be decreased to a large extent. However as every works have got particular disadvantages, certain defects are also present in these works. So the main aim is to make a project where the rectification of all the errors is to be done.

As for instance, as GSM module is basically based on Queue based technique, so there occurs a particular delay in transfer of message to emergency Centre. So by rectifying this demerit a better and more efficient system can be achieved. Moreover as in all these works mentioned in the research papers, the system is being fit into 4 wheelers only. So if steps are taken that the same system is implemented in 2- wheeled vehicles also, it would much more helpful to the common people. So the main change that can be brought in these projects is by rectifying the errors of these works.

ACKNOWLEDGMENT

REFERENCES

[1]   Mr.S.Iyyappan, Mr.V.Nandagopal, "Automatic Accident Detection and Ambulance Rescue with Intelligent Traffic Light System," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 2, Issue 4, April 2013.

[2]   Montaser N. Ramadan, Mohammad A. Al-Khedher, Senior Member, IACSIT, and Sharaf A. Al-Kheder, "Intelligent Anti-Theft and Tracking System for Automobiles," International Journal of Machine Learning and Computing, Vol. 2, No. 1, February 2012.

[3]   M.S. Joshi, Deepali V. Mahajan, "Arm 7 Based Theft Control, Accident Detection & Vehicle Positioning System," International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-4 Issue-2, July 2014.

[4]   Nirav Thakor, Tanmay Vyas, Divyang Shah, "Automatic Vehicle Accident Detection System Based on ARM &GPS," International Journal for Research in Technological Studies, ISSN: - Applied (Online) Vol-1, Issue - 1, Dec 2013.

[5]   Varsha Goud, V.Padmaja, "Vehicle Accident Automatic Detection and Remote Alarm Device," International Journal of Reconfigurable and Embedded Systems (IJRES). Vol. 1, No. 2, July 2012, pp. 49~54 ISSN: 2089-4864.