



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact Factor: 6.078

(Volume 7, Issue 5 - V7I5-1228)

Available online at: <https://www.ijariit.com>

Intelligent Accident Detection and Alert System

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Abstract: Road accidents rates are very high nowadays due to various factors. Timely medical aid can help in saving the lives. Traffic congestion, lack of an ambulance services, no network connectivity are the major elements which delay the provision of medical help. An automated response system is required to resolve these factors. For building such automated systems Smartphone with their in-built sensors are excellent platforms. In this paper we introduce the ADAS (Advanced driver-assistance systems) which will reduce the time gap and ensure medical assistance immediately. The server and the ADAS software are the two main component of this system. In this ADAS client system the location can be identified with the support of in-built sensors in the Smartphone and it will alert the nearest medical assistance provider, which will enable the team to arrive to the accident site on time. The action time and the death tolls can be decreased with the help of this ADAS system.

Keywords– Accident Detection, Alert System, Smartphone, Medical Assistance, Sensors, Software.

1. INTRODUCTION

In today's modern world, the motor vehicle population is growing at faster rate. So that accident and death rate due to road accident also increases. Most accident death happens due to lack of immediate medical assistance, on the roads like express highways. Most of the accident result in death as ambulance is not called immediately. The accident may occur at an isolated location where people not there to report an accident. Recent technology has inbuilt hardware modules to spot an report accident. This system is very expensive and non-portable. Not all vehicle has such system only expensive vehicle, so we introduces accident detection and alert system. Accident detection and alert system will identify the accidents with the help of sensors in the smart phone. It's possible to detect the accidents using sensors in the smart phone because all smart phone has basic required sensors and good computing power. So, it could be employed to detect accidents. Smart

phones are compared to hardware, smart phones are portable so we could carry it in any vehicle we are travelling in. This system is in expensive and life saving. By using sensors, the accident could be detected and updated easily. It's having more scope for forth coming enhancement. We could use multiply ways of communicating with server. i.e., if the internet connectivity is not available the SMS would be used to converse with the server for help. The main objective of accident detection and alert system is to detect accidents and to reach location on time. The accidents also detected by using ADAS software. The ADAS software will be installed in smart phone and it will used to detecting the accident as well as sending information to the server part. The detection will depend on the in-built sensors like accelerometer sensor, GPS receiver, microphone. This system also used to detect the medical condition of accident victim by checking heart beat to understand seriousness of accident and inform medical AID center.

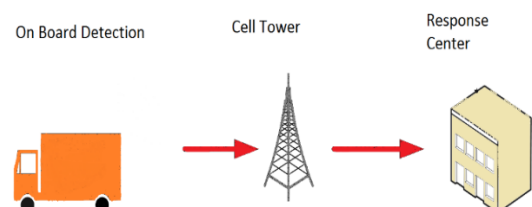


Figure 1: Traditional Accident Detection Systems

2. LITERATURE SURVEY

Previous researches and works of many different authors on automatic accident detection system are discussed in detail below:

- Automatic Accident Detection and Ambulance Rescue along with Intelligent Traffic Light System. It is entirely hardware based system and it also includes the likes of microcontroller, modem, drivers, GPS and so on. It mainly contains three basic units - Vehicle unit, Ambulance control unit, and Traffic unit. The author of this paper has also developed a

hardware system which in case of any accident occurs notifies the ambulance with appropriate data regarding the accident location. And along with that ITLS system will definitely help the ambulance to reach the hospital at as soon as possible by manipulating all the traffic signals. This can be efficiently executed with the help of Smartphone along with their in-built sensor and also with the use of Google maps. Besides that, the GSM modem used in the system forms a new delay while sending messages to the ambulance control unit (since it is a queue-based technique) along with that the maintenance or upgrading process of the ITLS system is quite costly an inexpensive.

- An effective and Efficient Vehicle Accident detection using the Sensor Technology [3]. It has also been suggested that with the support of these sensors like vibration sensor, MEMS (micro electrical mechanical system), GPS and GSM we can also develop an efficient accident detection system. The requirements for successfully implementing this system are the sensors, which can be very easily accomplished with the help of Smartphone and their in-built sensors. There may also be delay because of external GSM used – that is a queue based technique. And also the maintenance of the sensor will be quite expensive.
- Utilizing and managing the Emergence of Android Smartphone for providing to the Public Welfare by providing Advance Accident Detection and Remedy by 108 Ambulance [4] here they have importantly developed a unique android application that is used to identify the accidents using the variation in acceleration of the parameters. After detecting all the accident applications spontaneously it also generates the topographical information by GPS and then it sends the pre-recorded voice message to the main emergency response service. The most important and essential theory behind the working of this main application is that the mobile phone should not be kept along with the driver who is driving the car. It must definitely be attached inside the vehicle. The biggest drawback or the loophole in this system is that the phone may tilt or fall down inside the vehicle by accidently without having any of the real time accident and as a result generating false positives.
- By Providing an Accident Detection in the various Vehicular Network through OBD-II Devices and Android based Smart phones [1], here the main researcher develops an accident detection and report system that find and connects chain Smartphone with vehicle through a second generation On-Board-Diagnostics (OBD-II) which will work as an interface for the accomplishment of smart vehicle modeling, and by providing the user emergency facilities to all the users. Now, The researchers will have established an android based application that will deploy an SMS to the pre-stored address along with the related informations about the location of accident. Also a call will be made to the emergency service. The only prerequisite for achieving the goal of this system is the OBD-II standard. The OBD-II standard is especially made mandatory from 2001 in the United States and it is also a European, and Japanese variant of this unique standard, thus this solution is only restricted to these countries only. Besides these that the maintenance as well as upgrading procedure of the main system is quite costly.
- Accident Detection will be Depending on the Vehicle Position and the Vehicle Theft Tracking, Reporting Systems [5], and here the researcher introduces a new system along with the different algorithms that describes about the accidents along with the help of accelerometer sensor's tilt direction and some other various hardware tools like GSM modem and GPS. The researcher will have also developed an

unique android application which will contain the display the accident location if it happens. The most vital components on which the system is entirely dependent are the 3-axis accelerometer sensor and GSM modem, which can be replaced and maintained with a one single device i.e. 'Smartphone' as it comes along with the entire mentioned sensor above pre-built in it. In addition, along to this system it also uses GSM modem, which can definitely create a delay during sending the emergency message to the user as it is a technique based on queue. Besides that, the maintenance of the hardware system is very much costly.

- Car Accident Notification System is based on Internet of Things [10]; and here the researchers introduce a new method of emergency call notification system by using the Internet of Things and Cloud computing. The researcher will have implemented the proposed system by using X Bee Wi-Fi module, X Bee Shield, GPS module and crash sensors. The most basic idea of the concept is to detect the accident along with the help of crash sensor and trace the exact and accurate co-ordinates of the accident spot through cloud using X Bee Wi-Fi to the nearest hospital. The main aim is to propose a system so that allowing a global interconnect with the Internet of Thing and Cloud. Despite of the limitations faced by the system is a step forward in the field and sector of Internet of Things and with the help of Cloud the information can be transmitted and transferred to a very long distance. Furthermore the system can be improvised and maintained by using programming the system to immediately notify the family members of the victim.
- Assistance through Communication Technologies and Vehicle [11], also proposed a prototype architecture and it is called as e-NOTIFY that will help in increasing the chances of survival for the passengers involved in these car accidents. The proposed system also offers an automated detection, reports and assistance to the victims who are all exploiting the capabilities of the vehicular communication technologies. The main goal of the system is to provide an architecture that allows all the below 1. Automatic sending of data files that contains information regarding the incident to the control unit. 2. Assessment of the damage that is done to the vehicle and its occupants, based on the data received from the incident. According to the reported information and the preliminary accident estimation, the system will always alert the required rescue organization to optimize accident assistance.

3. SYSTEM ARCHITECTURE:

3.1 Smartphone Accelerometer Sensor:

The AADAS software will monitor the accelerator sensor information to identify the accident occurred with the help of G-force. Vehicle speed is used to identify probability of detecting accidents.

3.2 Smartphone GPS Transmitter:

With The help of GPS tracking software we extract the position of the vehicle on the globe is identified

3.3 Smartphone microphone:

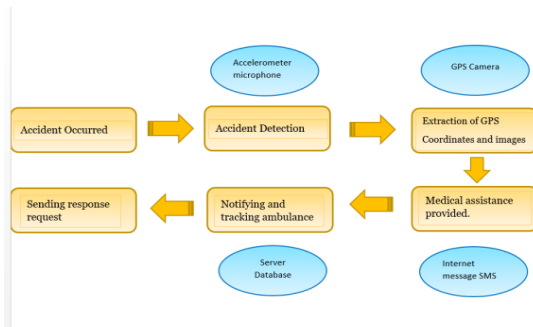
The microphone will detect the events like sound, when an airbag is opened or when vehicles collide. Microphone the possibility of detecting accidents can be increased with the help of microphone.

3.4 Smartphone Camera

When comparing to the microphone the probability of detecting accidents can be increased with the help of camera. The

Smartphone camera of the user and camera of the observers can be used to record and send videos or photo's to the server part so that an emergency dispatch are often deployed to the accident location.

The ADAS server will capture the image of the person, so that it will notify client family, friends, local police station, hospital (medical assistance). The ADAS server will give information about the ambulance availability which is near to the accident location. This server will also perform map and data hosting as well as the task like multimedia hosting. Below Figure describes the flow of ADAS software System, which will allow the client to share accident parameters (such as speed of vehicle, route, etc....) for analysis.



3. PROPOSED SYSTEM ARCHITECTURE

In the proposed methodology the result is to assist with an in-built sensors in the Smartphone and physical environment information to detect accidents. The ADAS (Advanced driver-assistance systems) system comprises of two key components

1. ADAS server
2. ADAS software

The ADAS software will be installed in Smartphone and it will execute the task of detecting the accident as well as sending information to the server part. The ADAS software will perform as a sensing device and it will also act as an interface for the third-party observer to contribute information to the accident report. The ADAS software will offer mapping functionality with the assistance of Google maps on the device. This map will permit other motorist to plan their route intelligently around an accident, hereby reducing the jamming. The ADAS client software can access to the data from phone database (such as a contact list) to assign emergency contacts. The detection will completely depend on the in-built sensors in the smart phone such as accelerometer sensor, GPS receiver, Microphone Figure.2 shows the ADAS System Architecture

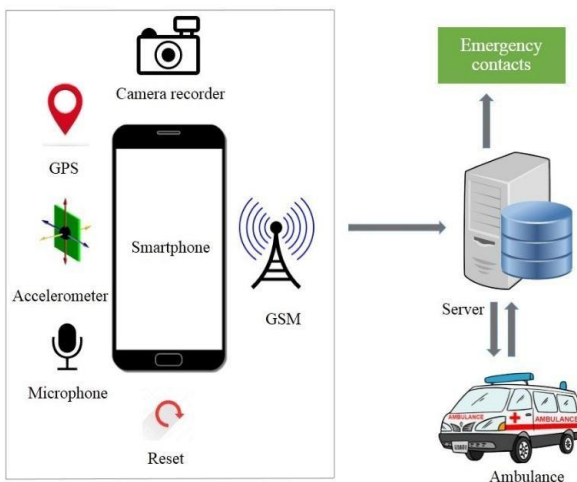


Figure.2: ADAS Architecture

4. CONCLUSION

Accident detection process is not an easy task to handle; it can be an extremely difficult process when it comes to real time applications, which is the main reason why it is not perform on a large scale. This system will provide benefits to avoid the present scenarios.

- In-vehicle accident detection system, it provides emergency reaction with essential information as soon as possible but inconvenient of this system are restricted by their non-portability and cost of high, whereas Smartphone or Android mobile plays a promising role with same sensors at low cost and portability benefits. Mobile phone can exceed the functionality of conventional in vehicle accident detection system.
- Various Mobile phones based vehicle accident detection systems are revealed to false positive readings. In the system various sensors and features are introduced to increase the accuracy of the system. It also have additional quality of resetting the alarm which is not found in the referenced system. Our technology will impressively decrease the redundancy found in other accident detection systems.
- Advanced driver-assistance systems (ADAS) Mobile phone network will have activation/deactivation button that can allow the user to start or stop medical response in a time of 30 seconds, after which the medical helper will be called by default. The user has another option to call back to the medical service even when the alarm is not begin.
- ADAS program will allow the uninjured patient and the views to take images, videos of the accident and send them to emergency responders to report the accident.
- ADAS program will quickly notify the friends or family or guardian of the patient. The information will be sent to pre-registered emergency contacts and it will provide the exact position of the accident place.

5. SCOPE FOR IMPROVEMENT

The entire project is independent on the application that is installed on the smart phone. This project can be integrated to the virtual systems of the vehicle that can improve the performance of this system. This project can also be carried forward and used to guess and concern a notice to the driver in case of any irregularity or issues noted in the driving or the vehicle itself. Thus, preventing accidents from occurrence. Though there are many ways to improve the notification system, it is entirely dependent on the hardware that is installed on the vehicle and for that reason we terminate that the limitations of the implementation of the project are;

- The damage of the hardware that is installed on the vehicle or the hardware accepted by the user.
- The connectivity of the hardware with the manage tower has to be maintain.

5.1 Expected Output

The work done in automatic detection and response, the system will be able to overcome various deficiency, and help the automated accident detection and response. The table which is given below is the results that is figure on the successful implementation of the project.

Key Terms	SAD-CS	UAS-VADS	RT-VADT
Devices	Raspberry pi, Sensors (Gas, Fire, Shock), GSM, GPS, Microcontroller, OBU, APICBI	Buzzer, Vibration sensor, Arduino, GSM modem, GPS module	GPS, GSM, microcontroller AT89S52, Accident detection
Methods	Push and pull methods	Android application based system	SMS Technology
Communication Types	Vehicle to Vehicle (V2V), Vehicle to Infrastructure (V2I), Infrastructure to Vehicle (I2V)	Vehicle to Smartphone	Vehicle to Specific Cell Phone
Notification Time	Before (In case of gas leakage) and after the accident	After the accident	After the accident
Broadcasting System	Warning message broadcasting system to other vehicles available	Not Available	Not Available
Identification System	Radio Frequency Identification System	No identification system	No identification system

The project is dependent on the application that is installed on the smart phone or mobile phone. This project can be joined to the virtual systems of the vehicle that can increase the performance of this system. This project can also be moved toward and used to see and arm a warning to the driver in case of any irregularity or provide a note in the driving or the vehicle itself. From these system , preventing accidents from occurrence. Though there are many ways to enhance the notification system, it is completely based on the hardware that is installed on the vehicle and therefore we conclude that the limitations of the implementation of the project are;

- The damage of the kit that is installed on the vehicle or the kit carried by the user.
- The connectivity of the kit with the control tower has to be maintained properly to avoid damage.

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