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ACCIDENT DETECTION AND ALERT -AN ANDROID APP

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Abstract: ***Accidents are the major cause for loss of lives. These may sometimes lead the people for a longtime hospitalization also. In many cases due to late response shown by the people around in the accident location will lead to the death of the victim. This paper presents a real-time solution for this problem by providing an alert system and notification to police and ambulance drivers. This is done by using commonly available electronic devices that are mobile phones to detect the fall. An Android smartphone with an integrated accelerometer is used for fall detection. Accelerometer will evaluate the frequency with which the phone has vibrated to detect the fall. The threshold is evaluated based on parameters such as height and frequency of vibrations. If it's higher than the set threshold then a pop-up message is raised for the user's response. Based on the user's response, further action is taken. If users do not respond within a specified time limit, then an alert and notification will be sent on-time to required pre-specified individuals whose contacts are provided by the user at the time of registering for the application. Along with them, an alert and notification or SMS having an accident location of the victim is also sent to police and ambulance drivers. The paper presents a system that provides a cost-effective solution to fall detection using a simple Android application which is user-friendly.***

Keywords: Accident detection, Alert system, Accelerometer Sensor, SMS Alert, Fall detection.

I. INTRODUCTION

Road accidents are a serious threat to human lives. Speed is the key factor liable for many of the accidents. The statistics which have been formed according to the recent surveys are really horrific. According to a survey conducted in 2013 by Hindustan Times in India in every three minutes, there is one death due to the road accidents in which 77% of accidents are due to manual mistakes.

According to a recent survey by WHO published in Times of India, India is on 1st position globally in terms of casualties due to road accidents. Despite many safety measures and programs launched by the government as well as nongovernmental organizations to make people aware of safe driving concepts, life claimed by these accidents are increasing at an alarming rate. In a study it has been uncovered that fifty percent of casualties occurred due to road accidents could have been stopped if they received immediate medical help. As in most of the cases the accidents result into casualties not because of the seriousness of the accident but due to the lack of immediate medical attention, delay in getting the medical help is one the major reasons for the casualties.

Hence, it's the essential need of this scenario to develop some technologies in order that tracking of the accident cases becomes easier which successively will further lower down the death rate.

II. BACKGROUND AND MOTIVATION

There are many previous works that are performed for the accident detection and reporting. One of the methods for accident detection was manual accident detection. This relied on the passengers passing by the accident spot who notified the concerned emergency authorities for any safety measures to be taken. But this method had a loophole in it because its efficiency was not reliable as someone had to witness the accident. Also, this method incorporates delays and inaccuracies because of the witness's expression problem. Some drawbacks are slow in responding to accidents, no prior notification of accident prone zones. Also, Casualty rate is high.

We propose an application that will send an alert to emergency contacts, nearest police station and hospital when the user of the application is met with an accident. Along with this, the user can enter his destination, and the application provides him with alerts about the accident prone zones in his travel route. Thus preventing accidents by cautioning the vehicle driver about the zones where many accidents have occurred before. Advantages of the Proposed System are Faster response to accidents, Prevention of accidents through prior notifications of accident zones and Casualty rate can be reduced.

III. LITERATURE SURVEY

Many works state that road accidents are a human tragedy. That they involve high human suffering and monetary costs in terms of untimely deaths, injuries and loss of potential income. A lot of work has taken place to reduce the death rate that happens through accidents.

Bankar Sanket Anil,et al. [1] had stated that there were so many new techniques such as Anti Lock Braking System (ABS) , Adaptive Cruise Control (ACC) , Anti Collision System (ACS) to avoid accidents and in spite of all that, such a large number of accidents takes place. Hence, his work presented a system which gave an idea about what can be done to provide medical help and other facilities after an accident as soon as possible.According to this contribution, Accidents can be detected using flex sensor and accelerometer, while location of accident will be informed to desired persons such as nearest hospital, police and owner of the vehicle through SMS sent using GSM modem containing coordinates obtained from GPS along with time of accident and

vehicle number.In this work[1], Camera located inside the

vehicle will transmit real-time video to see the current situation of passengers inside the vehicle. Thus, this contribution emphasizes the post-accident system for detecting and informing about it. Simulation result on the hyper terminal is also presented in this work.

R Sujitha,etal. [2] had urged that new communication technologies integrated into modern vehicles offer better assistance to people injured in traffic accidents. She had stated that recent studies showed how hybrid communication capabilities should be supported and improve the overall rescue process. Also, she had said that there were a variety of areas, where a need existed for a system capable of identifying and characterizing the severity of the accidents using the KDD process. In her work, the system considers the most relevant variables that can characterize the severity of the accidents (variables such as vehicle speed, vehicle location, accelerometer condition) by using embedded systems. System in her work consists of several wireless network devices such as Global Positioning System (GPS) and ZigBee. GPS determines the location of the vehicle. In this work, Based on vehicle motion, a report is generated and to be taken by emergency services. If a small accident has occurred or if there is no serious danger to anyone's life, then there is the option for alert messages to be terminated by the driver or any other nearby peoples by a switch in order to avoid sending the message to control and save the valuable time of the medical rescue team. Contribution of this work[2] is to improve the overall rescue process, a fast and accurate estimation of the severity of the accident system offering perfect facts to emergency services as soon as possible and saving precious lives of people.Main advantage of the system mentioned in [3] is to provide immediate hospital service, police service and immediate location tracking of where accident occurs.According to [4], Despite many efforts taken by different organizations all around the world by various programs to warn against careless driving, accidents have taken place every day. However, many lives could have been saved if the emergency service could get the crash information and proper help provided at time.

IV. WORKING METHOD OF APPLICATION

System requirements are as specified. Hardware requirements are i3 Processor, 8GB RAM, 100GB Hard Disk, 2.4 GHz+ Speed, Android Mobile, Ice Cream Sandwich to Pie App Version, Impact sensor, GPS model to get real location. Software requirements are Windows 7 or Higher Operating System, Java Coding Language, MYSQL back end, JDK 1.8 or above Java Software, SDK Android software, Android Studio Tool. The tools and technology used are Android Studio, Eclipse, SQLYog, JSP, JAVA, GPS.

In System Planning, five modules are identified for the application. Those modules are Actors, Admin module, Ambulance module, Police module and Citizen module. Actor module consists of Admin, Citizen, Police and Ambulance driver. They play their own specified roles in the use of the application.Admin module specifies the way that role of admin will take place. Initially logging into the application, then managing ambulance, police, places, viewing accident zones, number of victims and finally logout. Ambulance module specifies the role of Ambulance driver. Login, receive notification and view accident zone and logout. Police module also has similar work as an Ambulance driver. Citizen module specifies the role of a citizen using the application. Initially registering in the application, login, managing their contacts by giving emergency contact numbers of their relatives or friends. Then once they want to travel, select the route that updates the current location of the user. Receiving voice alerts in the accident zones, sending notification or SMS once the phone vibrates above threshold frequency and logout.

System Design and Implementation: Here the total design of the application is done as in what way the application works. The way of interaction that takes place between the admin, citizen, police and the ambulance driver who are using the application. Along with this the information as to where the data have to be stored and the way of processing the requests is all designed. The best response time and the way of handling the situation, when a failure occurs is also planned and taken care.

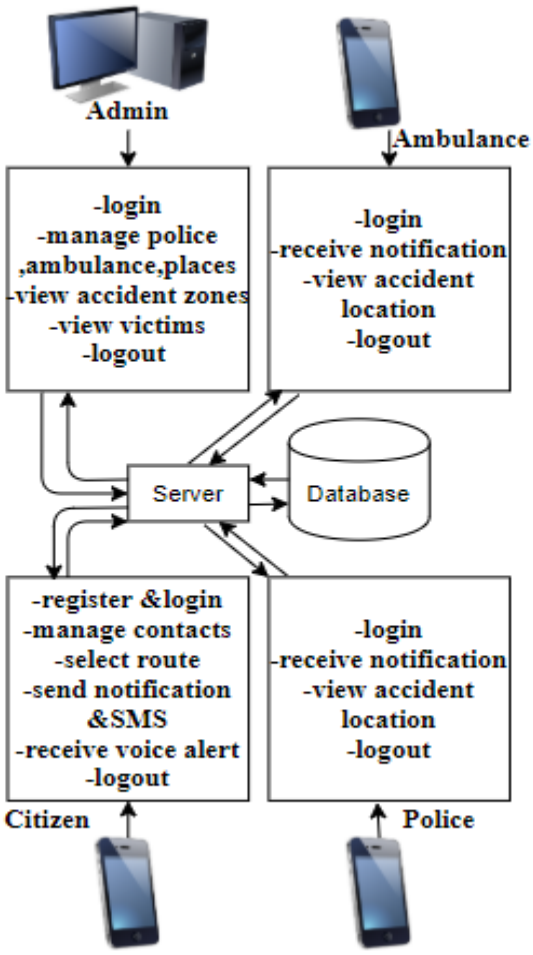

fig 1: System architecture

Fig 1. shows the System architecture consists of the main server, Admin, Citizen, Police, Ambulance. All the data from different users of the application are stored in the database which can be accessed only by the Admin. Main server taken care of by the admin will be helpful to accept the requests

from the users and to process it. Here, as given in fig 1, all the processes and steps will take place in its respective user's module to process the request and to give the required output by getting the route from given source to destination. This is the main architecture of the system that helps one to understand the working of all parts of the application.

For each and every module we have Database table also, which is as shown below,

- admin[adminId, password]
- police[policeId,policeName,mailId,password,latitude,longitude,fcm_token]
- ambulance[ambulanceId,driverName,mailId,password,latitude,longitude,fcm_token]
- places[placeId, placeName]
- routes[routeId, source, destination]
- accident_zones[zoneId, routeId, latitude, longitude, nov]
- victims[victimId, citizenId, zoneId, accidentDate, accidentTime]
- citizens[citizenId, citizenName, mailId, password]

As shown above there are eight database tables for five modules that come under Web Part.The admin table contains attributes adminId and password. The police table consists of attributes such as policeId, policeName, mailId, password, latitude, longitude, fcm_token. The ambulance table has ambulanceId, driverName, mailId, password, latitude, longitude, fcm_token as its attributes. The places table contains placeId, placeName attributes. The routes table consists of routeId, source and destination attributes. Then the accident_zones table has attributes zoneId, routeId, latitude, longitude, number of victims (nov). The victim's table has victimId, citizenId, zoneId, accidentDate, accidentTime attributes. The citizens table has citizenId, citizenName, mailId, password as its attributes. Hence,this is the overall picture of the database.

Each module has its own number of attributes in which some are Primary attributes, secondary attributes and some are weak attributes. All these attributes have their own important role to play in the Accident detection application and none can be ignored as such. All the content or the data of each attribute are stored in the Database that is accessed only by the admin and other than him, none can have access to the database. This is for the security of the data associated with the users of the application. Proper authorization and authentication are done. Thus, the security of the data is well and good in this application and no threats are found. Fig 2 shows the workflow of the application. Initially, the Accident detection phase is present, here when a mobile falls down, it starts detecting the sensor value against the threshold value. If sensor value is greater than the threshold then an accident alarm is given to the victim. If he cancels it within the set time constraint, then an accident has not occurred. Otherwise, it's assumed an accident has occurred and goes to the next phase, that is Emergency response and Notification phase. Next, the current location of the accident is extracted as the user's location will be getting updated in certain time intervals. Along with the accident location, the nearest hospital and Police stations are alsofound by

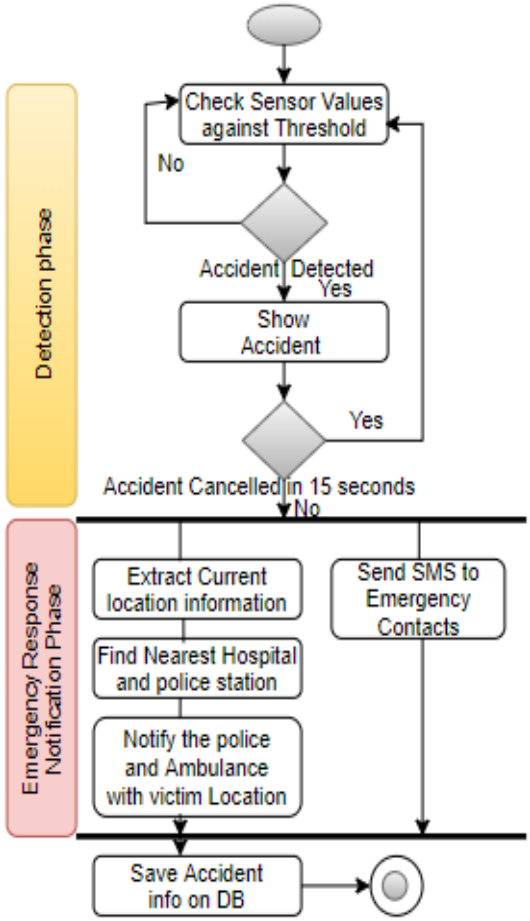

fig 2: Workflow of application

the algorithm running in the background. Notification of the accident occurrence is sent to the Ambulance driver, Police and family members whose contact information had been fed by the users while registering for the Accident detection application[5]. The notification or SMS will show the shortest route to the accident location with an emergency message along with the victim's name. Then, by having received the message the victim will be saved with the help of the ambulance driver or policeman or family members, whoever responds first. Then this accident information is stored in the database along with the location and the victim's information to know the vulnerability of the accidents in some spots. This will be helpful to alert the citizens when they are travelling through those accident spots. It also helps the policemen to have the track of all the accident information.Since the application automatically sends emergency notification to the police, ambulance and emergency contacts, the drawbacks of the manual system will be resolved.

V. TESTING AND RESULTS

This application is designed to detect the fall and also to be as simple as possible to use. So the people who are not so familiar with android phones are also able to use the application. To achieve this, we severely limit the number of buttons and options available to the user. The main screen consists of minimum buttons and labels. The button starts

and stops the autumn monitor while the label displays the state. A service allows the fall monitor to constantly run the background that is helpful to detect the fall. Users who have already registered within the application will log in to the application. They will select a source and destination wherever they have to reach as shown in figure 3. Then clicking on the start service button will lead them to show the shortest route with the help of Google maps. The current location of the user or the person who is travelling will be updated at certain time intervals frequently. When the monitor or the smart sensor suspects a fall, a pop-up message or notification is sent to the user as shown in figure 4. This wakes up the application andattempts to get the user's attention by repeatedly playing an audio message that makes the user respond at that moment itself without any delay. The app prompts the user with an easy pop-up window telling them to press an on-screen button if they're okay. Pressing the button cancels the alert, and the interrupted activity is restored. This gives users the opportunity to eliminate any kind of wrong alert to the Policemen and an Ambulance driver [7]. If the user does not respond to the pop-up message that is on-screen within a set time constraint, then it's assumed that an accident has occurred. This application has additional methods to reduce the number of mistakes. We allow the amplitude's upper threshold described within the 'Fall Detection' section to be variable.

fig 3: Setting Route

Fig 4: Detecting Fall

The application displays a small list of configuration options when the phone's menu key is pressed. One option is to regulate the sensitivity, the capacity to detect a fall. So the less sensitive, the more the upper threshold is. The other option under the application's menu is Add a contact. This allows the user to add social contacts to their emergency contact list. Using social contacts to verify a fall before alerting an emergency service is another method for filtering false positives. False positives are basically the mistakes that occur due to no response by the user for the pop-up message, when the phone sensor has vibrated beyond the set threshold value. Due to this it
will be unnecessary for the arrival of ambulance and police to the accident location. When a fall is confirmed, every contact in the emergency list, nearby police stations and nearby hospitals get an SMS message[6]. This message states that a fall was
detected at the given time and includes the GPS coordinates of the accident. The dedicated emergency services are only notified when a social contact also confirms the fall, or in the case if no social contacts call the fallen. Any of the other users who use this application will get a notification, whenever they pass by the accident zone. This makes the other users be aware and take precautions.

VI. CONCLUSION AND FUTURE WORK

The paper presents the accident detection system. This system basically consists of a web part and an android part. Web part is mainly implemented by using JSP (Java Server Pages). Android applications are constructed using Java as it is simple, object-oriented, secure, platform independent, robust, portable, dynamic, interpreted, multi-threaded et cetera. Web part is used by the admin. Only the admin has the authorized access to the web page. The android application is used by the citizens, ambulance drivers, and policemen. Here police and the Ambulance driver can also register and can make use of the application as a common citizen. This makes one understand the wide range usability of the accident detection application. Day by day, research work is increasing in this field and various techniques are implemented to get a more accurate result to avoid the accidents as much as possible. This application makes the people to be aware of the accident location while driving by giving Voice alerts. It's done by using the cost-effective hardware and easily accessible, usable software. It provides a realistic solution for the problem of saving lives that's there in risk because of accidents. The proposed system is working effectively for detection of accidents by providing Voice alerts for the driver. Hence, we assure that this project is a way to help the public to be safe and to rescue lives.

This application can be enhanced by including a camera and microphone hardware. Using a camera, the application can capture the accident scene which will be a major witness of the accident. And also with the microphone, audio around the location can be recorded. Thus, the victims get justice by providing the necessary proof in front of the court. Pedestrians witnessing the accident can save the life of the victims by sending SMS to police or hospital. Usually, people will hesitate to do so, as there will be problems, if

they are involved in the accident case as a witness. So, we can have an Anonymous message that will be sent from the pedestrians to police. Currently, the database is used to store the data of the application users and accident information. But cloud, which has benefits like flexibility, data security, better collaboration, better backup, facilitates innovation, can be used for easy access, and all time data. Thereby this approach would give more efficient application.

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