ANDROID BASED ACCIDENT DETECTION AND SMART RESCUE SYSTEM WITH REAL-TIME LOCATION TRACKING

OGBONNA SCHOLASTICA CHIOMA

DEPARTMENT OF COMPUTER SCIENCE, EBONYI STATE UNIVERSITY, ABAKALIKI EBONYI STATE.

EMAIL: SCHOLASTICAOGBONNA81@GMAIL.COM

ABSTRACT

Over the years a large number of deaths have been caused by traffic accidents worldwide. The global crisis of road safety can be seen by observing the significant number of deaths and injuries that are caused by road traffic accidents. In many situations the family members or emergency services are not informed in time. This results in delayed emergency service response time, which can lead to an individual's death or cause severe injury. This paper introduces a model that will increase the response time of emergency services in situations like traffic accidents or other emergencies such as fire, theft/robberies and medical emergencies. By utilizing onboard sensors of a Smartphone to detect vehicular accidents and report it to the nearest emergency responder available and provide real time location tracking for responders and emergency victims which will drastically increase the chances of survival for emergency victims, and also help save emergency services time and resources. Object Oriented Analysis and Design Methodology was adopted in this paper. Android studio was used for the integrated development environment and SQlite for the database management.

KEYWORDS: Accident**,** Smart Rescue Notification, Location tracking

1.0   INTRODUCTION

Now-a-days lots of accidents happen on highways due to increase in traffic and also due to rash driving from drivers, and in many situations the family members or the ambulance and police authority is not informed in time, this result in delaying the help reached to the person suffered due to accident. [2]

Road accidents constitute the major part of the accident. Transportation has great importance in our daily life and its development has made many of our chores much easy. But it can cause disaster to us and even can kill us through accidents. [4]

During 2008, Road Traffic Injuries ranked fourth among the leading causes of death in the world. Nearly 1.3 million people die every year on the world's roads and 20 to 50 million people suffer non-fatal injuries, with many sustaining a disability as a result of their injury. Road traffic injuries are the leading cause of death among young people aged 15-29 years and cost countries 1-3% of the gross domestic product (GDP). [12]

If no action is taken, road traffic crashes are predicted to result in the deaths of around 1.9 million People annually by 2020.

The number of deaths due to traffic accidents is very high. Looking at the number of deaths and injuries due to road traffic accidents shows the global crisis of road safety.

Traffic accidents are a major public issue worldwide. The huge number of injuries and death as a result of road traffic accident uncovers the story of global crisis of road safety. Road collisions are the second leading cause of death for people between the ages of 5 and 29 and third leading cause for people between 30 and 44. In this paper we are utilizing android smartphone to detect accidents and report it to the nearest available emergency responders with the exact location of victims in emergency. On an emergency responder side, the system will inform responders about the incidents that occur near to them and provide them with real time tracking of emergency victims on a Google map. This will help emergency responders keep track of victim's location and rescue them as soon as possible. [3]

1.1 Statement of Problem

Over the years a large number of deaths have been caused by traffic accidents worldwide. Though there has been different method put in place to rescue accident victim but despite this there exist some challenges which are:

1. No means where emergency services can be notified, or to detect cases of accident on time, which usually results in to an individual's death or cause severe injury.

2. The current method is by dispatching emergency responders to the scene of the accident but its takes lot of time to get to the accident scene due to traffic which usually delayed emergency service response time.

3. In many situations the family members or emergency services are not informed in time. This results in delayed emergency service response time, which can lead to death of victims.

1.2 Research Aim/Specific Objectives

The aim of this paper is to model an accident detection and smart rescue system using android smartphone with real-time location tracking. This specific objective of this paper is to:

1. Create an automated system that uses a sensor that detects phone damage in android phones to detect vehicle accidents.

2. Create a platform that detects accident using android phones to detect accidents and report it to the nearest available emergency responders with the exact location of victims in emergency.

3. Create a platform that will inform emergency responder about the incidents that occur near to them and provide them with real time tracking of emergency victims

1.3 Review of Related Works

Using smartphones to identify road traffic accidents is not a new subject. There are completed algorithms for systems which utilizes accelerometer as well as GPS to detect vehicle accidents

using smartphones to detect accidents dates back to 2011. Because there is already a lot done on this subject, what we decided to do was to develop a complete system that is more reliable and have much more functionality than the existing ones, designed for the ongoing paper in mind. [1]

In [9] the authors developed a system which used Android smart-phones and ODB-II connection in a vehicle. When the system detects an accident, will sends an SMS to emergency contacts specified by the user, SMS will contain information about the accident and also a call to the emergency services is made automatically. [11]

All modern vehicles have ODB-II connection installed which transmits data about the vehicle in real-time such as acceleration, oil pressure, speed, etc. For the system to work a vehicle must support OBD-II standard. In US and this standard is necessary since 2001, European countries have also implemented a version of this standard, so vehicles in the US and in Europe can use this system and is not available to all vehicle in other countries. Other than that, upgrading and maintenance of this system is very expensive process [11].

In [13], the authors at the University of Baghdad Iraq developed a system which made use of the accelerometer, GPS and microphone to detect accidents. Upon detection of an accident sends an emergency notification to the web server and also sends an SMS to the emergency contacts, emergency responders have to access the web server to find out about an accident. Their system made use of the same sensors and hardware that the algorithm presented in this research work makes use of, except for a few features. The main issue with this system is that the notifications are sent to a web server and responders needs to check the web server for accident notification, there is no system for individual responder that responds to the emergency to track victim's location and also the system lacks the functionality to send emergency notification to the nearest emergency center in case there is more than one emergency center in the area. [8]

In, the authors developed a system called WreckWatch which involves reading data from the accelerometer and acoustic data from the microphone to detect accidents. If an incident has

occurred, the application contacts nearby emergency services and provides GPS-coordinates of accident location. [7]

In [5], the authors have developed an android application that uses accelerometer sensor to detect accidents. After sensing the accident, application automatically sends a voice message to 108 ambulance emergency response service that is running in India. The issue is that this system is for specific emergency response services, only applicable in India. Also, the system is prone to increased false positives because there is no filter in place to verify if an accident detected by the smartphone is a real accident or just false alarm due to dropping smartphone, etc.

1.4   The Proposed System

The proposed system will be an android application that users will install on the android phones. The develop application has the ability to detect vehicle accidents and report it to the nearest available responders to help counter these emerging problems and reduce casualties as much as possible. The propose system will automatically detect accident using android smartphone to detect accidents and report it to the nearest available emergency responders with the exact location of victims in emergency. The proposed system will inform emergency responder about the incidents that occur near to them and provide them with real time tracking of emergency victims on a Google map, this will help emergency responders keep track of victim's location and rescue them as soon as possible..

1.5   System Modeling

System modeling is the interdisciplinary study of the use of models to conceptualize and construct systems in software development. Figure 1 and 2 shows the data flow diagram and use case diagram of the proposed system.

The dataflow diagram which shows the overall system process as just one process and shows the data flows to and fro from external entities. The main processes involve in this system is documented in this diagram. The diagrams below describe the flow of information in the proposed system and also dictate how the system works.
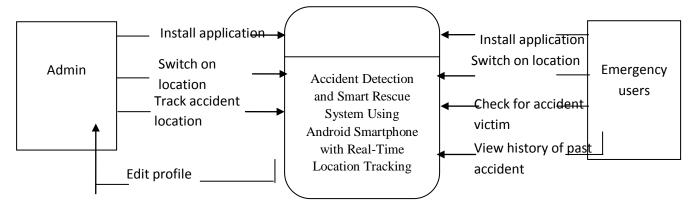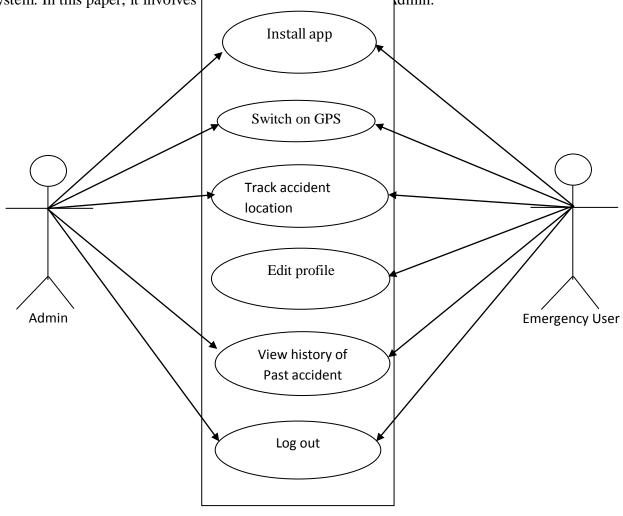
Fig 1: Dataflow Diagram of the Proposed System

Use Case diagram is a diagram that describes a set of sequence in which each sequence indicates the relation with outside things. It involves the interaction of the Actor (user) and the system. In this paper, it involves [   ]dmin.

© **Association of Academic Researchers and Faculties (AARF)**

A Monthly Double-Blind Peer Reviewed Refereed Open Access International e-Journal - Included in the International Serial Directories.

Page | 6

Fig 2: Use Case Diagram of the Proposed System

1.6   System Implementation

In the design of this system, Android studio was used as the Integrated Development Environment and also the front end design, SQLite was use as the back end design to store all the information of the complete system, Google Map was used to track the location of accident and Application Program Interface (API) for sending SMS to users.

1.7   System Deployment

Development of a Model of an Accident Detection and Smart Rescue System Using Android Smartphone with Real-Time Location Tracking work strictly with internet and can be access with any android version. The system is hosted on a server and a domain was registered in other for the system to be accessed worldwide. There must be a unit in the bulk SMS in other for users to receive the coordinates of the location of accident as SMS on their android phone.

1.8   System Result

Sensor in android mobile device that detect phone damage was used as a means to detect if accident as occurred or not. Once users phone get damage a signal will automatically be send to nearest rescue team through SMS containing the coordinates of the location which the user will have to enter on a Google Map to track the location of the accident.

1.9   Conclusion

In this paper, we developed the accident detection and smart rescue system, which uses on board accelerometer sensor to detect accident and generate emergency alert and send it to the nearest emergency responder and will also send an SMS to emergency contact containing location coordinates of the accident. With real time location tracking for both victim and responder the system will drastically increase the survival rate of an accident victim by providing emergency aid in time. The system will also provide help during other emergencies

such as during fire, robberies/theft and other medical emergencies. Emergency responder will be able pin point victim's location on a Google map in real time.

REFERENCES

[1] Appa T., and Narayana N., (2017) "GPS and GSM Based Vehicle Location and Tracking System", International Journal of Engineering Research and Applications,Vol.1, Issue 3,pp.616- 625,2017

[2] Behzad S., Khan A., Walayat Z., Qasim U., Javaid Z., (2018) "Design and Development of a Low Cost Ubiquitous Tracking System", The 9th International Conference on Future Networks and Communications (FNC) Procedia Computer science at Elesiver, Vol. 9, pp. 1-8, 2018.

[3] Bhatia J., and Pankaj V, (2017):- "Design and Development of GPS-GSM based tracking system with Google map based monitoring", International Journal of Computer Science.

[4] Chris V., (2018), "Calculate distance and bearing between two Latitude/Longitude points using haversine formula in JavaScript", Movable-type.co.uk, 2016. [Online]. Available: http://www.movabletype. co.uk/scripts/latlong.htm Engineering and Applications, Vol.3, Issue. 3, pp. 33-40, 2018.

[5] Grewal L., Weill A., Andrews K., (2019), Global positioning systems, inertial navigation, and integration. New York: John Wiley, 2019. Hendry, Near field communications technology and applications.

[6] Pranali M., Ulhas P., Avinash I., (2017): Accident Detection, Tracking and Recovery of Vehicles : International Research Journal of Engineering and Technology, Volume: 04 Issue: 10, Oct -2017

[7] Virtanen A., Schirokoff M., and Luom P.,, (2019) "Impacts of an automatic emergency call system on accident consequences," 18th ICTCT, Workshop Transport telemetric and safety, 2019.

[8]   Tang S., and Gao I.,, (2008) "Tramc-incident detection-algorithm based on nonparametric regression," IEEE Transactions on Intelligent Transportation Systems, 2018.

[9]   Rose G., (2017), "Mobile Phones as Traffic Probes: Practices, Prospects and Issues," Transport Reviews, 2017.

[10] Mohan P., Padmanabhan R., ,and Ramjee R. (2018), "Nericel1:richmonitoring of road and traffic conditions using mobile smartphones," in Proceedings of the 6th ACM conference on Embedded network sensor systems, 2018.

[11 Thompson J., (2017) White, B. Dougherty, A Albright and D.C. Schmidt, "Using Smartphones to Detect Car Accidents and Provide Situational Awareness to Emergency Responders," in Proceedings of 3'd Mobile Wireless Middleware, Operating Systems, and Applications Conference, 2017.

[12]   Yoon J., Noble B. and Liu M., (2017) "Surface street traffic estimation," in Proceedings of 5th International Conference on Mobile Systems, Applications, and Services, 2017.

[13]   Syedul A., Jubayer J., Reaz B,, (2018) "Accident Detection and Reporting System using GPS, GPRS and GSM Technology," in Proceedings of International Conference on Informatics, Electronics & Vision, 2018.