

ACCIDENT DETECTION SYSTEM APPLICATION

Akshay Agrawal¹, Anand Khinvasara², Mitali Bhokare³, Sumit Kaulkar⁴, Prof. Y. K. Sharma⁵

Department of Computer Science,
Vishwakarma Institute of Information Technology,
Pune, India

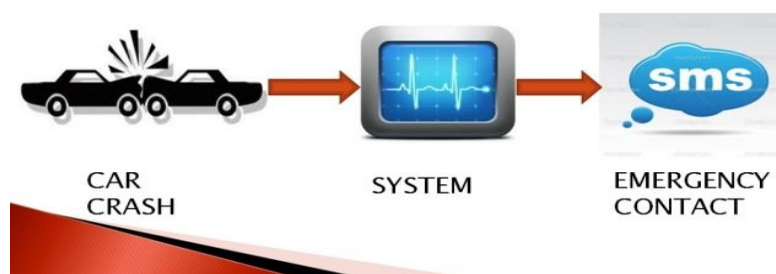
Abstract: Accidents are one of the leading causes of fatalities around the world. An important indicator of survival rates after an accident is the time between the accident and when emergency medical personnel are dispatched to the scene. To eliminate the delay between accident occurrence and first responder dispatch is to use in-vehicle automatic accident detection and notification systems; we propose to develop an android application which will detect the occurrence of accident through android phone which is kept at the deck of the car. The android phone has inbuilt sensors such as accelerometer, rotational sensors etc. whose values will be analyzed for accident detection. Once accident is detected, the application will capture images from the front and rear camera of Android phone & GPS location will be recorded. This data will be combined in SMS and MMS and sent to pre-stored contacts which will inform authorities about accident. Moreover, different cars will have different accident detection threshold values we propose to develop an Adaptive Algorithm to detect accident in for different cars. This paper presents related work carried out in this domain and analyses tools require for the idea to be successful. It also describes the proposed idea.

Index Terms: Accelerometer, accident, Adaptive Algorithm, Android, GPS, MMS, Sensors, SMS.

I. Introduction

Today, in case of accidents the location and the current scenario inside the car is unknown and in case of an accident the victim of the accident would not be in a state to notify an emergency, so our system would do that intelligently. Our application will use a common android phone which will immediately notify the concerned people about the accident. Our aim is to detect accident in any type of car using Adaptive Algorithm. Because of the android platform, our system will be available at low cost and even low end car owners can afford to use it. As the application will be released in Android Market the scope extends to users worldwide. The phone will be kept on the deck of the car. When the accident is detected by the Adaptive Algorithm, system would trigger that an accident has occurred and photos from the front and rear camera would be embedded in a message which would be sent out to default set of emergency contacts.

Figure 1: Overview of Application



As shown in the above figure, when the accident occurs, the system will detect that accident has occurred. After that the system will take photos through front and back cameras, GPS location, and level of impact will all be combined in an SMS and it will be sent to default set of emergency contacts.

II. Related Work

First, we give a brief overview of related android projects and implemented methods.

A. A MOBILE-BASED NOVICE ACCIDENT DETECTION AND TRACKING SYSTEM BICYCLE [2]

This idea proposes an accident detection and tracing system for bicycles embedded in Android. With this design, a biker can create a group. The positions of bikers will be displayed on self-devices and exposed to friends by their account. An alert message will be shown with a beep while the system detects the distance interval being far than the user-defined range. An automatic calling mechanism helps to make sure that every

biker arrives the destination stop on schedule. In case of emergency, the system will use the gravity sensor to detect the accident and send a signal to the other members. To test and verify the implementation of the system, evaluation have been conducted. Results show that all the distance-detect and emergency deal testing items perform exceptionally well. A complete system has been developed for the task of emergency detection and tracking. In order to provide more effective application services, they use the concept of fat-client to install the built-in module on the client side including GPS receiver connection module, analysis module, map module, module for converting the coordinates, driving management subsystem and emergency accident deal subsystem. Because of this application the system respond to users quickly while transforming coordinates or loading map. At the server side, they provide Web Services based on database content access that recording a user's last location-based information, team and biker's details without the need of making changes to any programs on the client side when the data were being updated. Through Google map API, they provide the basic static map and the services by the combinations of three modules (Database, GPS signal conversion module, Google API service). To track the in between distance of the team during riding, first of all, they will transform bikers' positions into coordinates. Since the earth is near- sphere, they apply the *Spherical Law of Cosines* concept to calculate the distance of two coordinates. All these formulas are for calculations on the basis of a spherical earth which is accurate enough for most purposes. When the data of two locations (location1 and location2) of two bikers with their latitude and longitude was captured from the GPS Signal Detection module, they will convert the coordinates from degrees to radians based on the Spherical Law. Next, they use the radians produced from the formulas to calculate the distance.

Figure 3: In this implementation, they use the built-in Google Map and request the Web- Service for the information to create an on-spot icon on the map. Due to the space limitation of on-screen display, the UI is designed with special attention on usability issue. It needs to allow users to clearly browse and identify the target icon on maps. Therefore, each icon needs to be recognizable with its distinct feature and/or symbol. Furthermore, they display the function menu by list to allow user to clearly understand every application of function.

Figure 2: U.I



Figure 3: Position of B-buddies



B. FALL DETECTION FOR MOBILE PHONES USING THE FEATURES FROM A FIVE-PHASE MODEL [1]

This concept presents a novel fall detection technique using the features from a five-phase model which describes the state change of the user's motion during the fall. Experiment results check the effectiveness of the algorithm and show that the characteristics derived from the model as gravity-cross rate and non-primarily maximum and minimum points of the acceleration data are useful to improve the precision of the identification of accident. Moreover, it implements the technique as uCare, which is an Android application that helps people in fall prevention, detection and seeking first aid immediately. To make use of the proposed fall detection technique, it designs and implements an uCare application, which is a demonstration application that works on the Android platform. Inertial wearable sensors such as accelerometers and gyroscopes can be used to detect the falls during accidents. This solution has the merits of portability and easy deployment. However, most of the

proposed approaches using wearable sensors require attaching specially made devices to the body tightly on certain positions, such as the armpit, ear lobe, chest and waist[6]. This kind of usage causes trouble to the users as well as developers who want to develop application based on the detection results. Recently, with integrating various sensors, powerful computing units and communication modules, the smart phone has become a mobile data collecting and processing platform.. As a personal assistant carried around every day, the mobile phone is a perfect device to detect the fall and further help the injured user get first aid as soon as possible. Users usually hold their mobile phones in hand or put them in their pockets instead of wearing them tightly on the body on certain body positions. This raises a challenge to adapt the approach of fall detection to the new situation. Though several attempts have been made such as iFall (Android Application for Fall Monitoring System) [7] and CRADAR(CRash Detection And Response) [4], the missed detection and false fall alarm still exists and negatively impacts the user experience. Refining the model and extracting other useful features will further enhance the performance of the detection. The concept proposes a technique to detect the fall using the acceleration data collected by the mobile phone. It employs new features derived from a five-phase model describing the fall process in the classification. In addition, a statistical classifier is trained to distinguish five types of fall (falling on hands, knees, the back, the left and right side of the body) from other common activities in the mobile phone usage context (answering the phone, putting the phone into the thigh pocket, sitting, dropping the phone from the hand and walking). The algorithm is implemented into uCare, a demonstration application on android. Functions including presenting knowledge tips for fall prevention, personal information card and seeking first aid through short message and alarm are also developed in uCare, which increase the serviceability of the fall detection application.



Figure 4: uCare Application

C. VEHICLE AUTOMATIC ACCIDENT DETECTION AND REMOTE ALARM SYSTEM [3]

Due to the Rapid growth of technology and infrastructure our life has become easy. The arrival of technology has also increased the traffic risks and the road accident take place very frequently which normally causes huge loss of life because of the poor emergency facilities. Project provides the most conducive to a favourable outcome solution to this draw back. An accelerometer can be used in a car alarm application so that dangerous driving can be identified. With the signals from an accelerometer, a dangerous accident can be recognized. According to this application when a vehicle meets with an accident immediately Vibration sensor will detect the signal or if a car rolls over, and Micro electro mechanical system (MEMS) sensor will detects the signal and sends it to ARM controller. Microcontroller sends the alert messages through the GSM MODEM including the location name to police control room or a rescue team. So the police can immediately trace the location through GPS MODEM, after receiving the accident position and other related information. Then after conforming the location necessary action will be taken and accordingly help will be given. If the person meets with a small accident or if there is no serious threat to anyone's life, then the alert message can be deactivated by the driver by a switch provided in order to avoid wasting the precious time of the medical rescue team. This paper is useful in identifying the accident exactly by means of both vibration sensor and Micro electro Mechanical system (MEMS) or accelerometer. As there is a scope for improvement and as a future modification to the application we can add a wireless webcam which will be capturing the images and will help in providing driver's assistance. The design structure consists of a components like control unit ARM7 LPC2148, accident detection module includes three-axis accelerometer sensor MMA7660FFC, user interface module includes the LCD, and a message sending module. When the collision occurs between vehicles the vibration sensor detects the collision automatically. When the vehicle rolls over, the roll angle is given by the the third axis in a 3-dimensional coordinate system i.e the Z-axis of the accelerometer sensor. The alert signal is sent when the roll angle is

greater than the set reference value. The Global Positioning System (GPS) is a satellite based navigation system that is used to send and receive radio signals. A GPS receiver obtains these signals and provides the user with information. Using this technology, an individual can determine location name, velocity and time, 24 hours a day, in any weather conditions and anywhere in the world for free. GPS was officially known as the NAVSTAR (Navigation Satellite Timing and Ranging). GPS was originally developed for military usage. Because of its popular navigation capabilities and because GPS technology can be accessed using very small, inexpensive equipment, the government made the system available even for people who are not members of Armed Forces or Military. The USA owns GPS technology and the Department of Defense maintains it. The GPS technology is a set of 24 satellites that are orbiting the earth at every point. It is a cost effective and system which can be easily carried or moved and which accurately detects the location name.[6].

III. Proposed Idea

We propose a idea of creating a system which will have an adaptive algorithm to detect accidents. We propose android ecosystem for creating such environment as it is cheap, effective and is present with most of the car users worldwide. An android phone will be kept at the dock of the car, it will detect the vibrations in the car using inbuilt sensors like accelerometer and magnetic accelerometer. After the accident is detected the system will take the current location(GPS) and photos(front and rear camera) of the phone. It will encapsulate these data - GPS co-ordinates into SMS and photos in MMS. The system will immediately send out this data to the emergency contacts pre stored in the phone through the network providers within one second, as the phone has a high probability of getting damaged after one second during accidents. Moreover, every car has different vibrations inputs, thus our system will have an adaptive algorithm for setting threshold limit of accidents of each car. First, we will ask the user to run the application for a few kilometres during which the system will analyze the inputs of the car. After the analysis the system will set threshold values for the respective car and detection will begin.

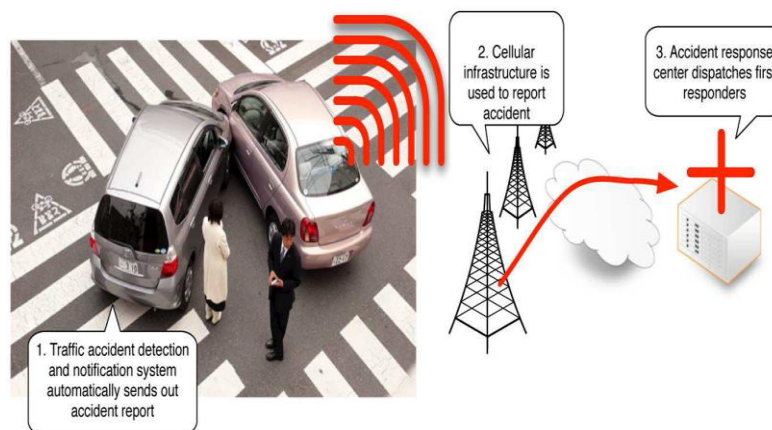


Figure 5: Scenario after accident

As shown in the above figure once an accident occurs, because of our system the arrival time of the first aid will be much quicker. It will definitely help in saving lives.

IV. Conclusion

This paper discussed about proposing a system for accident alert using android phone. The novel idea detecting and warning authority on the accident is briefly discussed in the paper. Moreover, related works such as similar applications and systems have been discussed in the paper. Thus the tools we will require have already been successfully implemented in other projects. The applications will help save lives by alerting the world about accident.

V. References

- [1] Yue Shi, Yuanchun Shi, Xia Wang, Fall Detection on Mobile Phones Using Features from A Five-phase Model , 2012 9th International Conference
- [2] Huang, Chuen-Min, Chang, Yen-Jia, A MOBILE-BASED NOVICE ACCIDENT DETECTION AND TRACKING SYSTEM BICYCLE
- [3] 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
- [4] CRADAR. <http://actionxl.com/CRADAR.html>.
- [5] GPS Beginner's Guide, Garmin LTD, 2008.
- [6] N. Noury, A. Fleury, P. Rumeau, A.K. Bourke, G.Ó. Laighin, V.Rialle, and J.E. Lundy, "Fall detection - Principles and Methods,"Proc. Engineering in Medicine and Biology (EMBS 2007), pp.1663-1666.
- [7] F. Sposaro and G. Tyson, "iFall: An Android Application for Fall Monitoring and Response," Proc. Engineering in Medicine and Biology Society (EMBC2009), pp.6119-6122.