Automatic Accident Detection with Android

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Abstract—Android phones are widely used due to its features like GPS, Computational ability, internet connectivity. Various mobile applications used to find solution in day to day life problems. In urban area people faces many problems related to traffic and accidents. Due to heavy traffic ambulance may not reach to accident spot in time because of this delay victim may lose his life. So in order to provide solution for this problem, we develop an android application which will recognise accident automatically and will send notification to nearby emergency services like hospital, ambulance, police station along with his personal information. Global Positioning System is used for locating the car with its speed. User can use this application by registering with his personal details. After detection of accident this application sends the information to nearby hospital, police station, blood bank.

Keywords—ODB-II, eCall, Smartphone sensors, Intelligent Transportation Systems, Avertino, Accident Detection Algorithm, Acceleration Severity Index.

I. INTRODUCTION

In automobile world a large integrated smart technologies is introducing which will lead to efficient and safer vehicle. Nowadays, a latest vehicle come up with highly integrated advanced function utilities such as VANET system, GPS, entertainment application, traffic weather detection etc. inbuilt equipped in car. But then also today road accidents have not reduce in large proportion. This is because occurrences of most probably a delay in providing an emergency help to a person whose accident has occurred. Delay is term as poor quality of an accident detection system. The system quality increases if it efficiently perform its task such as accuracy in tracing a location, smoothly functioning, user friendly, strong signaling.

When accident has occurred a person mentality and physical stability disturbed. So a person is not in such state that he can called an emergency by its own. At a same time, if at required time help is not provided then that person’s death might occur. So this smart work to provide emergency is done by today’s upcoming and leading smart technology that is smartphones. It is better to used accident detection system in smartphone rather than car as it will provide feasibility in cost and updating of application is done easily and instantly.

In this paper we have proposed a system which is automatic accident detection system with android. Accident detection algorithm analyse the sensor fusion data, and if data goes beyond the fixed acceleration severity than accident is detected. After system detect an accident then it launch the countdown activity. Simultaneously it also retrieve the stored emergency contacts and data of particular user from database. If countdown activity if not interrupted then system broadcast the SMS to nearby hospitals, blood bank, relatives and friends. Once it got the confirmation that SMS is delivered successfully then it wait for few sec giving second chance to user. It also provides feasibility in detecting the false alarm. If interrupt doesn’t occur then it launches the voice call. In this way a system process and try to save the lives by providing emergency help in a stipulated time.

There are different technologies such as intelligent transportation system, call system aiming to provide road safety, reduce vehicle accidents and lead to efficient and safer vehicle travel. Technologies efforts are going to minimize the car accidents but it cannot be completely eliminated. In future multiple system is going to be upgraded with launching its upgrade version with an aim of only one, to detect the accidents and to provide help in emergency time.

Now rest of paper is organized as follows, first section includes literature survey where number of paper are studied and analyzed thoroughly. Further section include actual system implementation in detail and final section come up with conclusion and aim that we learn from this work.

II. LITERATURE SURVEY

A literature survey plays important role in research problem as it provide summary, description of research problem is being investigated. It is used to gain knowledge and overview about particular domain in which research is going to be implemented. To demonstrate the existing system it is necessary to understand the domain of system thoroughly. Understanding to system properties and implementation is difficult as it required consistent focus and creative thinking. If we are unable to understand the system procedure, then we are
diverse from solution and it aim. Analyzing and conducting survey of a system is important to achieve complete understanding of system statistics. Number of application with difficult implementation technique has been implemented in order to promote road safety and human safety.

eCall System is proposed in aim to provide emergency help on occurrence of accident European Commission State that from October 2015 there will be eCall equipped car. The Europe emergency sin number 112 is called when accident is detected by eCall system. eCall state that when you need a emergency support it is better to be connected rather to being alone. eCall is one of the big approach in the world of automation[2]. In this automatic accident detection system with android one of the important parts is sensor fusion data. Multiple sensors are required to sensed vibration of car multiple sensors output might be different, inacquaril , inconsistent, noisy methodologies apply proper filtering and procedure on generated output for the ease of system. System has audio output with the delay, high accuracy and clarity. In Android Sensor fusion data concept of android API reference is one of the important approach [5].A VANET (Vehicular Ad-hoc Network) is one of the leading technology in automobile industry. This system also gives future alert by messaging location and severity of accident. On basis of notification, driver can change the route and thus the traffic congestion is avoided. Such function is implemented by audio controller which gives audio output to nearby vehicle in order to avoid collision on basis of changing the vehicle route. To demonstrate this wireless communication analysis of network infrastructure is essential. It leads to qualify communication wirelessly [9]. In vehicle to vehicle communication security of data is also a system which detect the accident on basis of vibration of vehicle. In ad-hoc network of maintain high network performance consistently is assumed to be difficult task. As everything is connected via network (i.e. wirelessly) it is difficult for network infrastructure to manage multiple routing protocols, sensor fusion data, network topology and countdown activity especially [1]. As the number of user, consistently increases it leads to degrade in the system performance. A security strength, latency and performance quality also decreases. In such case many system with different algorithm and smart technique has been investigated as a advanced version of current system such as ICSI (Intelligent Co-operative Sensing for Improving Traffic efficiency) such system with its new architecture and implementation technique intelligently performed task successfully [7].

In this paper, we have proposed a system which detects the accident based on security of gravity provided. If accident is detected the timer is launched. False alarms detection is also provided to void false detection. If timer is not interrupt then system send notification and voice call to nearby hospitals, blood bank and to the stored emergency contact of user. In this way system focuses on achieving road and human safety with the help of smart technologies.

In survey conducted, we studied few papers and concluded aim was that to avoid car accidents different systems with different testimonials are developed. Even there are such systems which come up with combination of advantageous of all other system functionalities to provide better and more efficient system.

III. PROPOSED SYSTEM

This system aims to provide emergency services to users after accident of any car takes place. We are proposing this system only for fully automated cars. After 2015 many cars are fully automated. This system is only for fully automated cars because they contain the sensors such as gyroscope, accelerometer and magnetometer which help for sensing the GPS location and the airbag signal. This system mainly needs a android smart phone. We can connect this smart phone to car with the help of Bluetooth or USD cable. We are using android Smartphone because it has a 3-axis linear accelerometer for GSM/GPRS capabilities for e-Call implementation. The system is mainly going to follow the Accident Detection Algorithm (ADA) which is at the core of eCall system and provide the facility to automatically detect vehicle accidents. The car accident happens due to collision and rollovers. When car collides it produces certain acceleration values which can be used to predict severity of injuries occurred during the accident to the user or passenger.

The acceleration values produced during an accident was studies by authors [9][10] and it was found that some value i.e. 4g (g=9.8m/s^2) is a threshold value above which accident takes place. It is proved in laboratory tests that smart phone can detect acceleration values. For the accurate detection of the collision and the force applied on the vehicle, smart phone should be attached to vehicle with a holder for same forces on vehicles and smart phone. We can use another method also for detecting collisions that is airbag deployment. We can access this information of airbags from OBD-II signals which are received by IT2S ITS-G5 station.

This all above information is for detection of collision now to detect rollovers; the ADA (Accident Detection Algorithm) constantly monitors the orientation of smart phone using a technique called as sensor fusion technique from [10] or we can get this information from android sensor manager API through sensor Manager.
getOrientation() method with the help of dates which is obtained from accelerometer and magnetometer data. But there is noise generated in the output because of magnetometer, the data is with high frequency noise so, for removing this noise from the generated output a low-pass filter is applied. 

On the other hand, the algorithm i.e. sensor fusion algorithm retrieves data from gyroscope is then multiplied with the sampling interval to determine increment in rotation. The event is declared as rollover when the smart phone rotates at least 45 degree over axis of device from its fixed initial position. The activity diagram for running ADA is shown in fig. It uses accelerometer, magnetometer and gyroscope sensor from the android phone. The ADA also uses vehicle sensors data, particularly the signal received after activation if airbag. When the initialization of algorithm is done it monitors 3 data sources constantly:

1) The data coming from USB data frames.
2) Information from sensors of device.
3) The location updates from GPS.

The accidents are detected by algorithm when one of 3 situations occurs that are the deployment of airbag, collisions and rollovers. The sensors are analyzing the frequency and start-up time of device constantly. When the acceleration is below 4g threshold, the process is repeated for next frequency and after the next frequency the 4g threshold value gets extended then we can say that collision is occurred. When the collision is detected the position of device gets checked and if device is in different position from the initial one than 45 degree, the speed of device is checked. The GPS API calculates mean speed and constantly updates it.

After one of these 3 activities occurs, the algorithm is get started and it launches the countdown activity. As per the base paper, the countdown activity lasts till 1 min but if the device is gets misplaced or dropped down due to the accident, by this we are going to add one new feature of beep sound, because of this we can find out our phone and off the countdown and no need to send the notification and we are going to add activity log of user as well.

IV. CONCLUSION

This system will detect the car accident automatically and will give multimodal alert to nearby hospitals, blood bank, relatives and friends. The system take input such as acceleration speed, mean average speed, angle of rotation from vehicle and based on its accident detection algorithm it try to recognize whether accident has occur or not. To avoid false detection countdown activity and false alarm is launch. Application is based on android operating system which is an open source and thus this built up one of its major advantage. The main aim of our project is to save lives and to provide emergency help at accurate time when needed. Using GPS it will detect the location and will broadcast the emergency help message using GSM when accident has occurred. In automobile industry many technologies are emerging to integrate a system which will detect car accident automatically in an aim of to reduce the car accident, to save the lives and to minimize the road traffic hazards. The restriction of our project is requirement of emergency call that is ecall equipped car and android based smartphone is mandatory. We have tried to improve system performance by decreasing its delay. Also we have tried to achieve accuracy in detecting location through global positioning system.

In conclusion paper explored the car accident detector and multimodal alert based on android smartphone by aiming to save the lives.

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