ACCIDENT DETECTION AND ALERT SYSTEM

Nikita Sarade
Computer Engineering
St. Vincent Pallotti College of Engineering and Technology
Nagpur, India
nikitasarade25@gmail.com

Dhawal Madankar
Computer Engineering
St. Vincent Pallotti College of Engineering and Technology
Nagpur, India
dhawalmad007@gmail.com

Palash Shrote
Computer Engineering
St. Vincent Pallotti College of Engineering and Technology
Nagpur, India
palash.shrote.58@gmail.com

Prof. Vaibhav Deshpande
Computer Engineering
St. Vincent Pallotti College of Engineering and Technology
Nagpur, India
vdeshpande@stvincentngp.edu.in

Abstract- **With 17.7% of the global population, India is the second most populous nation in the world. And the death rate in this heavily populated nation is 9.1 fatalities per 1000 people (as of 2022, by Knoema). The variant causes behind the death may or may not be explained as being natural or accidental. But it is possible to effectively examine a strategy for counteracts to any cause of death. This technology tries to lessen the frequency of emergencies by alerting your loved ones if something untoward occurs to you. Helping individuals in emergencies is the main goal of this system. Most of the time, when a road accident happens, neither the rescue crew nor the police authorities are notified right away. To solve this problem, we developed an accident detection system, which will assist the victims in receiving timely rescue and lower the likelihood of fatalities from traffic accidents.**

I. Introduction

Road accidents have dramatically increased along with the rising demand for cars. The growing number of traffic accidents highlights the global road safety crisis and highlights the need to upgrade the infrastructure and system for rescue operations. The police or the rescue squad are typically not notified in time when a road accident happens. The risk of mortality for the victim is further increased by the rescue team's delay in arriving at the accident spot and the traffic between the accident spot and the emergency facilities.

Our project is a solution to the issue; we have developed an accident detection system that will assist the victims in receiving timely rescue assistance and lower the probability of fatalities associated with traffic accidents. Mobile sensors are used by the system, sensors will detect the accident and produce an alarm. The GPS will track the coordinates of the position, generate a reference link for google maps and the alert notification along with the google maps link to the accident spot will be sent to the local police, medical authorities and other emergency services. As a result, the system will immediately alert the local hospital and rescue team of the accident, allowing them to take appropriate action.

II. Literature Survey

Emergency personnel can quickly access vital information thanks to the accident detection and alert system. Mortality rates can be decreased by shortening the time between an accident and it's the emergency facilities. To verify the car's reliability and functionality, the complete work must be connected with it. Thus, even on rural roads, this work will significantly lower the

accident-death ratio. Then it has a great importance in the day-to-day life of the people in a country like India. This proposed work will provide vital information about accidents even in unpopulated areas [1].

The proposed web application can prove to be an important aid in developing smart transport systems in the near future if implemented properly. Also the

system can be used by the owners of the transport companies to monitor the vehicle speed, track its real-time location, anti-theft control using the android application [2].

The purpose of this research is to design a web application that uses mobile phones to detect accidents and report them to the victim's emergency contact to help solve these problems and reduce casualties as much as possible. The detection system would help reduce fatalities due to vehicle accidents by reducing the time to access the emergency services. The system will provide emergency services like police station and medical emergency services, fire brigade.

In this project, we are using smartphones to detect accidents and report them to the emergency contacts, as saved by the user during singing in to the application, with the location of victims along with the link of google maps and coordinates in an emergency. On the emergency contact's side, the system will inform receiver about the incidents that occurred and provide them with location of victims on a Google map. This will help emergency contacts keep track of the victim's location and rescue or reach them straightaway.

This system helps with improved coordination, keeps all relevant bodies and authorities informed, and swiftly alerts them, which also speeds up the process of rescuing accident victims. In most cases, a person involved in an accident is not in a position to communicate with a phone app and request assistance. In this case, based on accelerometer and sensor readings, an accident is automatically detected in the user application. An application for users constantly senses these occurrences.

Lack of first aid services due to emergency services not having timely access to accident information is the most common cause of a person's death in an accident. When it comes to occurrences involving auto accidents, emergency reaction speed is crucial. Analysis shows that if we decrease just 1 minute in accident response time that can increase the chances of saving an individual's life by up to six percent [3]. To reduce reflex time, the evolving traffic technologies (like finding shortest route, route with less traffic) will be helpful, which will help to reduce

reflex time and therefore reduce fatalities. When the system notices an accident, it will automatically summon the emergency services and send an SMS with information about the accident to the user's designated emergency contacts.

The topic of using smartphones to identify traffic accidents is not new. Since 2011, there have been completed algorithms for systems that use smartphones to identify automobile accidents with both GPS and accelerometer data. We opted to create a comprehensive system with the ongoing project in mind that is more reliable and functional than the existing ones because there has already been a lot done on the issue.

III. Objective

Our objective is to develop a smartphone application that can identify car accidents and notify the appropriate authorities and contacts. The purpose of this program is to enhance communication between accident victims, their loved ones, and regional authorities. This application helps with improved coordination and informs all relevant authorities and bodies. It instantly alerts them, which also saves time when saving an accident victim. By determining whether the tremors and noise detected by the device surpass the anticipated threshold, the application will determine whether an accident has occurred.

IV. Proposed Approach

This web application is designed for better coordination and keeps all the concerned bodies and authorities informed, updated and alerts them quickly which saves time in rescuing an accident patient. When a person meets an accident, he is usually not in a condition to ask for help from any of the emergency services. In such a situation accident is detected automatically in the application based on accelerometer as well as sensor reading. Application continuously senses such accidents when the user is driving the car.

When an accident is detected, the app immediately allocates and notifies the local hospital and police station of the casualty's position and sends an alert. This aids in preparing and updating the designated hospital. Additionally, the user's information is shared with the hospital and police, enabling the

hospital to access the patient's medical data and the police to obtain the user's pertinent information in the event of an accident.

Once the patient has been taken to the hospital, the ambulance will continue to update the situation. If a patient is admitted, the hospital's app allows them to update their status. This aids in preparing and updating the designated hospital. Additionally, the hospital and police are given access to the user's details, enabling the hospital to view the patient's medical records and the police to see the information they need in the event of an accident.

All emergency services that can rescue a person in an accident are integrated in this application to keep them informed, updated and alert and provide them with the necessary information on their phones via the application, to do all the needful to rescue a patient.

The application automatically notifies the user of an accident. In the event of a false alarm, the user is also given the choice to stop the alert before it is issued by the app in the notification bar.
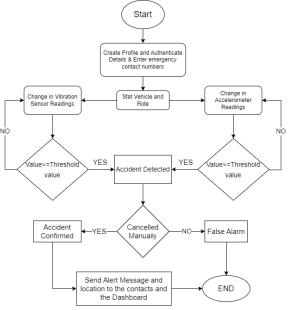

Fig. 1.1

V. Present Work

This application helps to improve coordination, keeps all relevant bodies and authorities informed, and immediately alerts them, which also cuts down on the amount of time it takes to rescue an accident victim. In most cases, a person involved in an accident is not able to communicate with a phone app and request assistance. mishaps in this condition are automatically detected by the user app based on sound readings and sensor readings, and the user app continually listens for such mishaps. When an accident is detected, the app immediately allocates and notifies the local ambulance, the local hospital, and the police.

A. Authentication And User Interface Module
This module is used by the user to access the system and provide functionality like sign-in / log-in.

B. Accident Detection Module
The accelerometer reading and gyroscope impact are sensed as when the values exceed a certain pre-determined threshold alert is sent to the concerned.

C. Location Tracker Module
It displays Google Maps and shows you the exact location of the accident and its details. It gets details from an SMS from the accident location.

D. Accident Detection Alert Module
It generates an alert once an accident SMS arrived at System and displays the casualty location where it automatically tracks the accident location based on the position specified in the SMS and Generates some kind of alarm. It continuously checks the status of the sensors and determines the impact signal that meets a pre-defined threshold. The impact sensors used in this system are based on accelerometers.

E. Dashboard module
It is a web application that will be for hospitals and police stations to receive victim details like location, and medical history.

Our project is now operating as follows:

- The accident detection and alert system will provide users with an interface to authenticate their details and set their profile (e.g., contacts, medical history, etc.).

- When the user activates the application, the application will start detecting vibrations in accelerometer readings.

- If an accident is detected it will generate and send alerts to contacts provided by the users and web application at nearby hospitals and police stations.

- This system has a great scope which can be implemented on a large scale by medical teams and police authorities together to address and handle accident cases more efficiently.

VI. Technologies Used

A. Smartphones

Smartphones are mobile computers which have much more functionalities than a regular mobile phones. Smartphones have built-in sensors, network interfaces, messaging services for alert notification.

B. Android & iOS

Android is a open-source mobile operating system that was developed for phones, tablets, watches, TVs, cars, and other electronic devices [4]. Everyone has full access to the Android source code. It is the most popular mobile operating system. iOS is not open-source, for iPhones.

C. Android Studio

Android Studio is Android IDE (Integrated Development Environment) which gives an environment for Android development. It allows writing code with auto-completion tools, debugging, testing [5], running the code on a physical or a virtual device, and setting programming-related or visual preferences. Java and XML are the only languages required to create Android applications with Android Studio [6]. It is possible to develop Android applications with Eclipse by using the Android Developer Tools plugin, but it is no longer supported by Google [7].

D. Flutter

Flutter is Google's portable UI toolkit for crafting beautiful, natively compiled applications for mobile, web, and desktop from a single codebase. Flutter works with existing code and is used by developers and organizations around the world, and is free and open source.

E. Dart

Dart is a programming language used to build mobile and web applications on various platforms. It has easy-to-use applications that can be utilized to work on both the user and server ends. Dart is used to build high-performance mobile or web applications. It's the basic programming language for the Flutter framework and is used to build scalable mobile applications. Being a general-purpose programming language, it is used to build native mobile apps for Android or iOS, desktop apps, and servers.

F. Accelerometer

An accelerometer works by sensing acceleration affecting the accelerometer to determine the G-forces affecting the accelerometer [8]. Proper acceleration means acceleration that is relative to free fall [9]. An object in free-fall would as such have no acceleration affecting it while an object at rest on the surface of the earth would experience an acceleration of 9.81 m/s2 upwards due to the surface pushing the object (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 9, No. 6, 2018 343 | P a g e www.ijacsa.thesai.org upwards to negate gravity. Accelerometers in smartphones base their functionality on micro-electromechanical systems (MEMS), which measure electric currents based on compression of a seismic mass, often silicon, caused by acceleration [10].

G. Google Play Services

Google Play services provide useful features, for example, Google Maps and many more. The services include the Google Play services client library and the Google Play services Android Package Kit. Important functionalities in Accident detection and Alert System, such as viewing a map and obtaining a user's location, rely on the google services.

H. Google Location API

The Google Location Services API [11] is part of the Google Play Services and provides a more robust, high-level framework that automatically chooses a suitable location provider. Location Services also provides new features like activity detection which is not provided by framework API.

I. Android Google Map API

The Google Maps Android API is a service that is part of the Google Play services library. Allows access to Google Maps server automatically, displaying a map, downloading data, and map gesture response. It also allows the addition of markers, polygons, and basic map overlays, and to

transition the user's context of a specific map area [12].

K. Google Places API Web Service

The Google Places API Web Service is a service that returns information about places like locations, geography, establishments, and prominent points of interest using HTTP requests [13]. The main alternative to Google Places API is Foursquare Venues. In the free version, Google Places allows 150000 queries per day [14] and Foursquare Venues allows 120 000 queries per day [15].

K. Google Directions API

The Google Directions API [16] is a service that uses HTTP requests to calculate the distance between locations. When calculating directions, the API returns the most economic routes. The API decides which route is most efficient based on travel time, number of turns, distance, etc.

L. Firebase

Firebase is one of many implementations of the BaaS model. Like other BaaS implementations, Firebase provides storage, push notifications, user authentication, and a database. Besides the basic BaaS features, Firebase also gives a test lab that permits testing a Firebase-connected application with different configurations and devices. A feature that makes Firebase different from other BaaS implementations in the real-time database. When new data is added to the database, it becomes accessible instantly to all the users of the application.

Conclusion

In this study, we created an accident detection and alert system that uses an accelerometer sensor on smartphones to detect accidents, generate alerts, and send them to the emergency services nearby. It also sends an SMS to an emergency contact with the accident's location information. The system's real-time location tracking capabilities for both victims and responders will significantly improve an accident victim's chance of survival by delivering emergency care on time. On a real-time Google map, emergency responders will be able to pinpoint the victim's location.

A smartphone-based accident detection and rescue system will inevitably have false positives. To lessen these problems, we implemented a few features. Here is one reason that we included to cut down on false positives.

- Timer alert: On detection of an accident, the system will present an alert dialog with 30 sec (by default) count down, which the user will be able to cancel in case the accident didn't occur. These also can be used when a false accident is detected by the application user can stop the alert to avoid panic to the emergency contacts.

In order to make the accident detection component of future work more dependable and accurate, which will assist to reduce false positives, more research is required. The system's reliability and accuracy will be greatly improved by the addition of additional sensors, such as a gyroscope, microphone, camera (to automatically take pictures of the accident), and a voice recognition module to detect noises made during a vehicle crash, such as noises made when airbags are deployed.

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