



Shri Ramdeobaba College Of Engineering and Management, Nagpur

Department of Computer Science and Engineering

PROJECT SYNOPSIS

on

“Design and Development of

An Accident Detection and Alerting System”

7th Semester, CSE [Shift 2]

Group Members :

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Project Guide :

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1. PROJECT TITLE : Accident detection and emergency alerting system

Now-a-days, due to increased traffic and human recklessness, there has been a huge rise in road accidents. And many-a-times, these accidents either remain unnoticed or get addressed late if it occurs in some isolated place. The local police authority or ambulance is not informed on time, and it results in delayed assistance for the affected person. Often, the accident cases are critical and every second is precious for saving the life of victim, but due to late addressal, the chances of proper treatment reduces. At such times, emergency resolution is necessary but due to lack of proper system the problem remains as it is.

2. PROBLEM DEFINITION:

Accident detection and Emergency alerting system is a real-time based application designed to avoid accident based scenarios, and to make the localites and official authorities such as police and paramedics aware of the situation instantly as soon as a critical accident takes place with the help of an integrated alerting system.

3. AIMS AND OBJECTIVE :

According to the World Health Organization, 1.35 million deaths were estimated per year .i.e. one death at every 25 seconds.[1] And the major reason behind death isn't the criticality of accident, but the delay in emergency assistance. We see many cases where people die on the road due to unnoticed road accidents. This becomes a usual case at nights. There are some systems that address the accidents as soon as it takes place but the major flaw is that they are expensive, and hard to maintain as they are entirely based on external hardware.

The proposed system focuses on reducing the time of accident detection and increasing the chances of emergency services assistance for the victim. The objectives of the current system are as shown below:

1. To identify the accident and its severity and to make the nearby authorities aware of the case.
2. To alert the localites nearest to the site of accident so that the accident gets noticed as soon as possible.
3. Detection of accident and improvisation of the same for effective addressal of accident, in such a way that alerts are sent only when the accident is occurred.
4. To process the driving habits of the driver and to keep track of it to make the system smart of the person involved in commute activities.
5. To determine accident on the basis of different environmental factors, human errors in order to increase the effectiveness.
6. To research on this system furthermore and publish it in a form of research paper.

4. BENEFITS :

The system accounts for improvisation of the accident alerting and benefits the user in many different ways. It can result in reduction of accidental deaths and increase in improved emergency services. The application or system can benefit the user in following possible ways:

1. **Localization:** Accident alerts are given to the nearest control station such as police station on the very first moment of collision. This results in reduction of late emergency services. Use of GPS helps in giving the precise location results so that the rescue team can be reached to the site of accident easily.
2. **Rescue notifications:** Alerting system that notifies the contacts and also the nearest population to the victim so that supervision or aid can be received immediately.
3. **Cost effective system:** The existing systems are costly and require quite maintenance as they are hardware based. But as the current proposed system is based on mobile based sensors and requires less or no dependency on external hardware, accessibility to the application is quite cheap and easier.

5. PROPOSED PLAN OF WORK :

Week No.	Start of Week	Work description	Status
1	01/07/2019	a. Case study and literature survey b. Analysis of available systems c. Initiation of documentation of the project synopsis	
2	08/07/2019	a. Submission of project synopsis b. Project based research of accident statistics c. Study of accidents and its characteristics	
3	15/07/2019	a. Determination of the available resources b. Mapping the characteristics with available resources	
4	22/07/2019	a. Recognizing the available services for development b. Ordering of the processes involved in development c. Determining the project hierarchy	
5	29/07/2019	a. Determination of the database requirement b. Design of the database structure and hierarchy	
6	05/08/2019	a. Creation of a representable model of the system b. Documenting the requirements and specifications c. Documenting the database design	
7	12/08/2019	a. Initiation of the project development b. Building the user interface prototypes c. User interface and API based unit development	
8	19/08/2019	a. Implementation of the available frameworks b. Unit based implementation of API's c. Programming location based services and required modules	
9	26/08/2019	a. Using Firebase services and Google Cloud services b. Development of database and it's queries c. Analysis of the results generated by each module	
10	02/09/2019	a. Integration of the modules and synchronizing its results. b. Incremental tests for the modules used in application. c. Testing the modules which are based on integrated services	
11	09/09/2019	a. Field testing of application b. Generating statistics from the results of application c. Comparative analysis of statistics d. Bug testing and user experience analysis	
12	16/09/2019	a. Documentation of the project report b. Creation of a repository for project and documenting it	

6. METHODOLOGY :

To achieve accuracy for accident detection and to reduce the false positive scenarios, the system takes various environmental cases and parameters as input. These environmental factors are calculated with the help of android device based sensors instead of IoT based sensors. These parameters altogether make the detection and alerting mechanism effective. Cases which are considered primarily are as follows:

1. Deceleration or retardation :

This parameter keeps a check on the linear acceleration of a vehicle and is calculated using the acceleration sensor of a device. Usually, a vehicle which has the continual average speed will not reduce its speed unless the rider experiences some unusual situation such as accident or speed bumps or potholes .etc. However, whilst facing a speed bump or pothole, the deceleration won't be instant but gradual. Moreover, during accidents, the speed descent is instantaneous and can be classified under a situation of accident, provided if it meets some other criteria. For classification, threshold is maintained and is checked constantly along with some other factors.

2. G-Force :

G Force denoted as g_0 is the gravitational force equivalent and is a measurement of the type of force per unit object. The G-Force acting on the user is continuously kept track of. A typical person can handle about 5 g_0 (49 m/s^2) .i.e. some people might pass out when riding a higher-g roller coaster, which in some cases exceeds this point before losing consciousness. The system maintains a threshold of 4 g_0 below which a rider is considered to be safe. When this value crosses the threshold, it indicates that the scenario is more of an implication of accident.

3. Rollover :

When a vehicle rolls over in an accident - in this case the vehicle while travelling meets with an accident in such a way that it experiences a sudden rotation. The orientation of the vehicle changes along with the impact experienced on it. Hence an accident is detected. This is assumed to be a critical situation. Android based Gyroscope sensor keeps track of the rotation along the three axis and if a huge change in values (more than 45 degree) is encountered, chances are that an accident has occurred. The rate of rotation is used for evaluating if the vehicle has rotated to its side or flipped completely.

4. Voice :

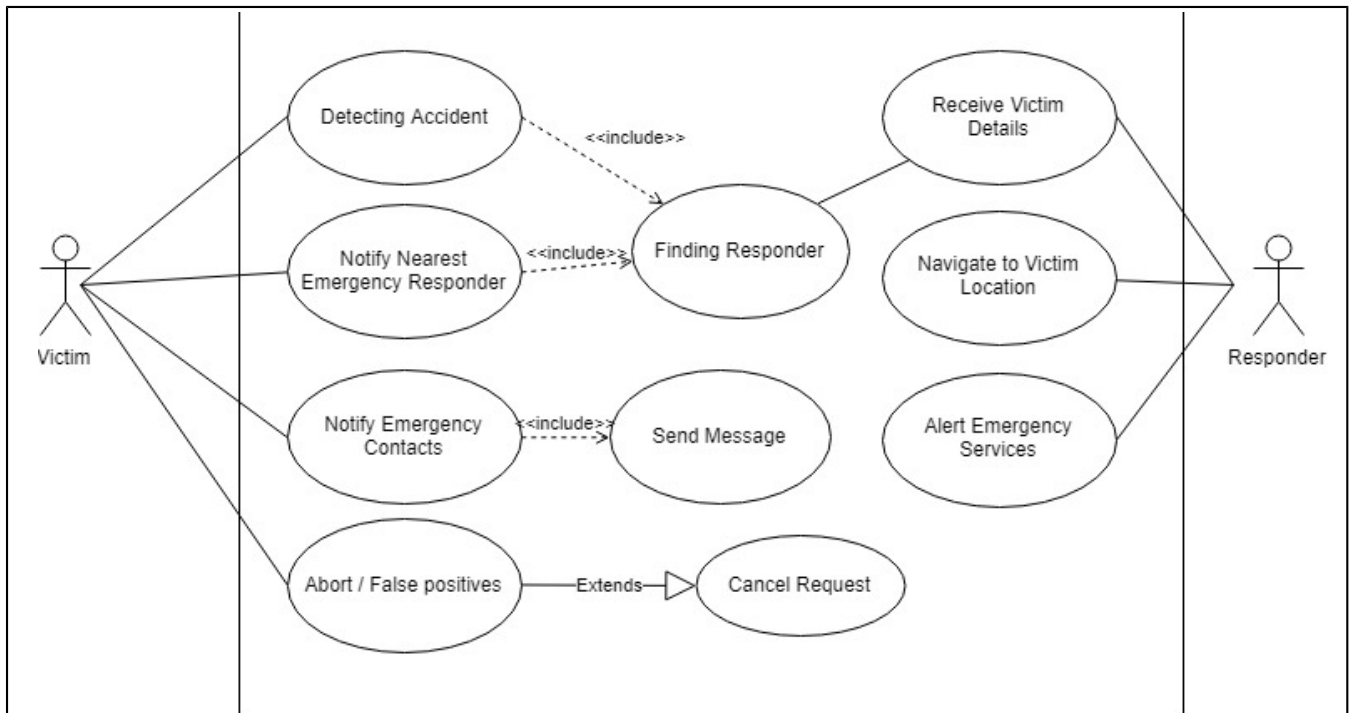
Accidents are abrupt in nature i.e. they occur suddenly. When accidents are met, apart from the above mentioned factors, voice recordings play a major role. The unit of measurement of voice is Decibels (db) and it is constantly tracked when a commute is taking place. There is a huge probability that during an accident, there can be a spike in noise or auditory levels. The microphone keeps track of surrounding noise and its levels, and it might be a risk scenario if the voice level has spiked up.

5. Fall detection :

The way in which a device falls is a major factor for classification of accident. A fall of device can be of two types, either it's a free fall or an abrupt one. A free fall takes place when only one of the three axis encounters a instantaneous change, whereas in a abrupt fall, more than one axis undergo a change. This factor is a huge classifier for accident detection as accident involves abrupt fall of device than a free fall.

6. Time factor :

The time span in which an accident takes place is important. Many a times, the acceleration speed or rotational value undergoes a change, but accident can't be classified merely on its basis. The major factor is the time for which a change has occurred and whether the device returns to its previous working state or not. If the values undergo an abrupt change and the values then goes to a rest state or halt, then the chances of accident are high.



USE CASE

These factors altogether help in classification of an accident from a normal scenario. The multiple number of parameters help in determining accidents with huge accuracy. The project development methodology is as follows :

1. Software Requirement Analysis :

- Case study and literature survey of accidents, types and its statistics.
- Case study of systems available for accident detection and it's accuracy.
- Study of factors affecting accident and methods to track them programmatically.

2. System Design :

- Analyzing the independent modules required and processes involved for the application and documenting it.
- Wireframing the modules, processes, API's and refining it until an effective integrated design is made.

3. Coding :

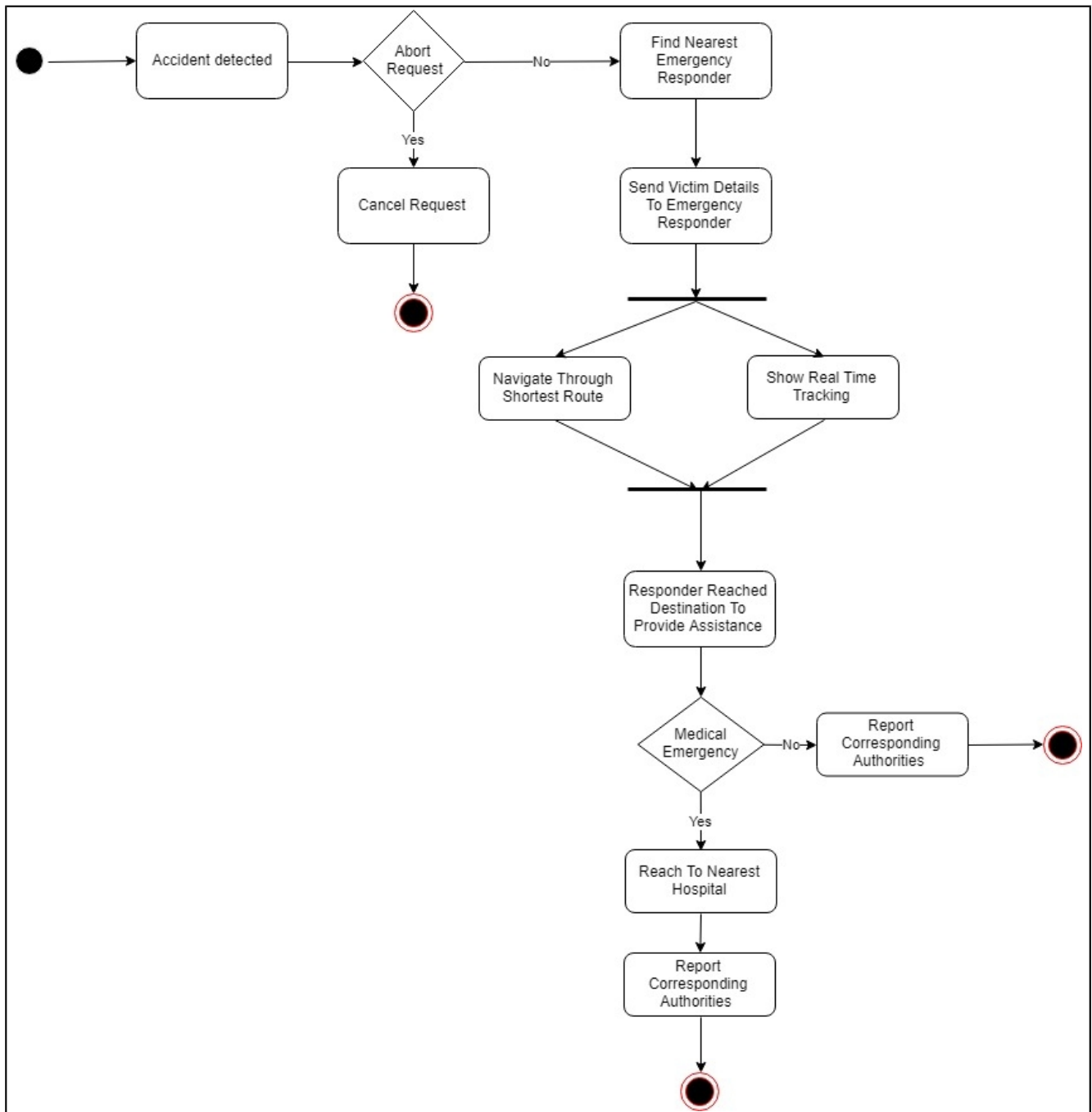
- Implementation of the preplanned user interfaces and involvement of components for better user experience.
- Programmatically implementing the required sensors and using it within the half-baked application.
- Programming location based services and its related modules.
- Using Firebase services and Google Cloud based platforms.

4. Implementation :

- Integration of the modules and synchronizing its results.
- Validating the actual implementation of application with the preplanned design schema.

5. Testing :

- Testing the integrated services of location services, firebase and cloud services.
- Field testing of application and determination of ways to improvise on accuracy of result.



ACTIVITY DIAGRAM

7. TECHNOLOGY :

1. Development software used :

- a) Java Development Kit 1.8
- b) Android Studio 3.2
- c) Android SDK API 29
- d) Firebase Web Services and Database
- e) Firebase cloud messaging

2. API's used :

- a) Google Location API

- b) Android Google Map API
- c) Google Places API web service
- d) Google Directions API
- e) Retrofit
- f) Geofire

3. Android Sensors used :

- a. Accelerometer
- b. Gyroscope
- c. GPS Sensors

8. DELIVERABLES :

The deliverable comprises of an integrated application for the end user which will allow him/her the following services or features :

- 1. Application allowing the user to register his/her details.
- 2. Feature to add emergency contact within the application.
- 3. Enabling the user to view history of previous accidents.
- 4. Availability to switch the alerting and tracking system.
- 5. Enabling user to request or cancel emergency services.
- 6. Availability of post-accident services and track up