Course Project Report

ACCIDENT PREVENTION SYSTEM

Submitted By

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as part of the requirements of the course

Soft Computing (IT402) [Dec 2023 - April 2024]

in partial fulfillment of the requirements for the award of the degree of

Bachelor of Technology in Information Technology

under the guidance of

Dr. Nagamma Patil, Dept of IT, NITK Surathkal

undergone at

DEPARTMENT OF INFORMATION TECHNOLOGY

NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

March 2024

DEPARTMENT OF INFORMATION TECHNOLOGY

National Institute of Technology Karnataka, Surathkal

CERTIFICATE

This is to certify that the Course project Work Report entitled **“Accident Prevention System”** is submitted by the group mentioned below -

Details of Project Group

Name of the Student	Register No.	Signature with Date
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This report is a record of the work carried out by them as part of the course **Soft Computing (IT402)** during the semester **Dec 2023 - April 2024**. It is accepted as the Course Project Report submission in the partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology in Information Technology.**

(Name and Signature of Course Instructor)
Dr. Nagamma Patil

DECLARATION

We hereby declare that the project report entitled **“Accident Prevention System”** submitted by us for the course **Soft Computing (IT402)** during the semester **Dec 2023- April 2024**, as part of the partial course requirements for the award of the degree of Bachelor of Technology in Information Technology at NITK Surathkal is our original work. We declare that the project has not formed the basis for the award of any degree, associateship, fellowship or any other similar titles elsewhere.

Details of Project Group

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Place: NITK, Surathkal
Date: 21/03/2024

Experimental Study Web Application for Accident Alert System

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I. INTRODUCTION

Web applications are essential for several reasons. They offer many advantages, one being they perform all of the necessary functions utilizing a web browser instead of installed software. Plus, cloud-based functionality has web apps becoming an essential component of business in today's expanding world. Organizations are embracing and creating web applications with the help of developers to meet their business demands. Considering the these advantages we set out to build an web applications for Accident Alert System.

In today's modern world, things are moving so fast that no one can spare a single minute to stop and look back at what is happening. The sudden raise in the population has unavoidingly increased the number of vehicle accidents on road, there are many lifes lost in these accident everyday. The report from World Health Organisation says that approximately 1.35 million people are dying in road accidents. Some of the major reasons for accidents is due distracted driving, druken driving, over speeding,etc. Report says that almost 55% of the life is lost in highways because of the negligence to report the accident to hospitals by the local people or passer-by vehicles. A person who survived an accident eventually loses his/her life because of lack of immediate medical responses. There are no system built inside the car to alert the hospital, ambulance and family members in case of an accident. These fatality can be cut down by using an automatic alert system. The objective of this will be to reduce the accidents fatalities by sending a SOS message to the hospitals, ambulances and family members, so that the medical team can arrive to the accident location immediately without much delays. This system is considered to be critical as it will immediately intimates to the family of the victim, ambulances and hospitals. A person surviving an accident might lose his/her life due to delays in immediate primary health care, this can be avoided by this system. The paper is divided as many sections, starting with methodology developed, algorithms developed, details of experimental set-up/ tools / platform, stages of executions of the experiment, results in pictorial/ screen shots. Each of these section are explained in details in further part of paper.

II. DIAGRAMATIC EXPLANATION

There are two major types of users in our Accident Alert System:

1. Public User/ Vehicle Driver
2. Hospital/ Ambulance Driver

Each roles plays significant part in our system to make our system work efficiently and help reduce the fatalities in road accidents.

1. Public User/ Vehicle Driver:

This is a separate module in our system, so we developed a separate User Interface for this module. As the name suggests, the public users are one of the main actors in our system. They are victims how seek medical help in case of an accidents. The figure-1 below displays the diagrammatic flow in our system.

In the user module, if the user is new to our system he has to register by providing few important details like name, phone number, email, username, password. As the system has to send message to user family in case of accident we required the users family details, the system ask for three emergency contacts details like name, phone number and email. If the user is already registered he can login to our system using username and password. After logging in onto our system the user is directed to our home page where few details about our system and about the developers are displayed. Then the user can navigate through other sub-modules of User module such as SOS module which will allow user to send SOS message to ambulance, hospital and emergency contacts. Route module which will navigate user to their desired location on map with directions, approximate time and distance displayed. Nearby Places displays the nearby pharmacies, hotels, and restaurants. The implementation of these modules will be explained in detail in further part of paper.

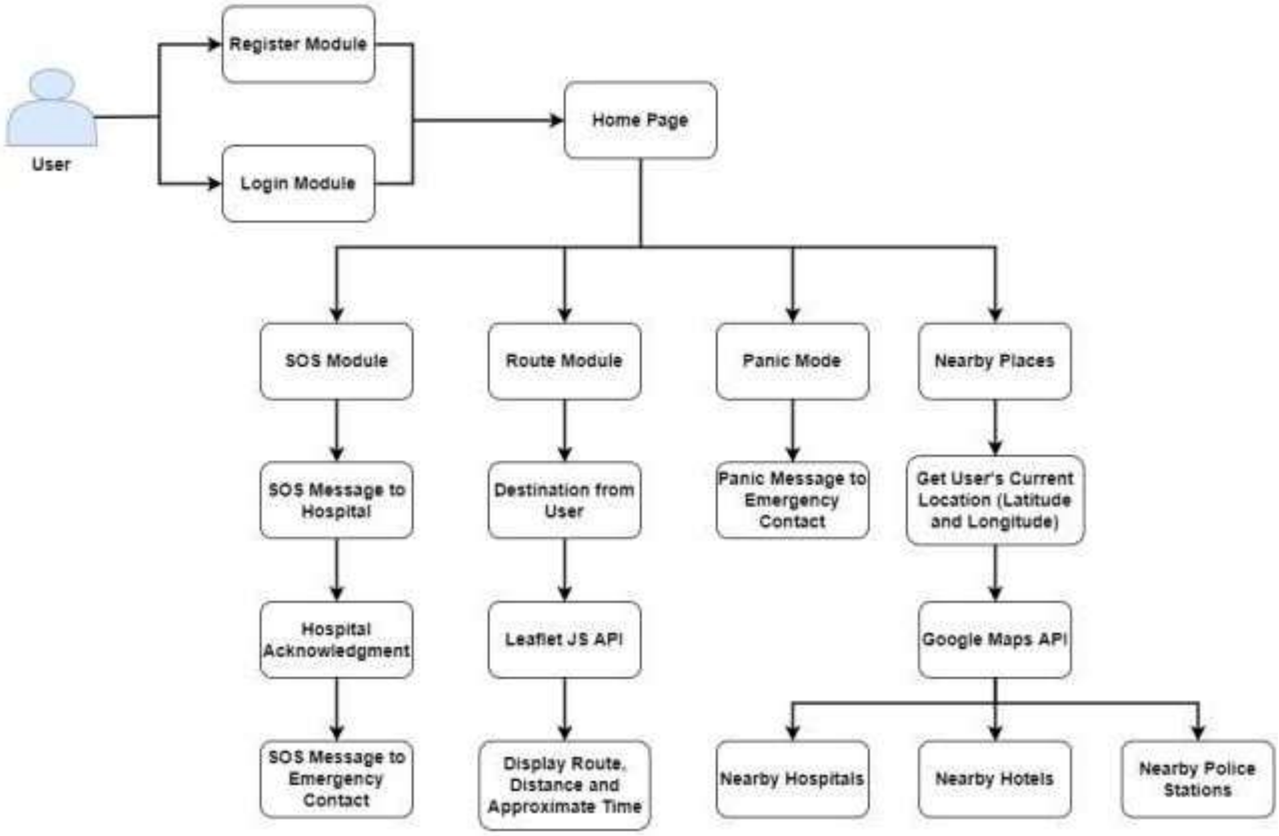


Figure-1 Diagram for User module flow in our website

2. Hospital/ Ambulance Driver:

This is also a separate module in our system, so we developed a separate User Interface for this module. This module is developed for the hospitals to register to our system so that they could get information about the accident as soon as an accident is detected in our system rather than to wait for passer-by to call the hospitals to inform about accident. Here, the ambulances of the specific hospital can login to our system using the hospital credentials so that many ambulances can get information about the accident and can reach to the location of accident as soon as possible. The figure-2 below displays the diagrammatic flow of hospital/ ambulance driver module in our website.

Similar to the public user module, if the hospital is new to our system, they have to register to our system by providing a few hospital credentials like – hospital name, hospital address, and hospital phone. The system will allow the hospital to set passwords for login. If the hospital is already registered to our system they can log in using the hospital name and password. After successful login, it will direct to home page of our system. From home page, they can navigate to different sub-module of hospital/ambulance driver module. There are two important sub-modules in this module – Accidents and Route to Accident Module. Accident module displays the list of accidents occurred which are ordered by time of the accident and some other important details like victims' username, name, location of accident in terms of longitude and latitude for more accurate location instead of conventional naming. The route to accident module gets the current location of the ambulance driver and asks the driver to enter the longitude and latitude of location of accident, then it navigates the user to the location of accident and also displays the approximate time and distance to the location of accident. These modules will be discussed in details in further part of this paper

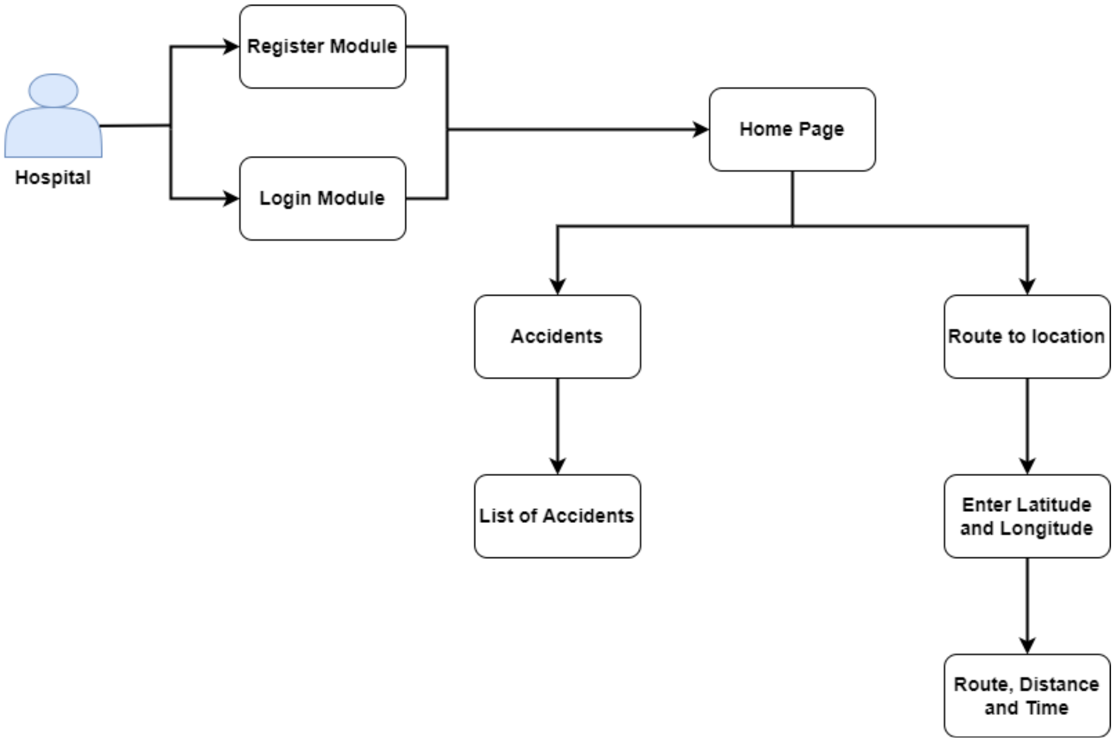


Figure-2 Diagram for Hospital module flow in our website

III. METHODOLOGY

In our Accident Alert System, we used a different methodology to build efficient software that would be robust and reliable. There are two methodologies that we used in our system, the first one was to use Social Networking Service to get initial user requirements, and then we used a social software engineering approach to design our website with its advantages.

In the idea proposed in the paper [1], we selected users who use social networking services to collect requirements from people on social networking sites like Facebook, Instagram, and WhatsApp (end-users). This method was cost-effective, easy to implement, and fast relative to any other small-scale system or product method. In this method, we used functionalities that are already present in the social networking app to collect ideas from the users. The comment functionality mentions what the users would want the system or product to be and like features for prioritizing their needs. For these tasks, no prerequisites were required of the participants. New stakeholders got involved because their friends are already participating, thus embedding participation in their relationship. Collecting user requirements started with us (system developers) posting information about our product on social networking sites. Users commented on their ideas in the comment section related to the post. We collected these ideas from the comment section and divide their ideas into two blocks: clear ideas and unclear ideas. The unclear ideas were clarified by one-to-one chat/discussion with the users. After this, we created groups based on the ideas mentioned, then we invited participants to these groups to brainstorm on this idea to elicit more information about ideas. In the next phase, we interpreted ideas into requirement and prioritized them using Google form. The flow of SNS based approach can be visualized from the figure-3 below.

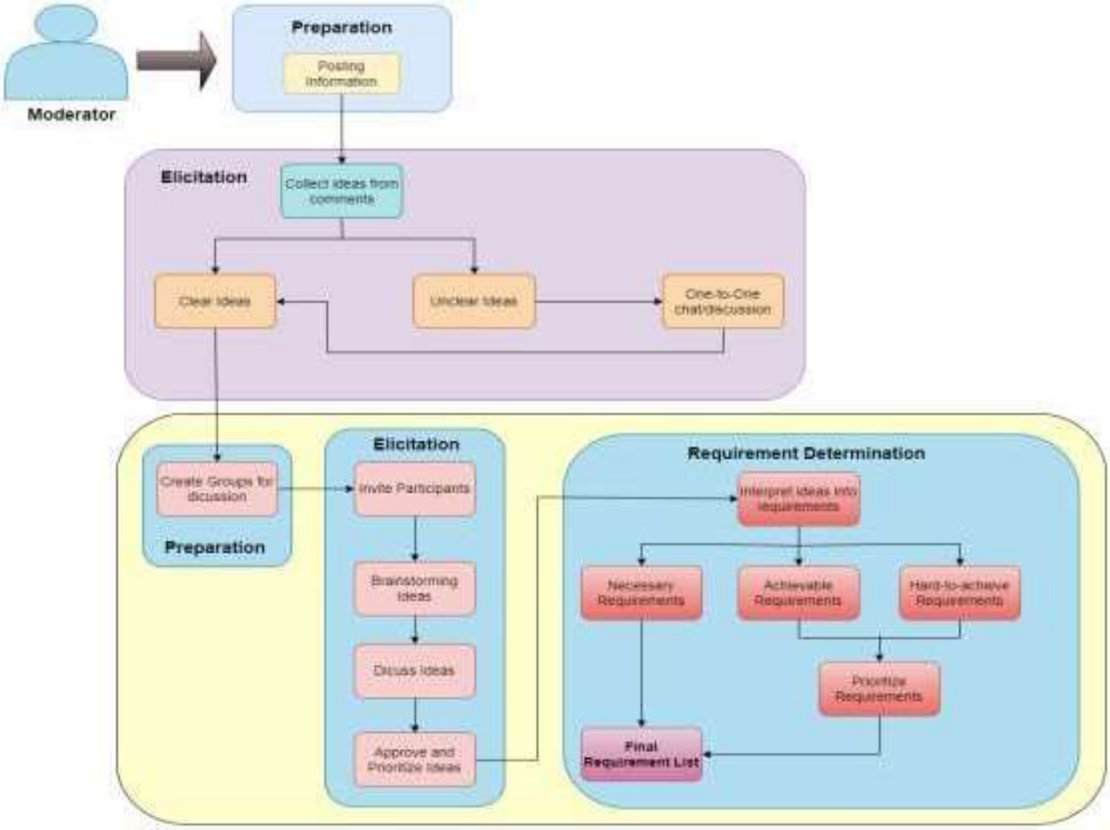


Figure-3 SNS based approach for Accident Alert System

We employed a Social Software Engineering Approach in the design phase of our system as described in paper. Our methodology uses an agile software development life cycle model. Along with that, we made sure that the proper attention is given to participatory design and its intersection with design thinking for development. By using Participatory design, we involved the end user in the actual design part of the software that we designed. We followed an iterative pattern to the user-centered design cycle. There were several phases that are performed in every cycle of the process. After the requirement engineering was completed, the next phase involved the creation of multiple prototypes of the requirements that were mentioned in the requirement engineering. These developed prototypes were presented to the end-users or participants of RE before going ahead with the next phase of implementation. In this phase, several branches of the prototype tree were eliminated and the leftover branches proceed to further phases of development.

IV. SOFTWARE ARCHITECTURE

There are many types of software architecture, but the one that is more suitable for our system is the client-server architecture. The client-server architecture is a distributed application structure that partitions tasks or workloads between the providers of a resource or service, called servers, and service requesters called clients. In the client-server architecture, when the client computer sends a request for the data to the server through the internet, the server accepts the requested process and delivers the data packets requested back to the client. The client-server architecture can be visualized in figure-4 below.

Here, in our system, the clients are the public users and hospital/ambulance drivers. These two module requests data like accidents list, current location, and nearby places to the server which is a remote computer that provides information (data) or access to particular services.

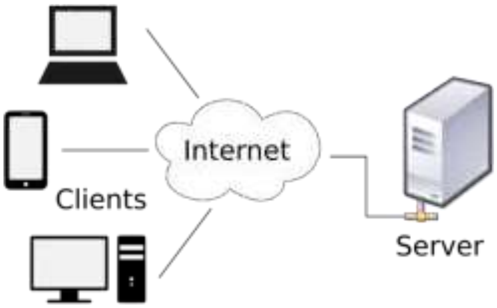


Figure-4 Client-Server Architecture

There are few main reasons for using client-server architecture, some of them are-

1. We can store and computer all the data in a single place.
2. It is cost efficient, requires less maintenance cost and data recovery is possible.
3. The capacity of the client and server can be changed separately.

V. ALGORITHMS

We developed a simple algorithm in our system that helped in finding out the nearest ambulance to the location of the accident.

Algorithm 1:

I. When an Accident is Detected, add the location (longitude and latitude) of the accident to the database.
II. The details of accident will be displayed to all registered hospital's ambulance driver.
III. A buffer time will be set, where the ambulance should check the approximate time to location of accident from their current location using 'Route to Accident' module.
IV. Within the buffer time they have to add entry to database.
V. Based on approximate time, the accident will be assigned to a ambulance.

Algorithm 2:

The route module in User and route to accident module in Hospital/ambulance driver module uses Dijkstra's algorithm to find the shortest distance between source and destination.

```
function Dijkstra(Graph, source):
    for each vertex v in Graph:
        dist[v] := infinity
        previous[v] := undefined
    dist[source] := 0
    Q := the set of all nodes in Graph
    while Q is not empty:
        u := node in Q with smallest dist[ ]
        remove u from Q
        for each neighbor v of u:
            alt := dist[u] + dist_between(u, v)
            if alt < dist[v]
                dist[v] := alt
                previous[v] := u
    return previous[ ]
```

VI. DETAILS OF EXPERIMENT

Set-up:

Database, we used a Relational database in our system to store data in the backend. We created a few important tables like public user, hospital, and accidents. As our database was small and the number of tables was less, it suited best to use MySQL (RDBMS).

We used PHPmyadmin to manage all the data in the database, as it give a better user interface as compared to MySQL command line.

Languages:

HTML: It is the most basic building block of the web.
CSS: It is a computer language for laying out and structuring web pages.
JavaScript: It is the programming language for the web, that can update and change both HTML and CSS.
PHP: It is a open source scripting language, which executes on the server side.

Tools:

Geolocation API: It allows the user to provide their location to the web application. For privacy reasons, the user is asked for permission to report location information. Here, we are using this tool to get the current location of public users and ambulance drivers.

Google Maps API: It allows developers to embed Google Maps into our application, or to retrieve data from Google Maps. Here, we will be using Google Maps API to re-direct the user to Google Maps application to show nearby places. The API includes the current location of the user and displays relevant details.

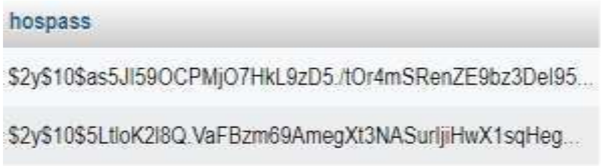
Leaflet JS: It is an open-source JavaScript library for mobile-friendly interactive maps, it has all the mapping features most developers need. We used Leaflet JS in the route and route to location module in our system.

OpenStreetMap: It is an open-source completely created by users, and it's free to use. We use this tool in navigation from source to destination. We also used this tool in calculating the approximate time and distance to travel.

password_hash(): It is a function in php that is used to hash the data. It takes two arguments data and algorithm for hashing. Here, hashing plays a major role in protecting users' login credential. In case the is hacked, the users details like username and password will be visible to hacker as plain data, password_hash() prevents this by hashing the password, so that the hacker cannot login using the credential to our website.
Figure-5 is the screenshot taken from a the entry in hospital table which uses password_hash().

Code:

```
password_hash(password,PASSWORD_DEFAULT)
```



hospass
$2y$10$as5JI59OCPMjO7HkL9zD5./tOr4mSRenZE9bz3DeI95...
$2y$10$5LtloK2I8Q.VaFBzm69AmegXt3NASurljiHwX1sqHeg...

Figure-5 Hashed Password Screenshot

VII. LOGICAL DESIGN

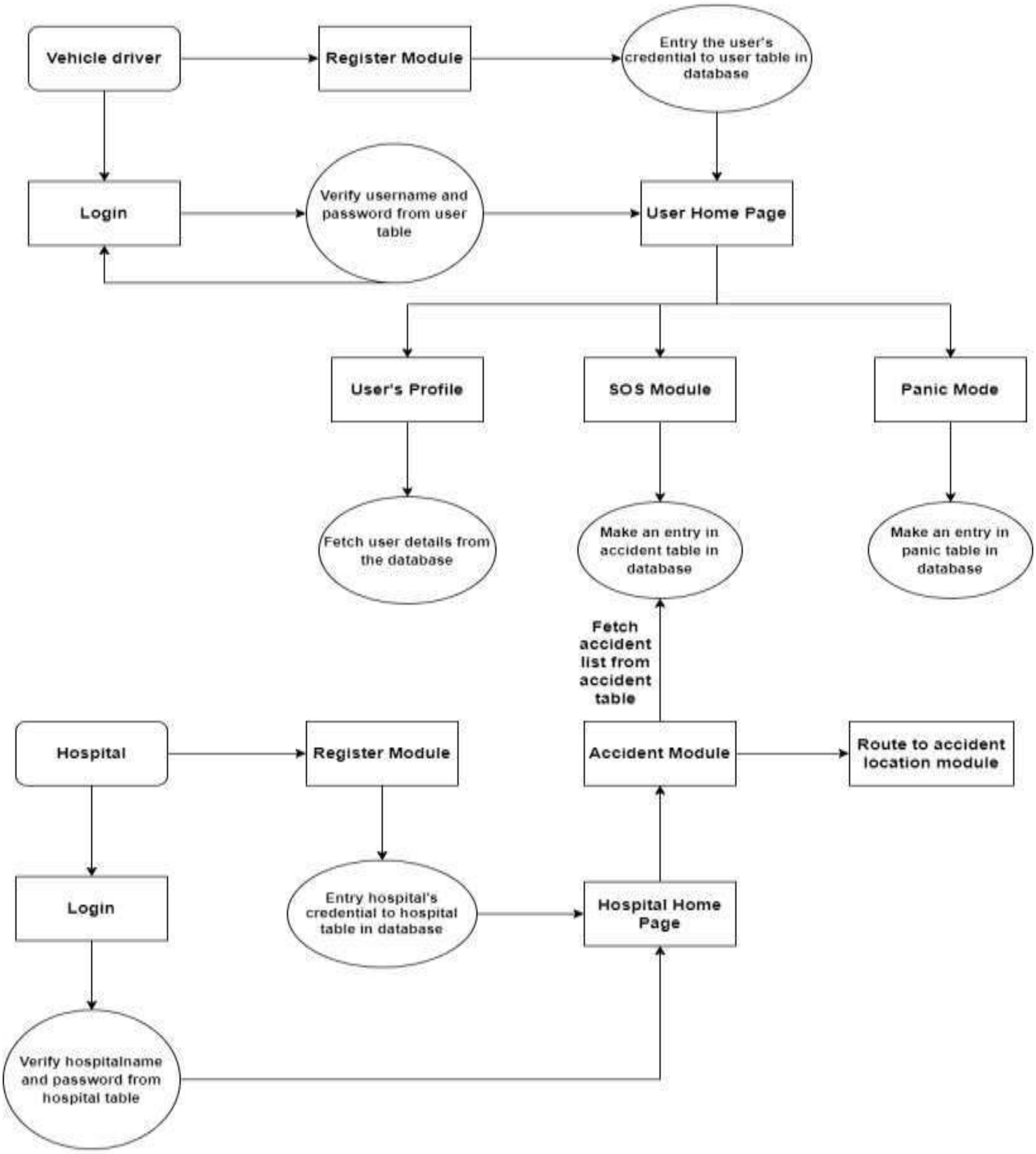

Vehicle driver
Register Module
Entry the user's credential to user table in database
Login
Verify username and password from user table
User Home Page
User's Profile
SOS Module
Panic Mode
Fetch user details from the database
Make an entry in accident table in database
Make an entry in panic table in database
Fetch accident list from accident table
Hospital
Register Module
Accident Module
Route to accident location module
Login
Entry hospital's credential to hospital table in database
Hospital Home Page
Verify hospitalname and password from hospital table

Figure-6 Logical Design of Accident Alert System

VIII. STAGES OF EXECUTION

1. Project Planning: This is the first stage of development. In this phase, we stressed on the question “What do we want?”. It is a vital role in software development as it defines the requirements of the new software.

After gathering information, we investigated the validity and possibility of incorporating these requirements into our system. The main goal of this stage was to understand every minute detail of the requirement and it was achieved.

2. Design: This is the third phase of our software development. The method implemented in our system is already explained in methodology part of this paper. We started off this phase by building prototypes for each module of system such as Sign in, log in, Home page etc., after development of each prototype we presented it in front of the community (end-users), we got many feedback from users for each prototype, every feedback was noted and we made changes accordingly to our prototype and presented it in next cycle. Many prototypes went on for few cycles, while some of them were selected in their first cycle.

3. Coding or Implementation: This is the fourth phase; in this we translated the design to a computer-legible language. The tasks were divided into modules and assigned to within our team. We started to build the entire system by writing code using the language (specified in details of experiment section). This stage was the longest of all the stages. It took a lot of time for debugging the code and implement it again without error.

4. Deployment: The fifth phase of our software development. After completely developing our software, it is time to release for customer to use. We deployed our system for public use and when we noticed something needed to added or removed, we altered the deployed system’s code. As it is web application, there is no need for the users of our application to update or install anything.

IX. RESULT AND CONCLUSION

Gathering Requirements & Analysis: This isthe second phase, where tried to gathermaximum information from the client’s requirement for our system. As we have already discussed the method used to elicitrequirements from users in the methodology.

Hospital Sign-in Module: This module allows the new hospital to register to our system by providing few credentials like hospital name, phone number, address, email, and password.

During the registration process the website will display error message on the screen if-

1. If password and confirm password does not match
2. If the hospital name is already taken.
3. If the email address is already registered by other user.

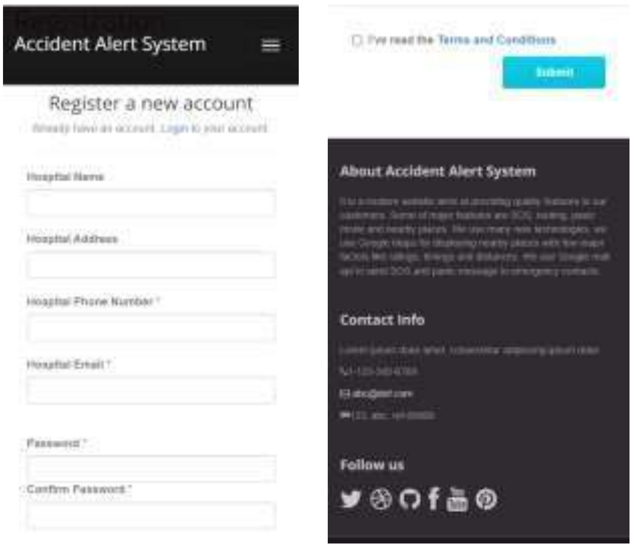
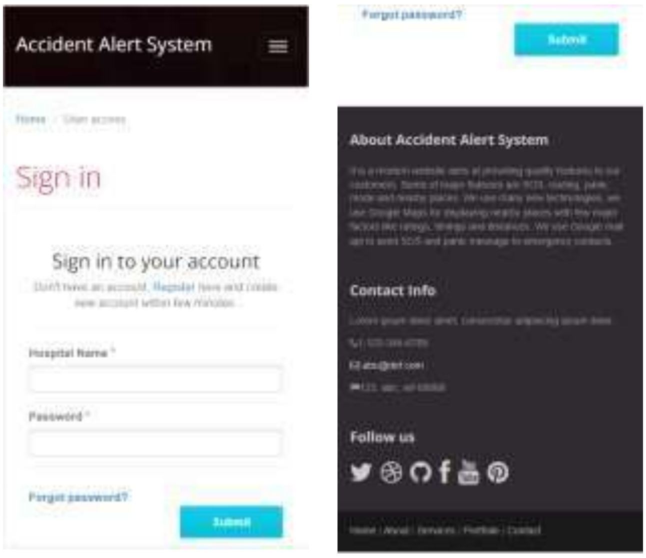


Figure-7 Screenshot of Sign in page for Hospital/ambulance driver module

Hospital Login Module: This module allows the already registered users to login to our website by providing hospital name and password which was given during registration. During Login process, the website will display error if-

1. the user is not registered to our website.
2. the user enters the wrong password.



Accident Alert System

Home / User access

Sign in

Sign in to your account

Don't have an account, Register here and create new account within few minutes.

Hospital Name *

Password *

Forgot password?

Submit

Forgot password?

Submit

About Accident Alert System

[illegible]

Contact Info

[illegible]

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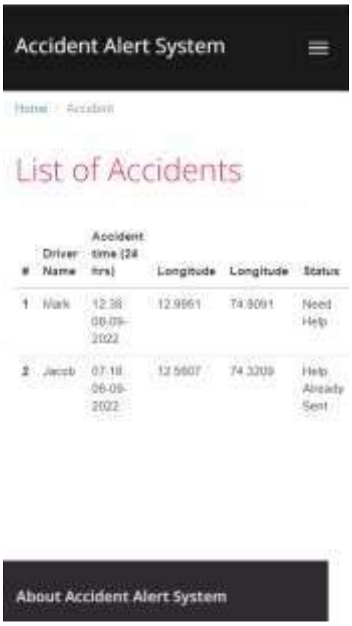
Figure-8 Hospital Sign in module

Accidents Module: This module is only present for hospital/ambulance driver. This module displays the list of accidents and details of accidents such as name, time of accident, longitude,latitude and status. The status has two options - Need Help and Help already sent.



Accident Alert System

Home / Accident

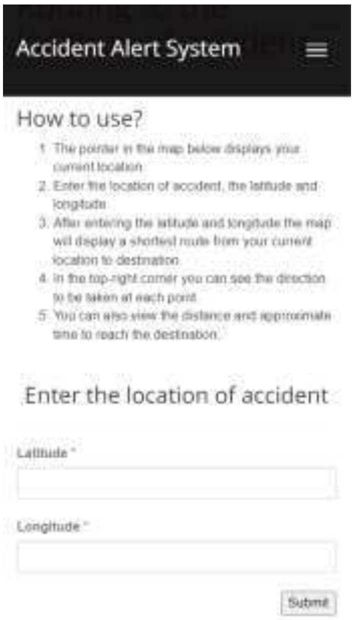
List of Accidents

#	Driver Name	Accident time (24 hrs)	Longitude	Longitude	Status
1	Mark	12:38 08-09-2022	12.9961	74.8091	Need Help
2	Jacob	07:18 06-09-2022	12.5607	74.3209	Help Already Sent

About Accident Alert System

Figure-9 Accidents Module

Route to accident: This is also only present in hospital/ambulance module. This module allows the ambulance driver to enter the latitude and longitude of location of accident. After submitting it, the website displays the route to location, approximate time and distance to location of accident.



Accident Alert System

How to use?

1. The pointer in the map below displays your current location
2. Enter the location of accident, the latitude and longitude
3. After entering the latitude and longitude the map will display a shortest route from your current location to destination.
4. In the top-right corner you can see the direction to be taken at each point
5. You can also view the distance and approximate time to reach the destination.

Enter the location of accident

Latitude *

Longitude *

Submit

Figure-10 Route to accident module

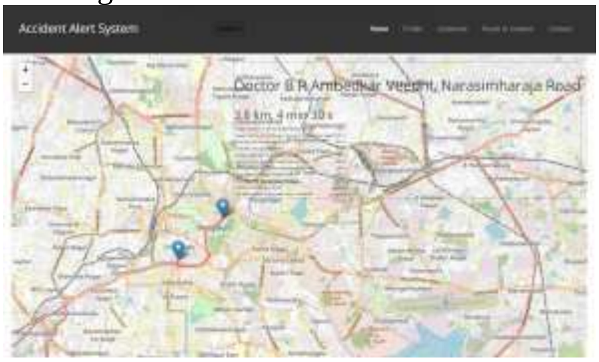
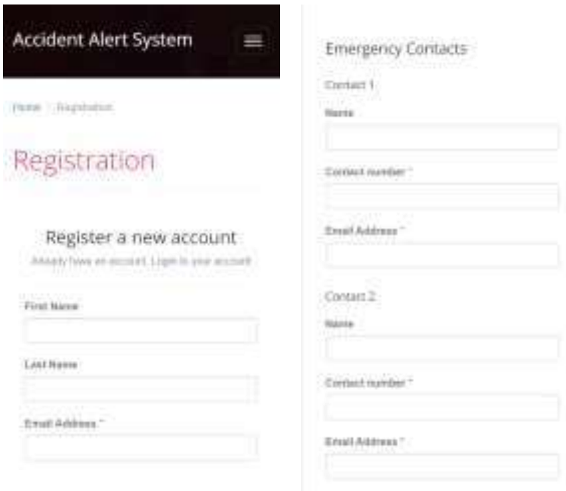


Figure-11 Screenshot of Route to accident module

Public User/driver Sign-in Module: This module is quite similar to hospital signin module. But here the user is required to add three emergency contact details to our database. The message will be sent to these emergency contact in case of accident.



Accident Alert System

Home / Registration

Registration

Register a new account

Already have an account, Login to your account

First Name

Last Name

Email Address *

Emergency Contacts

Contact 1

Name

Contact number *

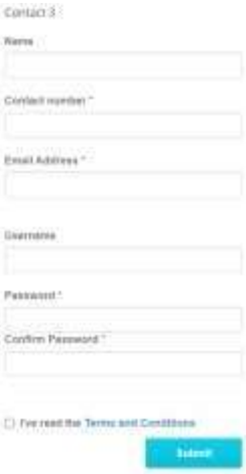
Email Address *

Contact 2

Name

Contact number *

Email Address *



Contact 3

Name

Contact number *

Email Address *

Username

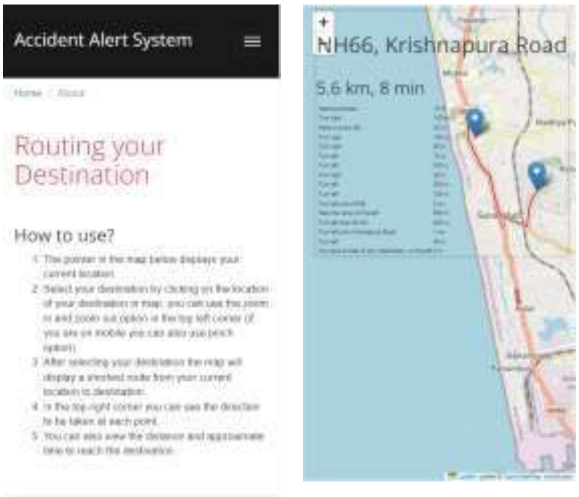
Password *

Confirm Password *

□ I've read the Terms and Conditions

Figure-12 User Sign in

Route Module: This module is only present for public user. It allows the user to navigate to their destination. They can select their destination tapping on the location on map. The map will display the route to destination along with approximate time and distance.



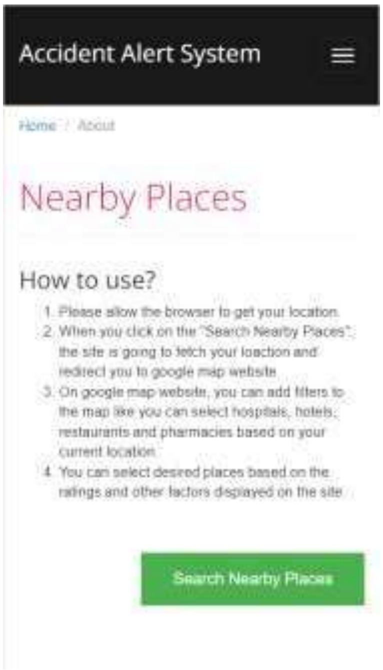
Routing your Destination

How to use?

1. The pointer in the map below displays your current location.
2. Select your destination by clicking on the location of your destination in map; you can use the zoom in and zoom out option at the top left corner (if you are on mobile you can also use pinch option)
3. After selecting your destination the map will display a shortest route from your current location to destination.
4. In the top-right corner you can see the direction to be taken at each point.
5. You can also view the distance and approximate time to reach the destination.

Figure-13 Route module

Nearby Places: This module is only for public users. This module makes use of google map API. The website gets the users current location and sends it the Google Maps on the API and by clicking 'Search Nearby Places' button the user will be redirected to Google Maps web application.



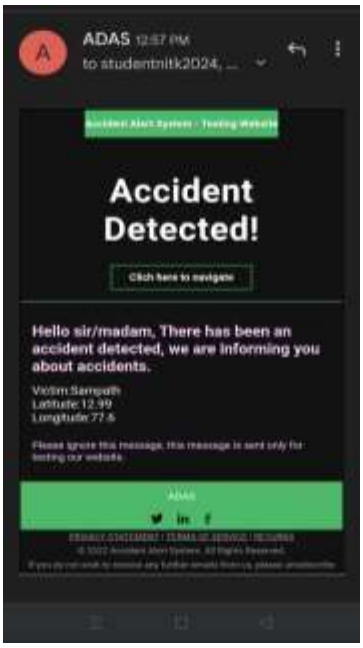
Nearby Places

How to use?

1. Please allow the browser to get your location.
2. When you click on the "Search Nearby Places", the site is going to fetch your loaction and redirect you to google map website
3. On google map website, you can add filters to the map like you can select hospitals, hotels, restaurants and pharmacies based on your current location
4. You can select desired places based on the ratings and other factors displayed on the site

Figure-14 Nearby Places module

Mail to Emergency Contacts: As soon as the SOS button is clicked, the application fetches the current location of the victim and sends mail to emergency contact which includes the victim's name, location(latitude and longitude) and a link which will redirect to google maps to navigate to location of accident. The screenshot of sample mail is displayed in figure-15.



ADAS 12:57 PM
to studentnitk2024, ...

Accident Alert System - Testing Website

Accident Detected!

Hello sir/madam, There has been an accident detected, we are informing you about accidents.

Victim:Sampath
Latitude:12.99
Longitude:77.6

Please ignore this message, this message is sent only for testing our website.

ADAS
PRIVACY STATEMENT | TERMS OF SERVICE | RETURNS

© 2022 Accident Alert System. All Rights Reserved.

If you do not wish to receive any further emails from us, please unsubscribe

Figure-15 Screenshot of SOS mail sent to emergency contact

Accident Detection System

Drowsiness detection is a safety technology that can prevent accidents that are caused by drivers who fell asleep while driving. This Python project is based to provide an effective means to prevent accidents that will detect that a person's eyes are closed for a few seconds. This system will alert the driver when drowsiness is detected. OpenCV has been used for gathering the images from the webcam and fed into a Deep Learning model which will classify whether person's eyes are closed, whether he is feeling sleepy or fatigue which might lead to an accident.

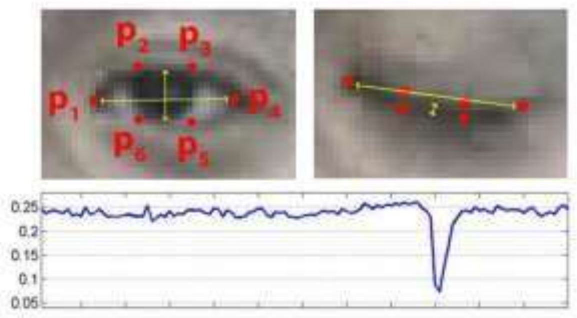


Fig. 16 Eyes landmarks. Upper: the distribution of eyes landmarks has significant differences. Bottom: the values of EAR at open and closed state.

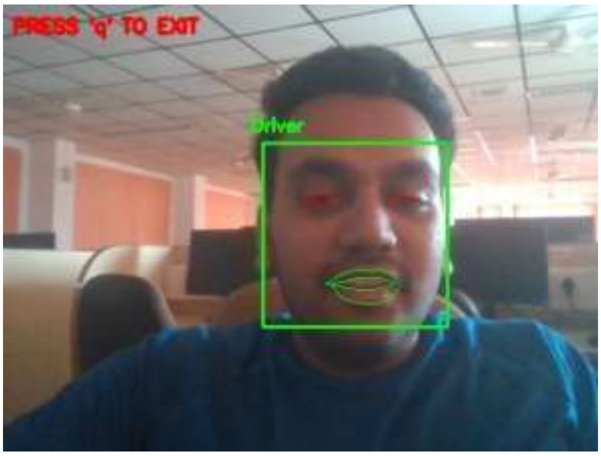


Fig.17 This figure clearly depicts that the system found out that the person was sleeping with his eyes closed and thus an alarm sound is heard with the intention to wake up the driver.

X. FUTURE WORK

The proposed model an Accident Alert System, which works fine when dealing with all alerting emergency contacts and finding out the nearest ambulance to the accident of location. In the future, we will work on building a machine learning model which will allow us to also detect an accident in real-time and integrate this model with our alerting system to build a Real-Time Accident Detection and Alert System completely based on software with much less cost of implementations and maintenance.

XI. REFERENCES

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