

Heal It- An Optimised Ambulance Booking App

Second Year Mini Project Report

Submitted in partial fulfilment of the requirements of the degree

BACHELOR OF ENGINEERING IN COMPUTER ENGINEERING

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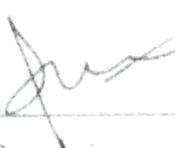
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(AY 2023-24)

CERTIFICATE

This is to certify that the Mini Project entitled "**Heal-It**" is a bonafide work of
Simran(87), Somya(30), Saniya(14),
Tanisha(46), Mukund(69) submitted to the University of Mumbai in partial
fulfilment of the requirement for the award of the degree of "**Bachelor of
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Mini Project Approval

This Mini Project entitled "Heal-It" by **Simran Karamchandani (37), Somya Jain (30), Tanisha Pandit (46), Saniya Dangat(14), Mukund Purswani(69)** is approved for the degree of **Bachelor of Engineering** in **Computer Engineering.**

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Date: 13/4/24

Place Chembur

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Abstract:

Emergency response is critical for saving a precious life, however one of the major problems the country's Emergency Medical Services faces is that the ambulance does not get to the patient on time for various reasons that have been discussed further ahead. But the gist of it is that the response time is sub-optimal and the calls are not being attended to. The toll-free number which is available for government-run ambulance services are limited in number and do not cover all aspects of patient transportation; hospital-based ambulances on the other hand are under-utilised. "Heal-It" is thoughtfully designed to enable users to easily book the nearest ambulance online with just a click of a button, whether it's for regular patient transporting needs or an emergency situation. The user-friendly nature of the app ensures that ambulance booking becomes a hassle-free task, providing a convenient solution for accessing timely assistance when it matters the most. The main objective of this app is to strengthen the Emergency Medical Service by establishing a well-structured and robust system that responds to emergency calls in a rapid and prompt manner.

Acknowledgement:

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We would like to express our deep gratitude to all the teaching and non-teaching staff for their unwavering encouragement, support, and selfless assistance throughout the project. Their contributions were indispensable to our project's success.

Abbreviations:

ALS: Advanced Life Support
BLS: Basic Life Support
EMRI: Emergency Management and Research Institute
EMS: Emergency Medical Service
EMT: Emergency MedicNRHM: National Rural Health Mission
UI/Ux: User Interface
al Technician
FCFS: First Come First Serve
NN: Nearest Neighbour
MHA: Minister of Home Affairs

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List of symbols:

App Logo



1. Introduction

1.1 Introduction:

According to the World Health Organisation, there should be at least one basic life support ambulance for every one lakh people and one advanced life support ambulance for every five lakh people. But that is really the bare minimum. With India having the largest population in the world, a strong ambulance infrastructure is essential for emergency care. Neither an appropriate database for future evaluation exists nor a standardised toll-free national access number to call for emergency medical assistance is currently available. A need to implement e-health and revolutionise the traditional process of ambulance booking was realised. This initiative aims to leverage information and communications technology for the betterment of the nation's Good Health and Overall Well-Being. Using the innovative approach of Online Booking and e-Commerce we allow users to immediately request ambulance services. The proposed system, Heal-It, intends to provide a streamlined ambulance booking experience, centralised and optimised dispatch, and medical guidance.

An unusual incident came to light involving an ambulance crew halting for dinner, in a recent assessment of Karnataka's 108 services. The individual in urgent need of the ambulance had to make four additional calls to check on its status. Despite 80 minutes passing without the ambulance's arrival, the patient had to be taken to a hospital using a private vehicle, sadly passing away during the journey. To prevent such cases, Heal-It, which connects the user directly to the ambulance through the ambulance driver's app, ensures the accountability of ambulance drivers.

1.2 Motivation

The current system for accessing ambulances relies on dialling 102 for emergencies. However, this system often leaves calls unanswered, and even when they are answered, ambulances usually arrive late at the scene.

For instance, in a recent incident at a remote Anganwadi centre, a 2.5-year-old child named Rohan was bitten while playing, prompting his parents to call for an ambulance. Unfortunately, the delayed response forced them to transport him to the hospital in a private vehicle as his condition deteriorated. Tragically, upon reaching the hospital, it was too late for emergency care, and an autopsy was performed instead.

This case is just one example of numerous similar incidents occurring daily. The primary culprits behind such occurrences include significant response delays, an inefficient communication network, and a shortage of ambulances, particularly in rural areas.

The lack of a centralised system and a standardised toll-free number along with unaccountability of the EMT crew has been the driving force behind our project's development.

1.3 Problem Statement & Objectives

According to the Comptroller and Auditor General (CAG) report from Madhya Pradesh (2017), the average response time for an ambulance to reach the patient ranged from 41 to 47 minutes. Surveys conducted in the past few years show that even though there are over 25000 ambulances working under the National Ambulance Service, ambulances were dispatched only for 5.43% of the calls. Details regarding the calls not attended were not even recorded. Idling of ambulances occurs due to improper communication between the ambulance and the hospital as well as procedural delays in the tender procurement, fabrication, and delay in payment of operating expenditure to the private provider. In Rural areas, the availability of ambulance services is limited, resulting in longer response times.

Objectives:

1. Enhancing Response Time: The primary goal is to minimise the duration it takes for an ambulance to reach the emergency site, potentially leading to life-saving outcomes.
2. Enhancing Accessibility: Ensuring that ambulance services are accessible to a wide range of individuals, including those with limited mobility or specific medical requirements, is crucial.
3. Geolocation and Mapping Precision: Utilising GPS technology to precisely identify the user's location and provide real-time tracking of the ambulance's route is essential for effective service.
4. User-Friendly Interface: Developing an intuitive and user-friendly interface is imperative to enable users to request an ambulance swiftly and effortlessly, even in high-stress situations.
5. Multilingual and Accessibility Support: To cater to a diverse user base, it's essential to offer support for multiple languages and incorporate accessibility features into the system.

1.4 Organization of the Report:

Chapter 1: Introduction

In the initial chapter of our report, we delve into the fundamental concept behind our project, which revolves around the development of an ambulance booking application. This chapter encompasses a comprehensive exploration of the Introduction, the Motivation behind the project's inception, the articulated Problem Statement, and the clear-cut Objectives that steer our project's course.

Chapter 2: Review of Related Work

This section is dedicated to a thorough examination of the existing systems and an in-depth exploration of pertinent literature. It involves conducting a comprehensive literature review encompassing research papers and studies closely linked to our project's domain. Furthermore, we scrutinise contemporary trends in ambulance access applications, identifying areas where enhancements can be implemented.

Chapter 3: Proposed System

The final section of the report focuses on our envisioned system. Within this chapter, we elucidate the architectural framework, the underlying algorithms and process design, and provide insights into the hardware and software components. Additionally, we present the outcomes of experiments conducted, followed by a conclusive summary. This section also outlines future prospects and directions, offering a comprehensive vision of the app's design and development process.

2. Literature Survey

2.1 Survey of the existing system

Table 1: Literature Survey

Serial No.	Paper/Journal Name	Date of Issue	Author Name	Abstract	Conclusion
1	Mobile Ambulance Management Application for Critical Needs	February 2020	Devi Gayathri P, Amritha Varshini R, Pooja MI, S Subbulakshmi	This paper focuses on creating a mobile Android app for efficient ambulance services. Providers install, register ambulances, and users can request help through registration or in emergencies. The app locates ambulances manually or automatically, directing them via the shortest route using GPS and Google Maps. Cloud storage holds user and ambulance details, highlighting the potential of evolving technologies in crucial services.	This paper examines creating efficient Android apps for ambulance services. Providers register ambulances through the app, users request services, and the app locates and directs ambulances using GPS and Google Maps. Cloud storage stores data, demonstrating technology's role in vital services.
2	Integrating the ambulance dispatching and relocation problems to maximise system's preparedness	23 November 2019	A. S. Carvalho, M. E. Captivo a , I. Marques	This study improves EMS decision-making for dispatch and relocation efficiency. It introduces integrated optimization methods, including a mathematical model and heuristic approach. Experiments with Lisbon EMS data show their potential over the current strategy. The proposed model outperforms the	This paper introduces innovative methods for ambulance dispatching and relocation: a MIP formulation and a heuristic. They consider often overlooked factors like additional response time and base change allowances. The mathematical model integrates dispatching and relocation, focusing on time-preparedness for

				heuristic and current Portuguese EMS approach in key indicators. The heuristic remains valuable for concurrent emergencies with faster results.	optimal system coverage. The heuristic offers a pilot approach to relocation, enhancing EMS operations..
3	A novel hybrid method for improving ambulance dispatching response time through a simulation study	30 October 2015	Mehdi Zarkeshzadeh, Hadi Zareh, Zainabolhoda Heshmati, Mehdi Teimouri	This paper presents a novel hybrid method to enhance ambulance response times in EMS. It combines network centrality, nearest neighbor techniques, and a FIFO approach, considering key dispatching parameters. The adjusted metric achieved up to a 42% reduction in response times in simulations, surpassing traditional metrics.	This paper introduces a weighted hybrid approach for ambulance dispatching, optimizing weight combinations through simulations. It significantly improves response times, achieving up to a 42% reduction, especially with more available ambulances and under moderate system loads, compared to previous methods
4	Emergency Medical Service in India: A Concept Paper	June 2012	National Health Systems Resource Centre (NHSRC) Technical Support Institution with National Rural Health Mission (NRHM)	This paper conducts a comprehensive analysis, offering insights into the existing emergency medical service (EMS) landscape across different Indian states. It juxtaposes this with international EMS systems, highlighting both similarities and disparities. Furthermore, it presents a visionary blueprint for enhancing India's EMS, encompassing a wide spectrum of elements.	In conclusion, this paper not only sheds light on the current state of emergency medical services in various Indian states and their global counterparts but also presents a holistic vision for a more efficient and responsive EMS system for India, addressing multifaceted aspects critical for its success and effectiveness.

S	A study and overview of the Mobile App Development Industry	June 2021	CG Thomas, International Journal of Applied Engineering and Management Letters	Mobile App Development has revolutionized software use, especially in India, with exponential growth. These apps, running on mobile phones, enable faster service delivery. This paper explores their dominance and impact.	While many apps on the market today blend various development approaches, each app is created with specific factors in mind. These factors include development costs, time constraints, required features, and customised preferences. Analysing these aspects guides us in choosing the most appropriate development environment for a particular app.
S	Report of the Working Group on Emergency Care in India	May 2010	Dr. Shakti Kumar Gupta Head, Dept of Hospital Administration AIIMS, New Delhi.	India's emergency care system faces challenges: lack of awareness, limited first aid skills, and no standardised national emergency number. Transit lacks proper ambulances, patient-centric design, and trained technicians. Healthcare facilities deal with limited access, overcrowding, deficient infrastructure, equipment shortages, and staff insufficiencies. Additional issues: underreported accidents, outdated laws, coordination problems, insufficient data, limited rehab, and inadequate victim compensation. Improving emergency care and road safety in India is vital.	Availability, Accessibility and Affordability of emergency care play crucial role in accessing emergency services and pre-hospital care. EMS in India is at crossroads and a lot needs to be done to achieve global standards and provide timely optimal care to victims.

2.2 Limitation of existing system or research gap

1. **Geographical Coverage:** Some remote or less accessible areas may have inadequate ambulance coverage, leaving residents underserved.
2. **Resource Imbalance:** Ambulances may cluster in densely populated regions, leaving rural areas with fewer resources.
3. **System Load:** During major accidents or disasters, the system may struggle to allocate resources efficiently.
4. **Response Time Variability:** Ambulance response times can vary due to factors like traffic, location and delays in communication with the control room, potentially delaying critical care.

Research gaps in current emergency ambulance services:

1. Limited studies on optimising ambulance routing and deployment strategies.
2. Insufficient research on leveraging emerging technologies like IoT and AI for enhancing ambulance services.
3. Lack of comprehensive data analysis to identify trends and areas for improvement.

2.3 Mini project Contribution

Sustainable Development Goal : Good Health and Well Being

Our objective is to create technologies that enhance healthcare and establish a robust platform accessible during health emergencies.

- 1) We aim to introduce streamlined methods for accessing ambulances during emergencies, ensuring prompt medical attention and reducing the risk of health deterioration resulting from system inefficiencies.
- 2) The app can significantly reduce the time it takes for an ambulance to reach the location of the patient. This can be critical in cases of cardiac emergencies, accidents, and other life-threatening situations.
- 3) Patients and their families can track the ambulance's location in real-time, reducing anxiety and uncertainty during critical moments.
- 4) By ensuring timely and appropriate care, the app can potentially reduce the long-term healthcare costs associated with delayed or inadequate treatment.
- 5) The development of such an app can also serve as an opportunity to educate the community about the importance of prompt action during emergencies, potentially leading to increased public awareness and safety.

3.Proposed System (eg New Approach of Data Summarization)

3.1 Introduction

We are planning to develop a user-friendly mobile application that will have two distinct versions: one for users and the other for ambulance drivers.

User Version:

In the user version of the app, individuals will be prompted to provide their current location, details about the patient's condition, and any additional information they deem necessary, such as medical history or allergies to medications. Users will have the ability to maintain a comprehensive record of their previous trips, which can be accessed at any time. Additionally, users will be given the option to choose between booking a government ambulance or a private one.

Once a user decides to book an ambulance, the app will initiate a search to identify the nearest available ambulance within their proximity. Furthermore, users will have quick access to relevant information and contact details for the assigned ambulance driver. This streamlined system will empower patients to efficiently secure ambulance services, whether it's for emergency or non-emergency situations.

Ambulance Driver Version:

The app designed for ambulance drivers will require them to upload essential documents, including vehicle documents, driver's licence, proof of citizenship, and qualification details. The usage of the app by drivers will only be authorised after approval from the administrator. It's important to note that the driver's personal information will not be displayed and will remain accessible only to the administrator.

Once a driver is verified, they will start receiving ambulance service requests. Drivers will have the option to either accept or decline these requests. If a driver accepts a request, the ambulance booking is confirmed, and the app will provide navigation guidance to the user's location. In the event that a driver declines a request, it will be automatically forwarded to the next available nearby driver.

To ensure the functionality of the app, it will request permission to access the device's location each time it is opened.

3.2 Architecture/framework

3.2.a. App working

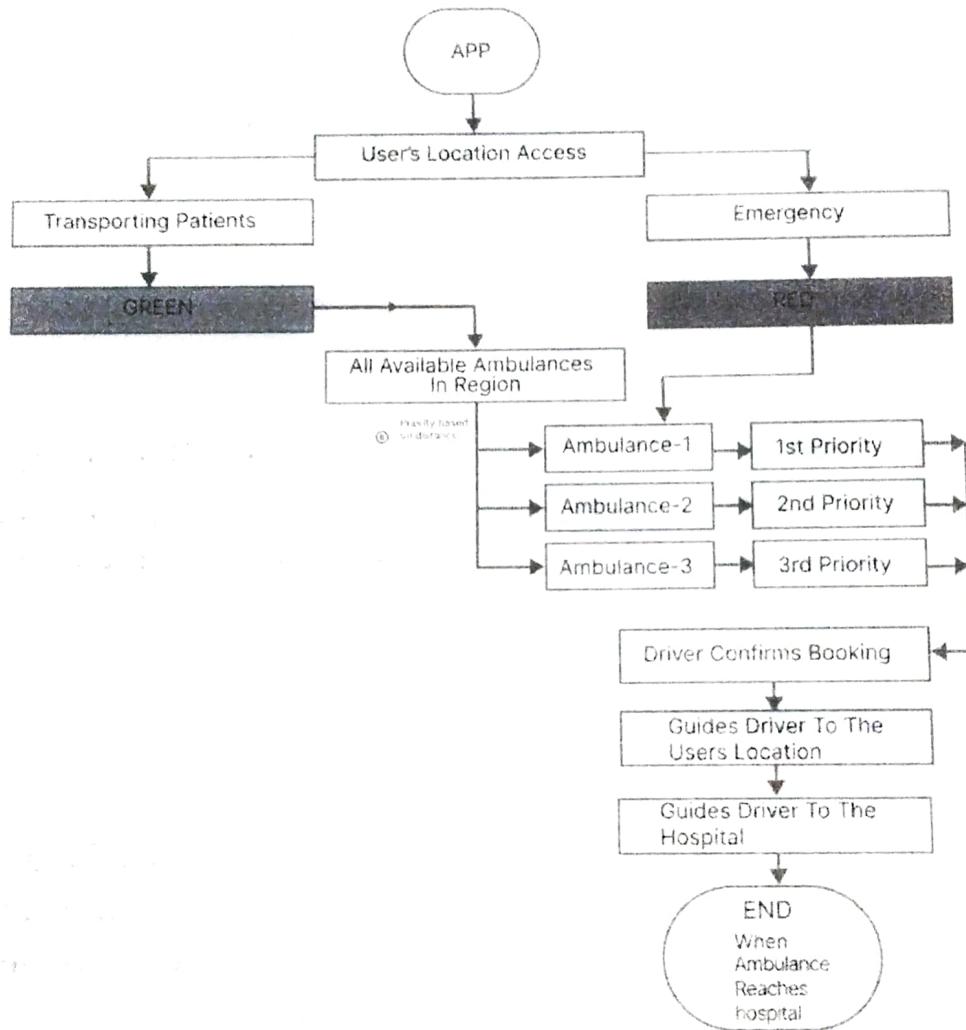


Figure 1: Flowchart explaining the App Working

3.2.b.Drivers App Interface

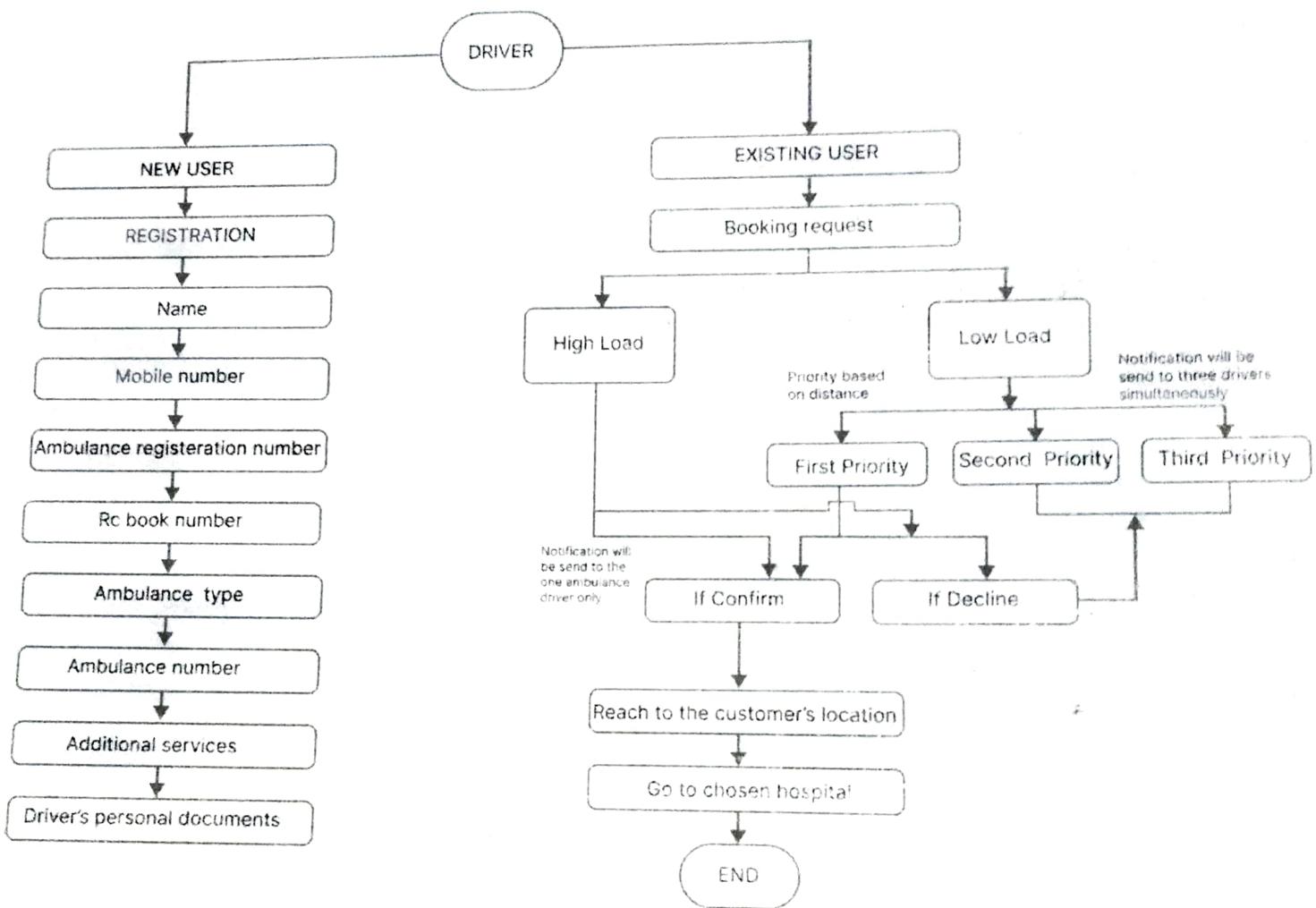


Figure 2: Flowchart of working of Driver's version of the App

3.2.c. User's App Interface

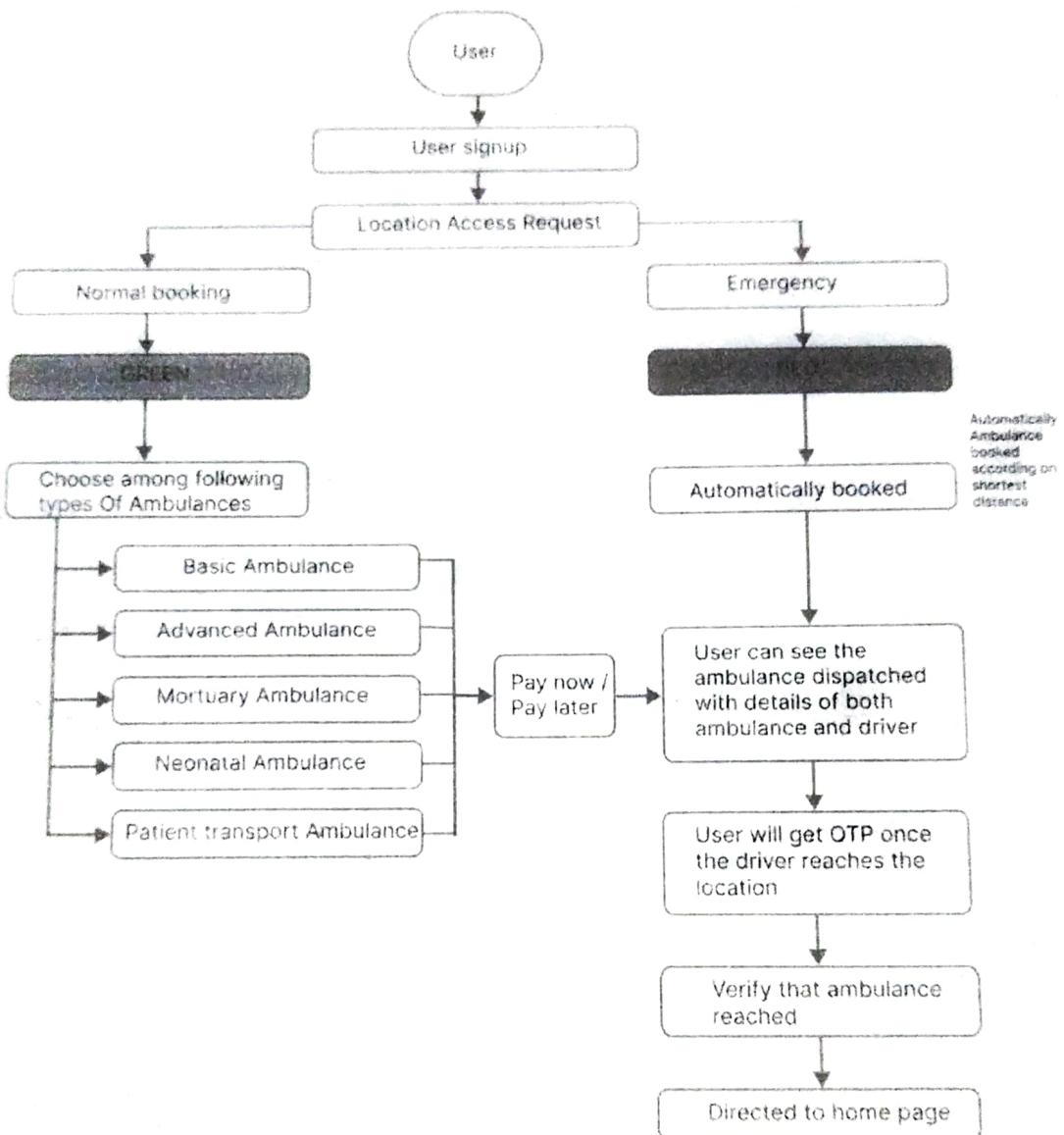


Figure 3: Flowchart of working of User's version of the App

3.3 Algorithm and Process Design

A detailed workflow or algorithm for developing an ambulance booking app:

1. UI/UX Design :

a. Wireframing:

- Identify key screens: Registration, Login, Booking, and Tracking.
- Sketch basic layouts and components for these screens.
- Define the information and actions available on each screen.

b. Prototyping:

- Create interactive prototypes using Figma to simulate the app's flow.
- Link wireframes together to visualise the user's journey.
- Add interactive elements like buttons, navigation, and form fields.

c. Visual Design:

- Design icons, colour schemes, and layout consistent with your app's branding.
- Ensure a user-friendly and visually appealing interface.
- Create assets for buttons, icons, and other UI elements.

d. User Testing:

- Conduct user testing sessions with target users to gather feedback.
- Iterate on the design based on user feedback, refining the interface.

2. Backend Development with Firebase:

a. Firebase Setup:

- Create a Firebase project and configure Firebase Authentication.
- Implement user registration and login functionalities using Firebase Authentication.

b. Realtime Database or Firestore:

- Set up the database structure to store relevant data, such as user profiles and ambulance availability.
- Firestore for storing user data, ambulance data, and booking information.
- Realtime Database for storing location coordinates which are sorted by DriversWorking, DriversAvailable and UserRequests's UID

c. Cloud Functions:

- Use firebase cloud storage to store heavy data such as images uploaded by driver's during registration for verification purposes

d. Firebase Cloud Messaging (FCM):

- Integrate FCM for push notifications, including booking confirmation and updates.
- Set up triggers to send notifications to users and drivers when relevant events occur.

3. Android App Development in Android Studio:

a. User Authentication:

- Implement user registration and login screens using Firebase Authentication.
- Enable users to reset their passwords if needed.

b. User Profile:

- Allow users to update their profiles, including contact information and medical history if applicable.
- Sync user profile data with Firebase to keep it up-to-date.

c. Ambulance Booking:

- Create a user-friendly booking process.
- Allow users to select between government and private ambulances.
- Collect user's location and additional patient information.
- Send booking requests to available drivers.

d. Location Services:

- Integrate Google Maps API to:
- Track user's location in real-time.
- Calculate routes for ambulance drivers to reach the user.
- Display maps with user and driver locations.

e. OTP Verification:

- Integrate an OTP API to send and verify OTPs during registration and booking confirmation.
- Ensure secure authentication and booking processes.

f. Testing and Debugging:

- Continuously test the app on various Android devices and screen sizes.
- Use Android Studio's debugging tools to identify and fix any issues.
- Conduct beta testing with a select group of users to gather feedback and make necessary improvements.

3.4 Details of Hardware and Software

1)Hardware:

PCs

Mobile Phones

2)Software:

Figma for UI/UX design of app

Android Studio for editing, debugging and testing of code.

Firebase for SDKs.

3)Tools:

API's for Maps and other features of maps like finding shortest route, accessing one's Location, Language switch, OTP generator.

3.4 Experiments and results

3.4.a. General Sign-up/ Login page

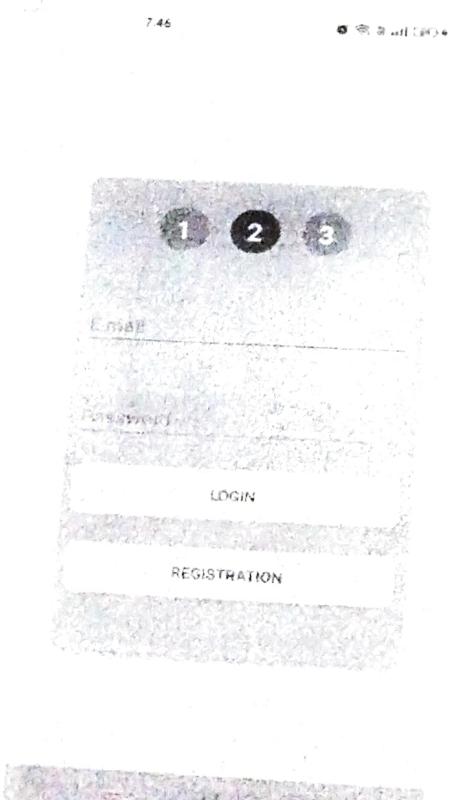
A screenshot of a registration form titled 'Create Your Profile'. The form includes fields for 'Name' (with placeholder 'John Doe'), 'Date of Birth' (placeholder '12/12/1990'), 'Gender' (radio buttons for 'Male', 'Female', and 'Other'), and a 'SAVE AND NEXT' button. To the right of the form is a sidebar titled 'Ambulance Info' containing fields for 'Chassis Number', 'R.C Book Number', 'Vehicle type(model)', and 'Vehicle Registration Number'. Below the sidebar is a section titled 'Documents' with fields for 'Driver's Aadhar card', 'Passport sized photo', and 'Driver's License'.

Figure 4: Login Page

Figure 5: Registration page

Figure 6: Driver Reg

3.4.b. User's App Screen

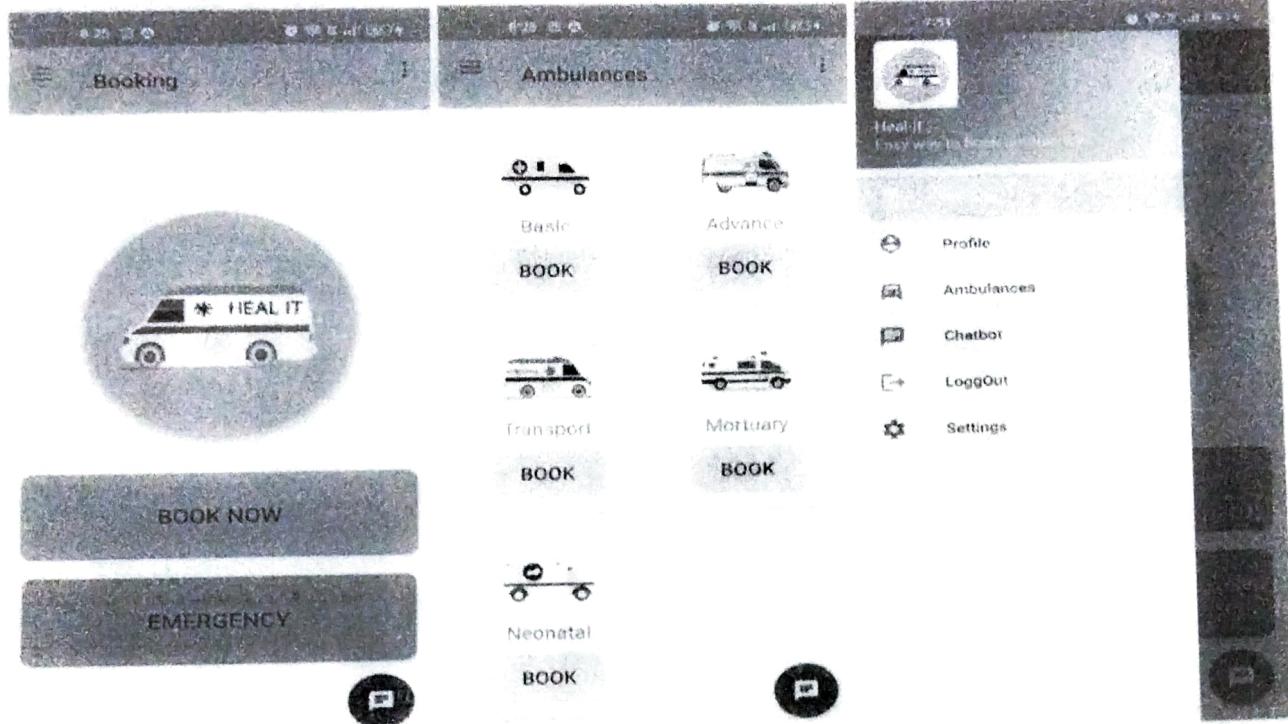


Figure 8: Home page

Figure 9: Types of Ambulances

Figure 10: User UI Side Menu

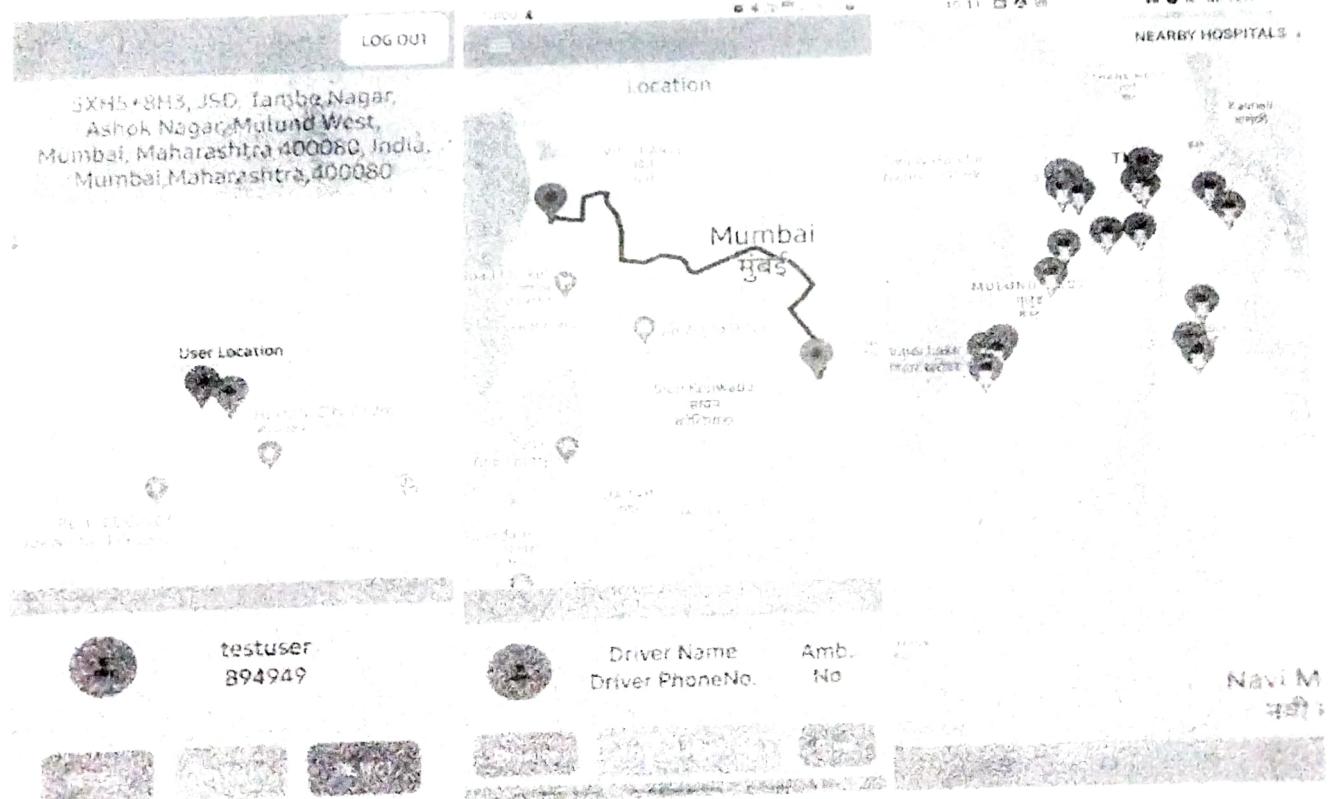


Fig 11: Booking confirmed Fig 12:Route between driver and user Fig 13: Hospitals Available

4.c.Database(Firebase, Realtime and Cloud Storage)

The screenshot shows the Firebase Cloud Firestore interface for a project named 'healthpt2'. The 'App' collection is expanded, revealing three sub-collections: 'Ambulance', 'Driver', and 'User'. Each sub-collection has options to 'Start collection', 'Add document', and 'Add field'. A note at the bottom right of the interface says 'Activate Windows'.

gs://healthpt2.appspot.com > Images > Aadhar

Name	Size	Type	Last modified
65f032a1-6d7b-49c6-b310-2545abc31f8f	38.52 KB	Image/jpeg	Feb 12, 2024
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f50cf1ef-1630-472b-be2f3919701b84dd	8.07 KB	Image/jpeg	Feb 12, 2024, 8:57:39 PM Updated Feb 12, 2024, 8:57:39 PM

File location
Other metadata

The screenshot shows the Firebase Realtime Database interface for the same project 'healthpt2'. The database structure is visible under the 'Realtime Database' tab. It includes a 'DriversAvailable' node with child nodes 'driveravailable' and 'driverworking', and a 'UserLocation' node with a child node 'nearesthospital'. A note at the bottom right of the interface says 'Database location: United States (US)'.

https://healthpt2.firebaseio.database.firebaseio.com/

https://healthpt2.firebaseio.com/.json

- DriversAvailable
 - driveravailable
 - driverworking
- UserLocation
 - nearesthospital

3.5 Conclusion and Future Work

3.5 a. Conclusion

In conclusion, the integration of e-health solutions into ambulance services holds immense potential to revolutionise the healthcare landscape. By allowing users to easily request ambulances without cumbersome phone calls, the speed and efficiency of emergency response can be drastically improved. Automated dispatch and real-time tracking mechanisms not only enhance response times but also ensure a more organised and timely deployment of resources.

To illustrate, a study conducted by ResearchGate found that a reduction in response times leads to a 34.5% decrease in mortality rates in emergency cases. The benefits extend beyond just speed and efficiency. The electronic nature of the system minimises errors in communication and data recording, ensuring accurate and reliable information exchange between medical professionals and users. Storing user profiles and medical histories securely offers a comprehensive understanding of a patient's needs, enabling more personalised and effective care delivery. Moreover, the ability to allocate resources based on demand and location contributes to a more efficient allocation of healthcare resources, reducing unnecessary delays and optimising service provision. As e-health solutions continue to evolve, the potential for positive impacts becomes even more evident.

3.5 b. Future work

1. Integrating an AI-powered chatbot into the ambulance booking app enhances its capabilities, providing users with optimal solutions during emergencies. This advanced feature ensures that users can quickly access assistance, even in moments of distress.
2. To enhance security and trust, the ambulance booking app can incorporate advanced verification measures to significantly reduce the risk of fake accounts. This ensures that only genuine users can access the service, bolstering the safety and security of the app and instilling confidence in users, whether they require emergency or non-emergency medical assistance.
3. Integrating an optimised ambulance dispatch system that is a culmination of NN, ECFS and Centrality dispatch system.
4. Implement language switching functionality for users to select their preferred language. Update app text and UI elements dynamically based on language preferences.

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(Affiliated to University of Mumbai, Approved by AICTE & Recognized by Govt of Maharashtra)

Department of Computer Engineering

Second Year Sem IV Mini Project I - B

Review Stage I Evaluation Sheet 2023 - 24

Class: D7 A/B/C

Group No.: 4

Sustainable Development Goal:

Flood health & well being.

Title of Project: Local Flood Prediction System

Group Members:

Rishabh

Shivam

Sayali

Simran

Somya

Dnyaneshwar

Yash

Y

Vivekanand Education Society's Institute Of Technology

(Affiliated to University of Mumbai, Approved by AICTE & Recognized by Govt. of Maharashtra)

Department of Computer Engineering

Second Year Sem IV Mini Project I - B
Review Stage I Evaluation Sheet 2023 - 24

Class: D7 A/B/C

Group No.: 4

Sustainable Development Goal: Good Health and Well Being

Title of Project: Health

Group Members: Suman Karamchandani (3), Sonya Jain (30), Tanisha Pandit (46), Soniya Dargat (14), Nukund Gururaj (D7B 69)
D7C 37

Quality of Survey/need identification (3)	Clarity of Problem definition based on need (2)	Innovativeness in solutions (3)	Feasibility of proposed solutions and selection of best solution (3)	Cost effectiveness (1)	Societal Impact (1)	Innovativeness (1)	Ethics (1)	Full functioning of working model (2)	Lifelong Learning (2)	Effective use of skill sets (1)	Effective use of standard engineering norms (1)	Contribution of an individual's as member or Leader (2)	Total (25)
03	02	03	01	01	01	01	01	02	02	01	01	01	22
Comments: Article publication is due.													

Dr. D.G. Mane

Name & Signature Reviewer |

Quality of Survey/need identification (3)	Clarity of Problem definition based on need (2)	Innovativeness in solutions (3)	Feasibility of proposed solutions and selection of best solution (3)	Cost effectiveness (1)	Societal Impact (1)	Innovativeness (1)	Ethics (1)	Full functioning of working model (2)	Lifelong Learning (2)	Effective use of skill sets (1)	Effective use of standard engineering norms (1)	Contribution of an individual's as member or Leader (2)	Total (25)
03	02	02	03	01	01	01	01	02	02	01	01	01	23

Reviews