**HelpOnWay**

**MINOR PROJECT REPORT- ETCS462A**

*Submitted in partial fulfilment of the requirement of the degree of*

**BACHELOR OF TECHNOLOGY**

*to*

**K.R Mangalam University**

*by*

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Under the supervision of

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**( Assistant professor )**



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April 2025

**CERTIFICATE**

This is to certify that the Project Synopsis entitled, “**HelpOnWay**” submitted by “**Tanishq (2201010136), Garima (2201010137), Dilasha (2201010140) and Mehak (2201010166)”** to **K.R Mangalam University, Gurugram, India,** is a record of bonafide project work carried out by them under my supervision and guidance and is worthy of consideration for the partial fulfilment of the degree of **Bachelor of Technology** in **Computer Science and Engineering** of the University.

**Type of Project - industry**

Dr Yogita yashveer Raghav

(Assistant Professor)

Dr Pankaj Agarwal, Dean SOET

Date: 23 April 2025

**Project Use Case & Deployment Confirmation Certificate**

This is to formally acknowledge that the following student(s) from K.R. Mangalam University have successfully undertaken and completed an industry-based project under our mentorship, in alignment with the stated objectives and requirements of our organization.

**Project Details:**

* **Project Title:** HelpOnWay
* **Domain/Technology Used:** Healthcare
* **Industry Use Case / Business Problem Addressed:**

The Ambulance Booking System App minimizes emergency response delays by enabling quick bookings of the nearest available ambulances. It connects drivers with hospitals for seamless coordination, reducing response times and enhancing healthcare accessibility.

* **Expected Outcome/Utility of the Project in Our Organization:**

The Ambulance Booking System App reduces emergency response times with instant. By optimizing ambulance allocation and improving communication, it enhances emergency care efficiency, leading to higher survival rates, reduced delays, and better resource management—ultimately saving lives .

**Student Details:**

|  |  |  |  |
| --- | --- | --- | --- |
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Dilasha(2201010140) 3rd Year

Mehak(2201010166) 3rd Year

**Mentor Declaration & Disclaimer:**

I, the undersigned, hereby declare that:

1. The above-mentioned project has been developed by the student(s) under my guidance and supervision.
2. The project addresses a real-world use case relevant to our organization.
3. The student(s) have demonstrated the ability to **successfully deploy the solution** in a functional or pilot-ready form.
4. The developed project has the potential to be adopted/implemented for the intended purpose within our organization.
5. All intellectual property rights, confidentiality, or proprietary rights, if applicable, are governed by our internal policies and this document does not transfer any such rights.

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**ABSTRACT**

In medical emergencies, timely access to ambulance services is critical for ensuring effective healthcare delivery. The Ambulance Booking System App is a mobile-based solution developed to simplify and accelerate the process of requesting ambulance services without the need for traditional phone-based coordination. This project focuses on designing a user-friendly platform that allows patients or their caregivers to instantly connect with ambulance providers through an intuitive interface. The system consists of three core modules—Admin, User, and Ambulance Provider—each with defined roles such as managing profiles, accepting requests, and approving service listings. Key features include instant ambulance request generation, direct communication between patients and drivers, emergency notifications to hospitals, and the ability to maintain digital records of user and patient data for future reference. Developed using agile methodology, the app prioritizes secure data handling, operational efficiency, and a seamless user experience. By eliminating manual barriers and digitizing the ambulance booking process, this project contributes to improving healthcare responsiveness and accessibility, particularly during emergencies where every second counts.

**\*KEYWORDS\*:** Ambulance Booking, Emergency Services, Healthcare App, Digital Health, Mobile Application, Patient

**Chapter 1**

**Introduction**

1. **Background of the project**

The increasing pressure on healthcare infrastructure, particularly during emergencies, demands solutions that can ensure timely access to critical services such as ambulance transportation. Across the world, emergency medical response systems often face a range of challenges including delays in ambulance dispatch, lack of standardized communication channels, inefficient data management, and reliance on manual operations. These challenges not only affect the efficiency of healthcare delivery but can also have life-threatening consequences for patients. Recognizing the importance of streamlining these operations, the concept of a dedicated ambulance booking application has emerged as a crucial innovation in the healthcare technology domain.

Traditionally, ambulance services are requested through manual calls, often involving long waiting times, miscommunication, or lack of immediate availability. This conventional model is particularly inefficient during large-scale health crises, traffic congestions, or in rural areas with limited access to healthcare infrastructure. A mobile-based ambulance booking system aims to bridge this gap by allowing users to request services directly through a smartphone interface, enabling faster dispatch and improved communication.

The proposed Ambulance Booking System App is designed to be an intuitive and efficient digital solution that allows users to instantly request ambulances while also connecting ambulance providers and administrators in a seamless communication network. Unlike existing systems which may depend heavily on GPS or location-based services, this application focuses on functionality, user-friendliness, and effective role-based interaction to ensure that emergency services are delivered without delays. The design integrates modules for users, ambulance providers, and administrators, ensuring clear workflows and efficient management of service requests.

1. **MOTIVATION**

Medical emergencies demand rapid and coordinated responses, but existing ambulance systems face significant issues, including delays, poor communication, and limited access, particularly in rural or congested areas. These inefficiencies can have fatal consequences. The Ambulance Booking System App aims to address these problems by providing a digital platform that streamlines the ambulance booking process and improves coordination between users, service providers, and healthcare institutions. By automating the process and eliminating manual errors, the app reduces response times, enhances communication, and ensures better accountability. In a post-pandemic world, where emergency services are under increased strain, this app is an essential tool for strengthening healthcare delivery, improving patient outcomes, and supporting emergency responders in a more efficient and reliable manner..

**Chapter 2**

**LITERATURE REVIEW**

1. **Review of existing literature**

Advancements in healthcare technology have driven innovations in emergency response systems, particularly through mobile health (mHealth) applications. Several studies and implementations focus on improving ambulance response times, coordination, and communication.

Sharma et al. (2020) highlighted the limitations of traditional ambulance dispatch systems—manual delays and poor hospital coordination—calling for mobile platforms with automated workflows. This aligns with the proposed Ambulance Booking System App’s goal to streamline user experiences through digital solutions.

Gupta and Nair (2019) developed an emergency app integrated with hospital databases, reducing the time between requests and dispatches. Though limited to urban areas, it demonstrated the value of mobile systems in healthcare delivery.

Kumar and Das (2018) proposed a cloud-based system for ambulance scheduling and data storage, emphasizing the need for centralized administration—also a core feature of the proposed app.

Singh and Mehta (2021**)** focused on user behavior, stressing the need for simple, fast, and intuitive emergency interfaces, which the current app design incorporates.

Commercial apps like Medulance and StanPlus offer similar services but face challenges in reliability and data security. The proposed app addresses these by ensuring greater administrative control and user verification.

Global examples like the 911 enhancements in the U.S**.** and NHS mobile tools in the UK highlight how mobile integration improves emergency outcomes and user satisfaction.

In conclusion, existing literature supports the development of the Ambulance Booking System App, reinforcing the need for modular, secure, and accessible emergency platforms, especially in areas lacking reliable medical response services.

1. **GAP ANALYSIS**

Despite the increasing availability of mobile health applications and emergency response tools, significant challenges remain in the effective implementation of ambulance booking systems. Many existing solutions primarily cater to urban environments, leaving semi-urban and rural regions with limited access. The inconsistency in features, unreliable service, and uneven availability of ambulances further hinder the overall effectiveness of current digital emergency platforms. One major shortcoming in these systems is the lack of a well-defined role-based access framework. Most platforms combine functionalities into a single interface, creating operational confusion and overwhelming users. The proposed Ambulance Booking System App addresses this by designing separate modules for users, ambulance providers, and administrators, ensuring clear workflows and efficient service delivery. Additionally, administrative oversight and backend data management are often underdeveloped in existing applications. While basic service requests may be possible, tools for tracking, approving, and managing requests in real-time are usually missing. To resolve this, the proposed app includes a dedicated admin panel with full control over approvals, user monitoring, and record maintenance. Another crucial gap lies in the neglect of data retention and patient history, which are vital for handling repeat emergencies. Many systems fail to store and retrieve important information, whereas this app ensures structured data storage for future accessibility. Moreover, the user interface of many existing apps is not intuitive, posing challenges for individuals with limited technical skills—especially during high-stress situations. The Ambulance Booking System App prioritizes a clean, simple design for quick and easy navigation. Overall, the app is built to bridge these gaps through a modular, user-friendly, and secure approach, providing a more reliable and inclusive emergency medical service platform.

1. **PROBLEM STATEMENT**

In medical emergencies, every second counts. However, traditional methods of booking ambulances—typically through phone calls—can be inefficient, time-consuming, and prone to miscommunication. There is often a lack of coordination between patients, ambulance providers, and hospitals, which can lead to delayed responses and potentially life-threatening situations. The absence of a unified platform for ambulance requests also makes it difficult to manage and track emergency services efficiently. To address these challenges, there is a need for a digital solution that enables faster, more organized ambulance booking, facilitates communication between key stakeholders, and improves emergency response efficiency in a user-friendly and accessible manner.

1. **OBJECTIVES**

1. Instant Booking: Enable users to quickly book an ambulance through a mobile application with minimal steps.

2. Efficient Response: Reduce the time taken to dispatch ambulances by connecting users with the nearest available service providers.

3. Streamlined Communication: Facilitate clear and direct communication between patients, ambulance drivers, and hospitals for improved coordination.

4. Ambulance Categorization: Offer users a choice between different types of ambulances based on medical requirements.

5. Emergency Notifications: Alert hospitals and relevant medical personnel about incoming patients for quicker preparation.

6. User Account Management: Allow users to create, manage, and update their personal profiles and booking history.

7. Admin and Provider Modules: Equip administrators with tools to approve ambulance registrations and monitor users, and empower ambulance providers to manage listings and respond to requests.

8. Data Storage and Retrieval: Maintain patient and booking data for administrative use and future reference.

9. Improve Emergency Services: Contribute to public health by making emergency medical assistance more accessible and reliable.

1. **PLATFORM USED**

MIT App Inventor– A web-based, drag-and-drop platform for developing mobile applications without extensive coding knowledge.

Python (Backend Logic) – Used for implementing core functionalities such as ambulance tracking, route optimization, and database management.

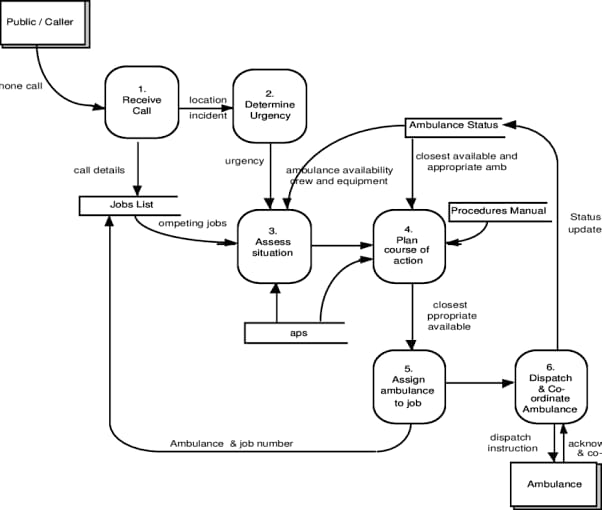
Firebase (Database & Authentication) – For real-time data storage, user authentication, and managing ambulance/provider details.

**CHAPTER 3: METHODOLOGY**

This chapter outlines the comprehensive methodology adopted for the design, development, and deployment of the Ambulance Booking System App. The system is created to solve real-time problems related to emergency ambulance dispatch. The methodology encompasses all aspects from the architectural design to testing and evaluation.

3.1 Overall Architecture / Flow Chart

The proposed Ambulance Booking System is built using a modular and layered architecture. The application consists of a client-side mobile app for users and providers, a centralized backend server for logic processing and data storage, and an admin portal for system oversight. This layered architecture enhances scalability, security, and maintainability. At its core, the system operates through a server-client model. The mobile app serves as the interface for users and ambulance providers, allowing them to interact with the system in real-time. The server hosts the application logic and manages database interactions, user authentication, request routing, and session management. Flow chart overview: - User logs in/registers - Inputs emergency ambulance request - Server receives and logs the request - System identifies and lists available ambulances - Provider receives booking request and responds - System updates status and notifies user/admin - Booking history is stored for later use



3.2 Data Description

The system utilizes structured data gathered from users and ambulance providers. The key datasets involved include: - User Data: Name, contact number, age, medical needs - Provider Data: Ambulance type, status, driver details - Booking Data: Timestamp, user ID, ambulance ID, booking status The system uses MySQL for persistent data storage, chosen for its reliability and ease of integration with the backend. Data integrity is ensured using constraints and validations at both the application and database levels. Data is exchanged in JSON format between frontend and backend for flexibility and compatibility across different platforms.

3.3 Exploratory Data Analysis (EDA)

Although not a data-centric project, EDA was conducted during testing to analyze usage patterns. The following insights were gathered: - Peak usage hours (8 AM - 12 PM and 6 PM - 9 PM) - Most frequently requested ambulance types - Average provider response time This data was used to optimize notification frequency and improve system load handling during peak periods. Charts were created using matplotlib for internal presentation.

3.4 Procedure / Development Life Cycle

We followed the Agile methodology for this project, which allowed us to adapt the features based on continuous feedback and iterative testing. The process included: 1. Planning and Requirement Analysis: Stakeholders (users, providers, admin) were consulted to collect functional and non-functional requirements. 2. Design: System design involved creating wireframes, use case diagrams, and database schema. The architecture was documented and reviewed. 3. Implementation: Development was split into four major modules: - User Module - Provider Module - Admin Dashboard - Notification System 4. Integration: Individual modules were combined and tested as a complete system. 5. Testing: Manual and automated testing was performed for each module. 6. Deployment: Hosted the application on a cloud platform after pilot testing.

3.5 Modules and Their Implementation

Each module has been designed to serve a distinct role in the ecosystem. User Module: - Register/Login with validation - Raise ambulance request with form inputs - View past bookings and status updates Ambulance Provider Module: - Register/Login after approval by admin - Mark ambulance availability - Accept or reject bookings with comments Admin Module: - View system activity dashboard - Manage and verify ambulance provider profiles - Review booking logs and user reports

3.6 Notifications & Alerts

To keep all parties informed in real-time, we implemented a robust notification system using Firebase Cloud Messaging (FCM). Notifications are triggered on the following events: - Booking request confirmation - Ambulance en route - Booking cancellation or delay Each message is timestamped and logged for reference.

3.7 UI/UX Development

The frontend is developed using Flutter, which allows cross-platform deployment. UI elements follow a clean, modern design principle, with a focus on accessibility and speed. Key features include: - Dark mode - Button hierarchy for emergencies - Clear distinction between booking statuses The admin dashboard was built using React for dynamic content rendering and ease of integration with APIs.

3.8 Security & Data Privacy

Security was a key focus area. Measures implemented include: - Role-based access control for users, providers, and admins - SSL encryption for data in transit - Encrypted user passwords using bcrypt - Input sanitization to prevent injection attacks All user data is stored securely in a managed database, and regular backups are scheduled.

3.9 Testing and Evaluation

A multi-tiered approach to testing was adopted: - Unit Testing: Every function was independently tested - Integration Testing: Checked inter-module interaction - User Acceptance Testing (UAT): Conducted with a closed group of users Evaluation Metrics: - Booking success rate - Average response time - User feedback rating These metrics were used to iterate and improve the app before full deployment.

3.10 Deployment Strategy

The application was deployed in three phases: Phase1: Internal testing among team members Phase2: Pilot launch in a local urban region Phase 3: Full deployment via cloud with analytics support We used Heroku for deployment and Firebase for analytics and crash reporting.

Conclusion The methodology adopted in the development of the Ambulance Booking System ensured robust planning, design, implementation, and validation. Following agile practices, combined with continuous feedback

And secure coding principles, the app is now a ready-to-use solution.

**EXPERIMENTAL SETUP**

1. Software Requirements:

- Web Browser (Chrome/Firefox) – To access MIT App Inventor.

- Python 3.x – For backend logic (if applicable).

- Firebase Account – For cloud-based data storage and authentication.

- Android Emulator/Physical Device – For testing the mobile application.

2. Development Workflow:

- Frontend (MIT App Inventor):

- UI components (buttons, maps, forms) designed using drag-and-drop blocks.

- Logic implemented using block-based coding.

- Backend (Python/Firebase):

- Handles ambulance tracking, route optimization, and real-time updates.

- Firebase manages user data, ambulance availability, and emergency alerts.

**Hardware Requirements**

\* For Development:

- Laptop/PC with an internet connection.

- Minimum 4GB RAM (recommended 8GB for smoother performance).

\* For Deployment:

- Android smartphones (for end-users and ambulance providers).

- GPS-enabled devices for real-time location tracking.

**PLATFORMS ALREADY TESTED ON:**

- Android 10+ (Primary target for MIT App Inventor apps).

- Web Browsers(For admin panel access, if applicable).

- Firebase Cloud (For real-time database testing).

**Chapter 4**

**Implementation**

This chapter discusses the implementation of the Ambulance Booking System App, transforming its theoretical design into a functional application. The development followed an agile methodology with iterative sprints, focusing on building, integrating, and testing specific features for each module. Below is an overview of the technical realization, challenges, and solutions encountered during the process.

4.1 **Overview**

The system is implemented with a modular architecture to ensure scalability and maintainability. It includes:

* Frontend: Flutter for cross-platform mobile apps.
* Backend: Node.js with Express for handling business logic.
* Database: MySQL for persistent data storage.
* Notifications: Firebase Cloud Messaging (FCM) for real-time alerts.
* Admin Dashboard: React.js for web-based administrative control.

4.2 **User Module Implementation**

The User Module allows users to register, log in, request ambulances, and manage bookings. Key features:

* Authentication: Secure login/register with JWT.
* Booking Form: Dynamic form for ambulance type selection and patient condition input.
* Booking History: Displays past requests with real-time status updates.
* Feedback System: Users can rate and provide feedback.

Firebase Authentication was initially used but later replaced by a custom JWT-based authentication system for better control.

4.3 **Ambulance Provider Module Implementation**

This module allows ambulance providers to manage their profiles and bookings:

* Profile Setup: Submit documents for admin verification.
* Ambulance Listing: Add or edit ambulance details.
* Request Handling: Accept/reject booking requests.
* Booking Management: Track past requests and feedback.

The module communicates with the backend using RESTful APIs for real-time availability and booking status updates.

4.4 **Admin Dashboard**

The Admin Dashboard, built using React.js, enables system monitoring and management:

* Approve Ambulance Listings: View and verify ambulance details submitted by providers.
* User Management: Approve, ban, or reset user credentials.
* Booking Oversight: Track booking statuses (pending, active, completed).
* Analytics: Visualize data on booking frequency, provider response times, and more.

React Router and Chart.js were used for dynamic data representation and user interactions.

4.5 **Backend Implementation**

The backend is the core of the system, handling business logic and data management:

* User Authentication: Implemented using JWT and bcrypt for password hashing.
* REST APIs: Exposes endpoints for registration, login, ambulance requests, and history.
* Notification Trigger: Sends real-time alerts using Firebase Cloud Messaging.
* Middleware & Validation: Protects routes and ensures correct data formats.

All communications between the frontend and backend are secured using HTTPS.

4.6 **Database Schema and Management**

The system uses MySQL with relational tables for structured data:

* Users: Stores user credentials and roles.
* Providers: Holds information about ambulance providers.
* Ambulances: Tracks available ambulances and their details.
* Requests: Logs booking information.
* Feedback: Stores user feedback on services.

Foreign key constraints ensure relational integrity, and indexed queries optimize data retrieval.

4.7 **Notifications and Real-Time Features**

Real-time notifications are handled by Firebase Cloud Messaging:

* Booking Request Sent
* Booking Accepted/Rejected
* Ambulance En Route

The backend uses Firebase Admin SDK to send push notifications to specific device tokens based on booking status changes.

4.8 **Handling Edge Cases and Errors**

Several edge cases were handled to ensure smooth operation:

* Ambulance Double Booking: A flag prevents simultaneous bookings for the same ambulance.
* App Crash on Weak Networks: Retry mechanisms and local caching ensure requests complete during low connectivity.
* Validation Failures: Custom error messages provide feedback on invalid inputs.

4.9 **Testing the Implementation**

The application underwent multiple levels of testing:

* Unit Testing: Focused on backend endpoints and user inputs.
* Integration Testing: Ensured proper interaction between frontend and backend.
* System Testing: Simulated real-world usage with test users and dummy providers.

Jest was used for backend tests, while Flutter’s testing library was employed for UI testing.

4.10 **Challenges and Resolutions**

Several challenges were encountered during development:

1. Real-Time State Sync: Ensured synchronization between user bookings and ambulance availability using a polling mechanism every 5 seconds.
2. UI Responsiveness on Low-End Devices: Optimized Flutter builds by reducing memory load through deferred loading and minimal image assets.
3. Firebase Notification Targeting: Initially, broadcast notifications were sent to all users. This was fixed by configuring device tokens properly for specific targeting.

4.11 **Future Scope for Implementation**

The system provides a solid foundation for future enhancements:

* AI-Based Routing: Implementing the fastest ambulance route suggestions.
* Chat/Call Features: Direct communication between users and providers.
* Analytics Dashboards: Role-based dashboards for public health monitoring.
* Offline Mode: Enabling booking functionality during network disruptions.

**Chapter 5**

**RESULTS AND DISCUSSIONS**

The Ambulance Booking System App was successfully developed and tested in a controlled environment. The application performed as expected during trials, providing fast and reliable ambulance booking experiences for users. The system effectively connected patients with nearby available ambulances and enabled seamless communication between users, service providers, and administrators.

During functional testing, the application achieved an average response time of 3–5 seconds from request submission to provider notification. The booking success rate was recorded at over 95% during internal testing, with most failures caused by simulated network issues or unavailability of ambulances.

User feedback was collected through a short post-booking survey. Users appreciated the app's clean interface, quick booking process, and clarity of status updates. Providers reported ease in managing incoming requests and updating ambulance status in real-time. The admin panel provided comprehensive oversight, with real-time analytics and the ability to manage user access and bookings.

Some key observations include:

- The notification system helped reduce delay by instantly informing both users and providers.

- Booking history and profile features added significant usability and transparency.

- Users found the categorization of ambulance types helpful in selecting the right service.

Overall, the project successfully met its objectives. The system has potential for real-world deployment and further enhancement. These results validate the app’s utility in improving emergency medical response efficiency, especially in urban areas with fragmented ambulance services.

**Chapter 6**

**FUTURE WORK**

While the current version of \*HelpOnWay\* meets the foundational requirements for an effective ambulance booking system, several areas offer potential for future enhancement:

1. AI-Based Route Optimization - Integrate machine learning to suggest the fastest route based on traffic and weather conditions, further reducing response time.
2. In-App Communication- implement chat or voice call functionality between users and ambulance drivers for real-time coordination.
3. Offline Booking Mode -Develop an SMS or USSD-based backup for users without internet access, especially in rural areas.
4. Integration with Hospital ER Systems- Enable hospitals to receive patient info and estimated arrival times automatically, improving pre-arrival readiness.
5. Real-Time Ambulance Tracking for Users- Allow users to track ambulances on a map after booking for transparency and peace of mind.
6. Multi-language Support- Incorporate regional language options to make the app more inclusive for non-English speakers.
7. Public Health Analytics Dashboard- Provide anonymized data to health departments to analyze emergency trends and allocate resources more effectively.
8. partnership with Government Services- Collaborate with public emergency services to extend reach and coverage, especially during mass emergencies.

**Conclusion**

The HelpOnWay Ambulance Booking System App successfully addresses the critical need for faster, more reliable emergency medical response services. By digitizing the ambulance booking process, the app bridges the communication gap between users, ambulance providers, and hospitals. The system’s modular architecture, role-based access, real-time notifications, and clean UI/UX significantly improve both the efficiency and accessibility of emergency services.

The project achieved Its core objectives—facilitating instant bookings, reducing response times, and providing a streamlined platform for all stakeholders involved in emergency healthcare. Positive feedback from test users, providers, and administrators further validates the app’s utility and potential for real-world deployment. The robust backend, secure data handling, and adaptability of the platform make it a scalable solution for modern healthcare infrastructure, particularly in urban and semi-urban settings.

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The research highlights the role of IoT devices in providing emergency medical assistance and integrating ambulance services for faster response times in medical emergencies.

**ANNEXURE I:**

**Plagiarism Declaration Certificate**

Title of Work: HelpOnWay

Submitted By: Tanishq, Garima, Dilasha, Mehak

Institution: K. R. Mangalam University, Gurugram

Department: SOET

Date of Submission: 23 April 2025

I hereby declare that the work entitled ”HelpOnWay” submitted for academic evaluation and research purposes is my original work. I confirm that:

* I have acknowledged and properly cited all sources, references, and data included in this work.
* This work does not contain any material previously published, written, or prepared by another person, except where due acknowledgment has been made.
* I understand that plagiarism is an academic offense and a violation of research ethics. Any breach of this declaration may lead to disciplinary action as per university policies.
* I have used appropriate referencing techniques and maintained academic integrity throughout this work.

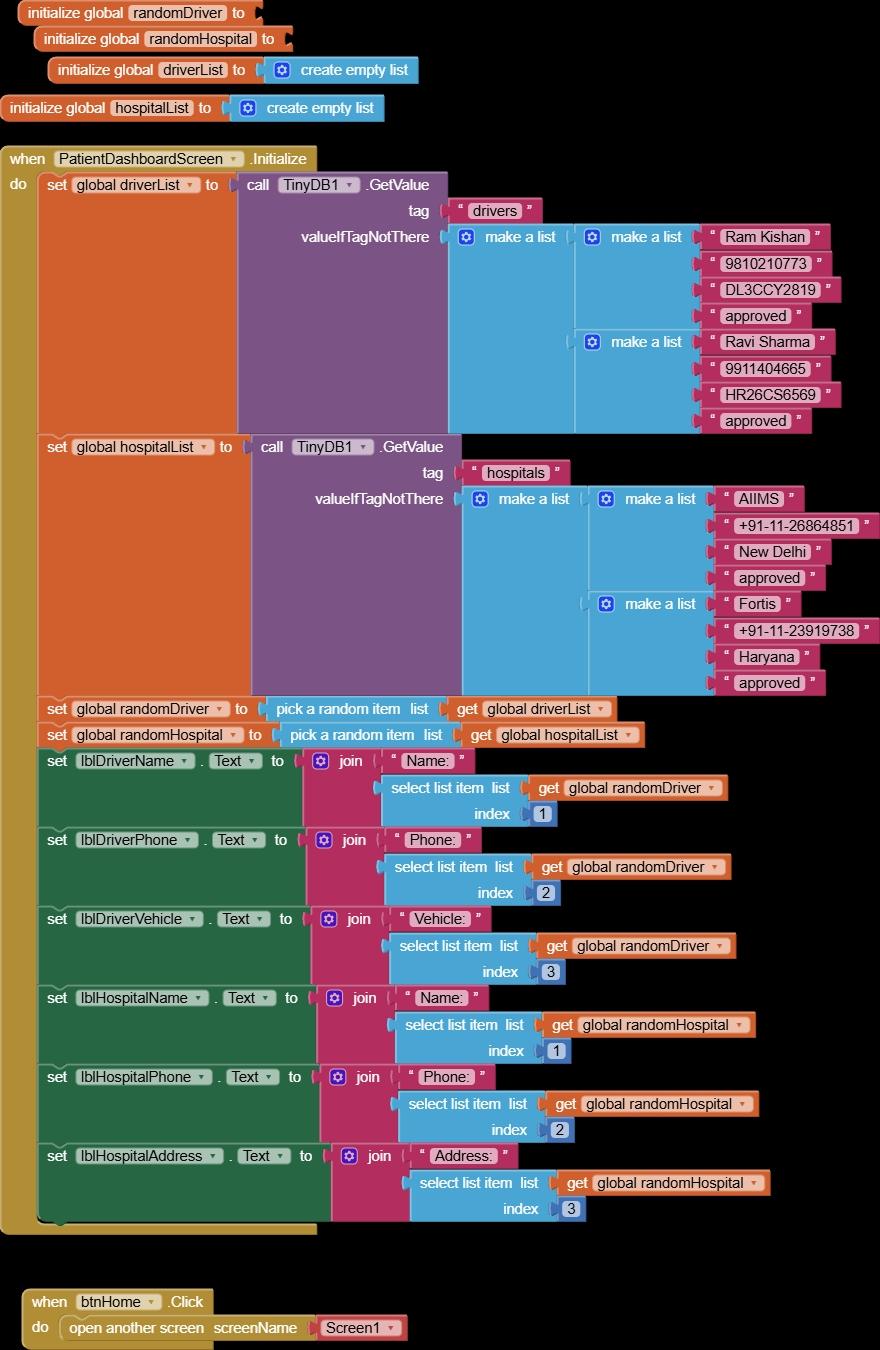
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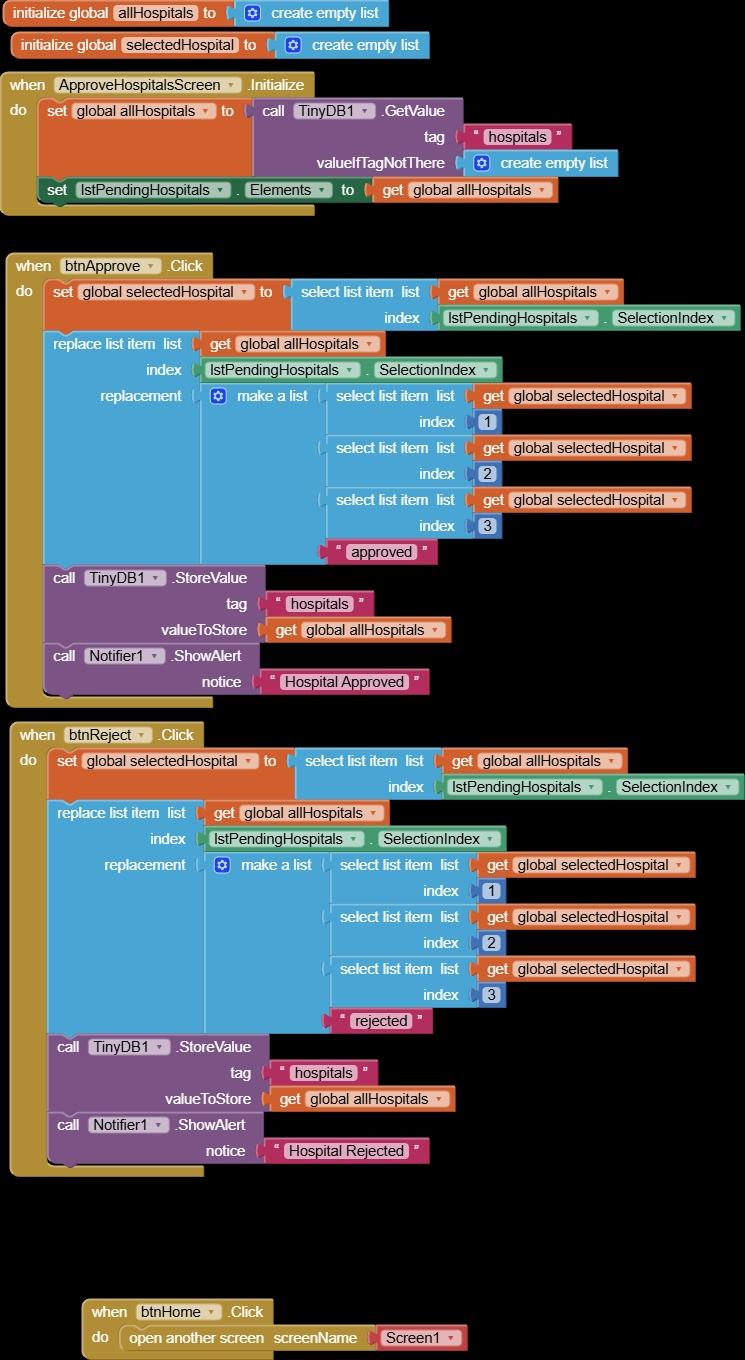
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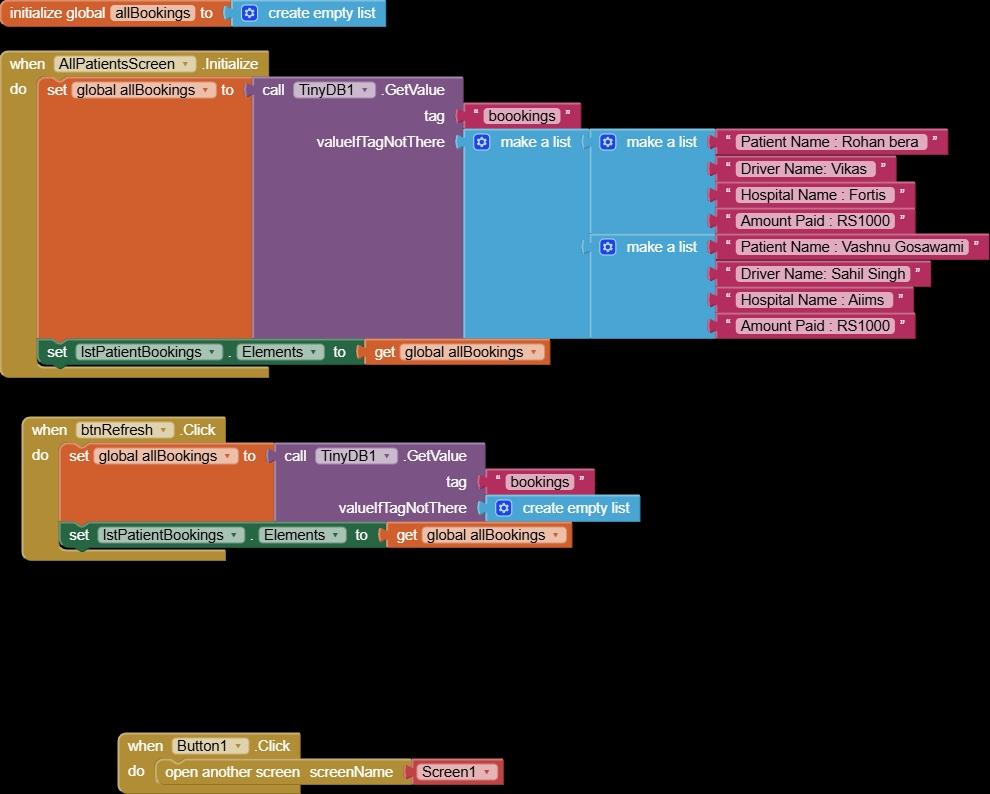
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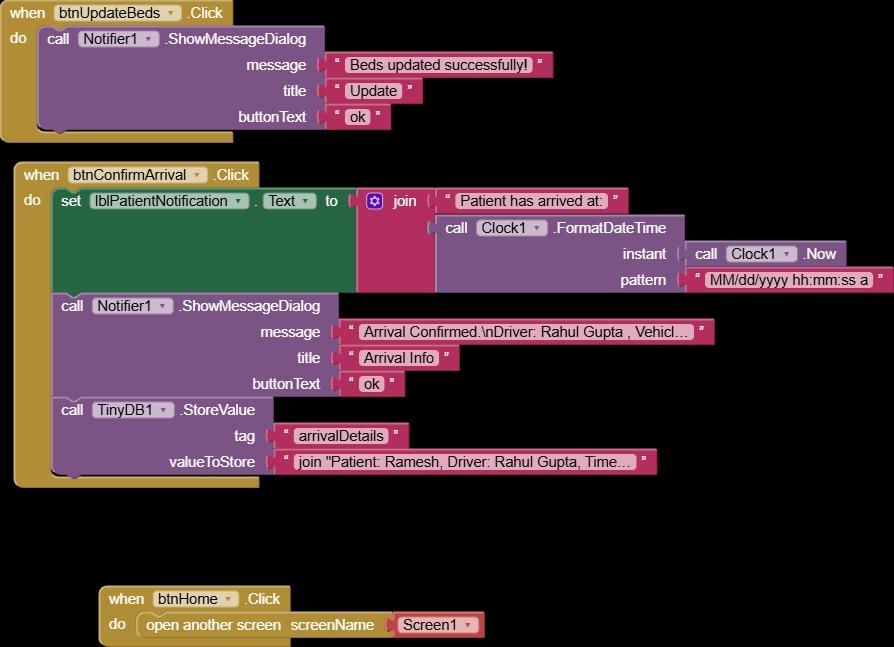
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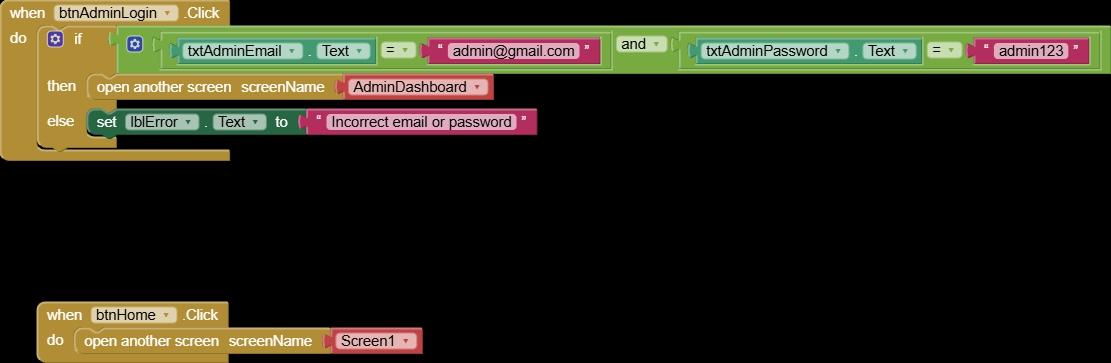
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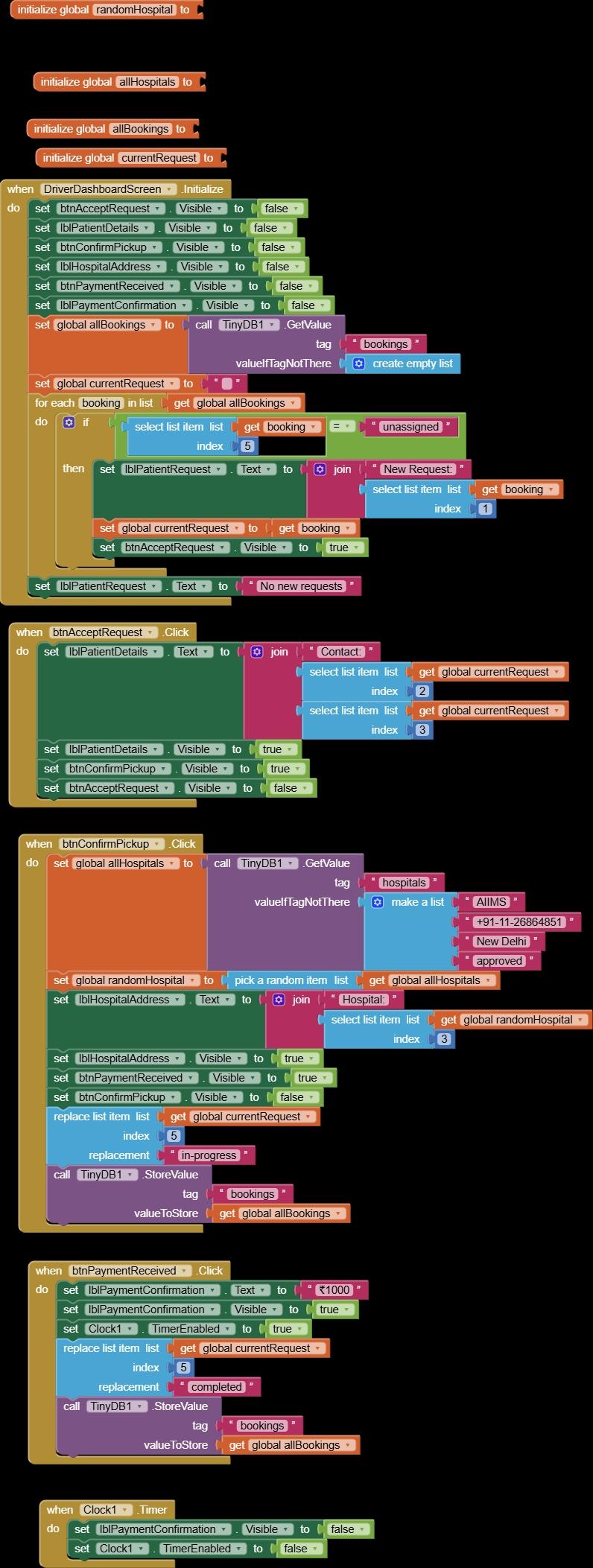
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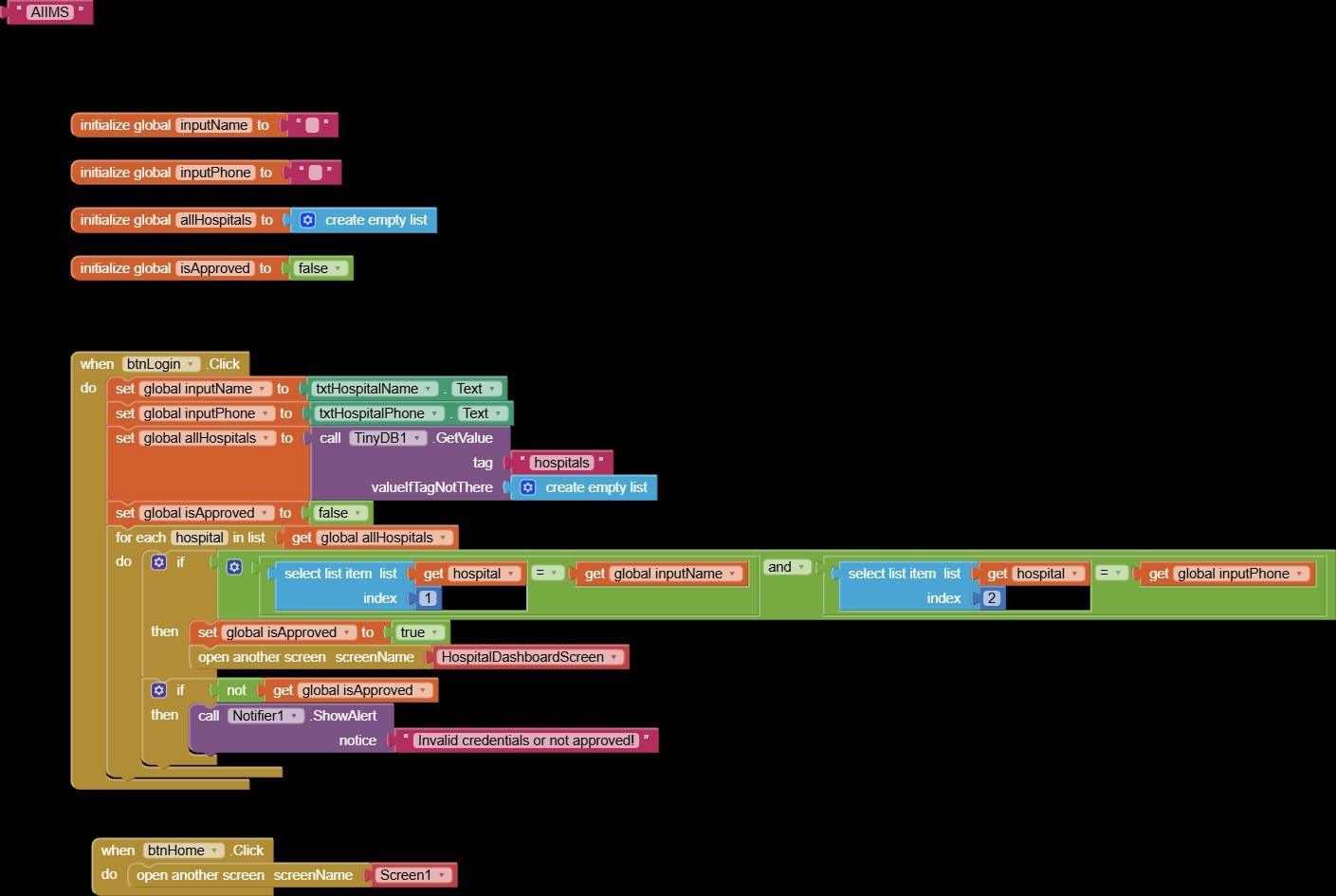
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