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FlashAid: Smart Ambulance Tracking System

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Abstract: *Rapid availability of ambulance services is a critical factor in saving lives during medical emergencies. In many situations, delays occur due to poor communication, lack of accurate location information, and dependency on traditional phone-based ambulance booking systems. These limitations become more severe with increasing population density, traffic congestion, and rising accident rates.*

To address these challenges, an Android-based emergency ambulance tracking application named 'FlashAid' has been designed and developed. The system provides a unified digital platform that connects patients and ambulance drivers using real-time GPS tracking and cloud-based services. FlashAid supports separate login modules for users and ambulance drivers. When a driver activates the application, the ambulance status is updated as available, allowing users to locate and request nearby ambulances instantly.

The application uses GPS technology along with Firebase real-time database to monitor live locations and manage emergency requests efficiently. Real-time tracking continues until the ambulance reaches the patient, after which the system automatically updates the ambulance status. FlashAid improves emergency response efficiency by minimizing delays, enhancing coordination, and ensuring accurate location sharing during critical situations.

Keywords: Emergency Response System, Ambulance Tracking, Android Application, GPS Technology, Firebase Database.

I. INTRODUCTION

Emergency medical assistance must be delivered without delay, as even a few minutes can determine the survival of a patient. Ambulance services form the backbone of Emergency Medical Services (EMS) by providing immediate transportation and first aid to patients. However, conventional ambulance systems primarily rely on phone calls, which often result in miscommunication, delayed response, and inaccurate location sharing.

In many urban and semi-urban regions, patients struggle to identify the nearest available ambulance, while drivers face difficulty locating patients due to unclear address details. Additionally, ambulance services operated by different organizations often function independently, leading to inefficient resource utilization.

To overcome these issues, FlashAid has been introduced as an Android-based smart ambulance tracking system. By integrating GPS technology and cloud-based data management, the application enables real-time location sharing and seamless coordination between users and ambulance drivers. The primary objective of FlashAid is to reduce response time and improve the effectiveness of emergency medical services through digital automation.

II. LITERATURE REVIEW

Several studies have focused on improving ambulance response time using modern technologies. Early ambulance management systems relied primarily on manual communication methods such as telephone calls and radio transmissions. Although these systems facilitated basic coordination, they were prone to delays, communication errors, and inefficient dispatching processes [1].

With the advancement of wireless communication technologies, researchers introduced systems based on the Global Positioning System (GPS) and Global System for Mobile Communications (GSM). These systems enabled real-time ambulance tracking and improved coordination between emergency responders and hospitals. Patil et al. proposed a GPS

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based ambulance tracking system that significantly enhanced response efficiency by allowing dispatch centers to monitor vehicle location and allocate the nearest ambulance to emergency sites [2].

In addition, intelligent traffic management systems have been developed to reduce travel delays. Technologies such as Radio Frequency Identification (RFID) and the Internet of Things (IoT) have been integrated into traffic signal control systems to create automated "green corridors" for ambulances [3]. These systems dynamically adjust traffic lights to prioritize emergency vehicles, thereby minimizing travel time during critical situations.

Recent research emphasizes cloud computing, IoT-enabled platforms, and mobile applications to create integrated emergency response frameworks. IoT-based ambulance systems provide real-time updates to hospitals, allowing medical personnel to prepare in advance for patient arrival [4]. Cloud-based architectures enhance scalability, data storage, and communication reliability across multiple stakeholders.

Despite these advancements, challenges remain. Infrastructure limitations, particularly in developing regions, hinder the effective deployment of IoT-based systems. High installation and maintenance costs also restrict widespread implementation. Furthermore, concerns related to data privacy, system security, and network reliability continue to pose significant barriers [5].

III. PROBLEM STATEMENT

In many emergency situations, users face difficulty in finding an available ambulance and sharing their exact location. Traditional systems are slow, unreliable, and poorly coordinated. Ambulance services often operate independently, causing delays even when a closer ambulance is available.

FlashAid is proposed to overcome these challenges by integrating all ambulance services onto a single digital platform. The application allows users to find the nearest available ambulance in real time and enables drivers to receive accurate location details. This reduces confusion, avoids unnecessary delays, and improves overall emergency response efficiency.

IV. SYSTEM METHODOLOGY

A. System Overview

FlashAid is an Android-based application with two modules: User Module and Driver Module. The system uses GPS for location tracking and Firebase for real-time data storage and communication.

B. Working Mechanism

When a user requests an ambulance, the system captures the user's GPS location and sends it to Firebase. The nearest available ambulance is identified, and the request is forwarded to the driver. Both user and driver can track each other's live location until the ambulance reaches the patient.

V. FUNCTIONAL REQUIREMENTS

- Users and ambulance drivers must register and log in
- Real-time display of available ambulances
- Users can request ambulances during emergencies
- Drivers receive requests and navigate to user location
- Live GPS tracking until destination is reached

VI. HARDWARE AND SOFTWARE REQUIREMENTS

A. Hardware Requirements

- 64-bit Windows 10/11
- Minimum 4 GB RAM
- 8 GB free disk space and x86_64 Processor

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B. Software Requirements

- Operating System: Windows 10/11
- Programming Language: Java
- Database : Firebase
- IDE: Android Studio

VII. DESIGN

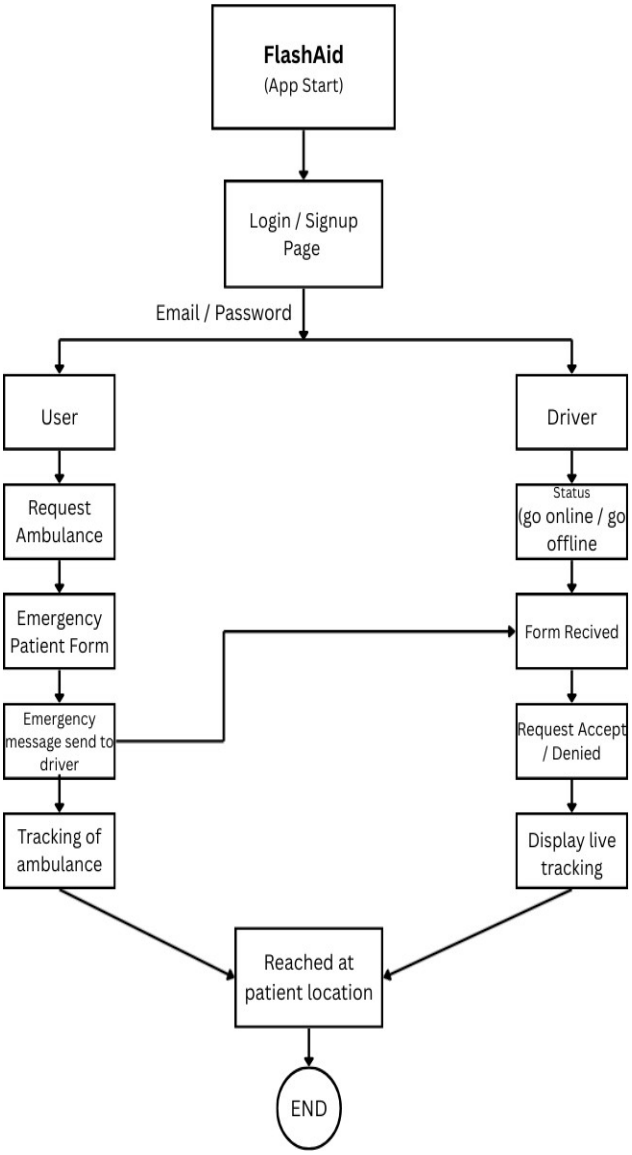

Fig 1. Flow chart

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VIII. OUTPUT

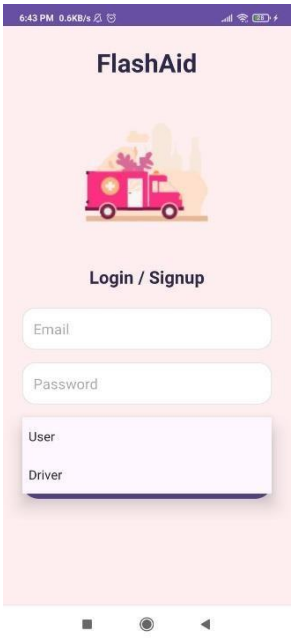


Fig. 2 Login Page

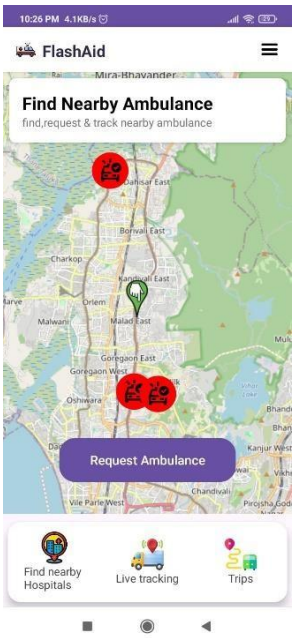
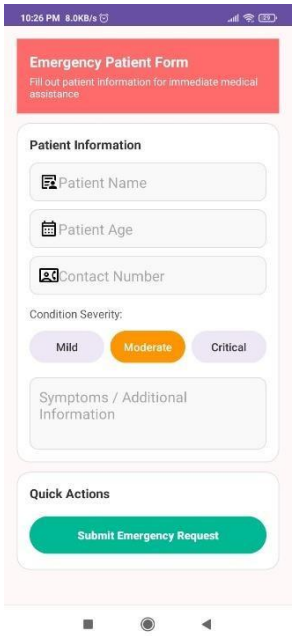


Fig. 3 User Interface



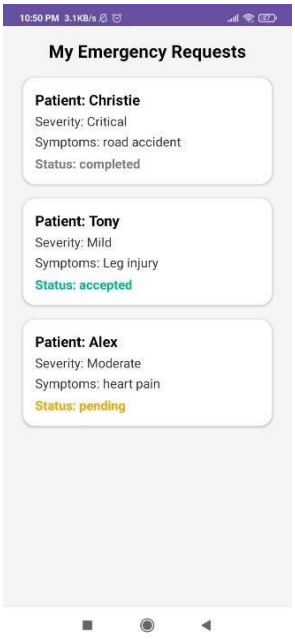


Fig. 4 Patient's form Fig. 5 Patient's list of request for ambulance in driver interface

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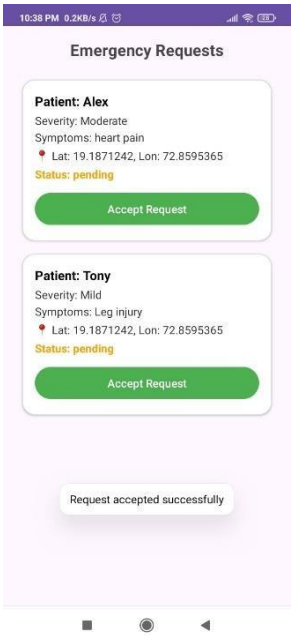

Fig. 6 Driver accept the request

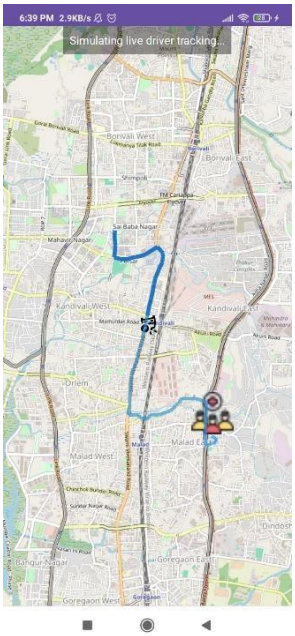

Fig. 7 Live tracking from both ends

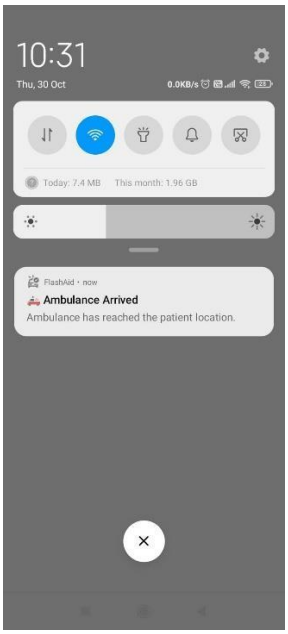

Fig. 8 Notification after ambulance arrived

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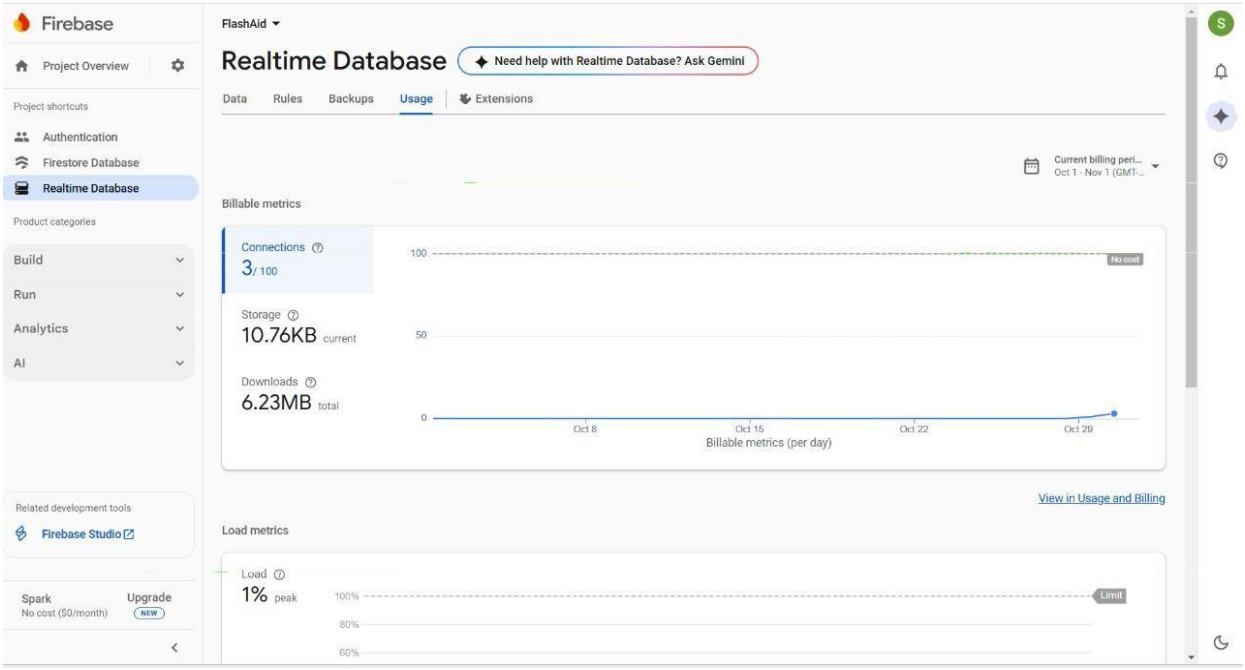

Fig. 9 Firebase Database

IX. FUTURE WORK

Future enhancements may include integration with IoT-based wearable devices, AI-based ambulance allocation, government emergency networks (108/112), multi-platform support, and voice or gesture-based emergency activation.

X. CONCLUSION

FlashAid provides an effective solution for improving emergency medical response by integrating real-time tracking, automated ambulance allocation, and cloud-based communication. The system ensures faster response, better coordination, and accurate location sharing, making it highly useful in life-critical situations. The project demonstrates how mobile and cloud technologies can significantly enhance emergency healthcare services.

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