PathPilot: Find Your Way

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Abstract— **This paper presents the design and implementation of PathPilot: Find Your Way, a cutting-edge mobile application that facilitates easy navigation and enhances the campus experience with an interactive 3D map. It is a dynamic platform that enables users to stay updated about campus events and has a search functionality where users can search for information by searching for their names. Key features include easy location selection by floor, staircase, and destination, an easy-to-use interface, real-time updates on events and the latest updates on campus, and an interactive 3D map. It is an innovative and practical solution to enhance their campus navigation experience.**

Keywords— Campus navigation, Smart campus, Interactive map, 3D map, Mobile application, Mapping technology, Real-time updates, Search functionality

I. INTRODUCTION

PathPilot is a mobile application that simplifies campus navigation and enhances the overall campus experience. It has an easy-to-use design and user-friendly interface, that makes it effortless for students to navigate their college campuses. The users can select floors, staircases, and destinations for easy location of their destination within the campus efficiently. PathPilot is also a dynamic platform, that enables users to stay up to date about campus events, making it easier to stay connected. It also has a search functionality where users can search for a person's name to get their contact information, location, and their details. It also features an interactive 3D map that allows users to easily and efficiently navigate the campus environment. The map provides a comprehensive overview of the campus layout that allows users to zoom in and out of the map. It is built using Flutter framework, SQLite, and Blender. With PathPilot, users can have an enhanced campus navigation experience while staying updated with the campus community.

II. LITERATURE REVIEW

The evolution of campus navigation and event management has been significantly influenced by the advent of cutting-edge technologies. The Flutter-based Interactive Map [1] is a testament to the versatility of the Flutter framework, enabling the creation of an application that not only looks good but also functions seamlessly, making campus navigation easy for its users. The GPS-based Android Navigation system [2] takes advantage of the ubiquity of Android devices, integrating with Google Maps to provide a real-time navigation service that addresses the complexities of navigating large campuses. The Unibs4all Accessibility App [3] is a shining example of inclusive design, utilizing the Google Maps API to offer navigation solutions that cater to the needs of users with visual impairments, thereby fostering an environment of accessibility on campus. The Smart Campus initiative [4] harnesses the power of the Internet of Things (IoT), collecting and analyzing data from a network of sensors and devices to inform decisions that shape the future of campus infrastructure and operations. The convergence of IoT and AI [5] in smart campuses is revolutionizing the educational landscape, enhancing the learning experience through smarter resource management, and fostering a sustainable campus environment. The ARCore-based Navigation System [6] introduces an augmented reality layer to campus navigation, providing users with intuitive visual cues and an immersive experience as they move through the campus. AR for Indoor Library Navigation [7] applies AR technology to the library setting, guiding users to resources and transforming the library experience into an engaging and interactive adventure. The "Campus Navigator" app [8] showcases the potential of beacon technology for precise navigation both indoors and outdoors, overcoming the limitations of traditional GPS systems in enclosed spaces. AR in Campus Navigation [9] combines AR with mobile technology to offer a rich, cultural

tour of the campus, enhancing the educational experience with historical and cultural narratives. In the realm of event management, Presentik QR Code Attendance [10] leverages QR codes to provide a secure and efficient method of tracking attendance, streamlining the process for event organizers and participants. Evecurate Event Management [11] offers a comprehensive suite of tools for event planning, including budgeting, checklists, and audience interaction, all packaged within a user-friendly mobile application.

III. METHODOLOGY

The aim is to simplify campus navigation and facilitate campus experience with an interactive 3D map, search functionality, and updates on-campus events.
Key aspects covered in system design:

- Enhance the user experience with a user-friendly UI with a search bar, interactive maps, a clear navigation menu, and 3D mapping for an immersive experience.

- Provides a real-time update by enabling users to receive notifications.

- Integrate a campus mapping system with an interactive 3D map for easy location of the campus facilities.

- Implement a database to store user data (email ID and password) and authenticate their login.

This system design emphasizes the main features of PathPilot, such as campus navigation, real-time updates, communication tools, campus mapping, and an easy-to-use interface.

A. Hardware Requirements:

- 8GB RAM
- 256GB storage
- i5 Intel processor

B. Technology Stack:

- Flutter framework
- Android Studio software
- Figma is used to design the UI of the application's development.
- SQLite, used to store user data (email ID, password) and authenticate their login.
- Blender, for creating a 3D map.

IV. DESIGN DETAILS

PathPilot application integrates several key components to create a seamless user experience.
1. *SQLite Integration:* This component serves as the local database for PathPilot. It is lightweight, self-contained, and serverless. Key features include:
    i. Ensure data consistency and reliability.
    ii. Eliminate the need for a separate database server as it simply creates a new file and connects to it via the SQLite3 API.
    iii. Occupying less than 1MB in size.

2. *Flowchart:* The flowchart depicts the login and sign-up processes within PathPilot.
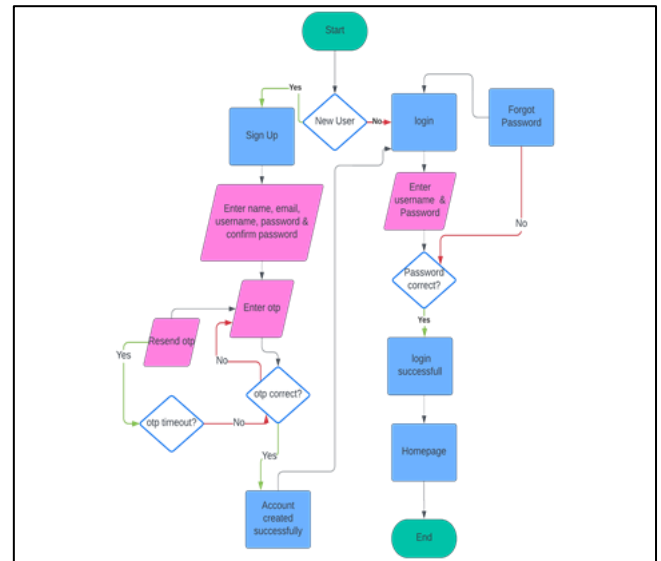

Fig. 1. Flowchart of PathPilot Application

To build PathPilot, we first need to create a Flutter project in Android Studio and install all the necessary tools. Once the setup is done, we can develop the splash screen, login screen, sign-up screen, homepage, search page, map page, and profile page. The search page contains a feature that displays names. When a name is selected, it opens the detailed description page. On the map page, we have implemented a function that allows users to switch floors, select staircases, and choose their destination. This function enables the display of a 3D map featuring the route and zooming capabilities. Additionally, users can access detailed descriptions of destinations, including timings and associated professors. The login and sign-up pages, after their creation, are integrated with the SQLite database to store user data and authenticate the login process.

The homepage features a function that presents updates; when selected, it displays detailed descriptions and is the same for event information as well. Also, a push notification alert system can be implemented and integrated with the database to provide real-time alerts. For the creation of a 3D map, Blender software is used. A map for one floor is created, with routes added from various staircases to destinations. Multiple files are created for this purpose. When the user selects a staircase and a destination, the corresponding map with the route is displayed.

V. RESULT

The successful result of the PathPilot application is shown, which has simplified campus navigation. Its user-friendly interface makes it easy for users to locate classrooms and offices and also enhances the campus experience.
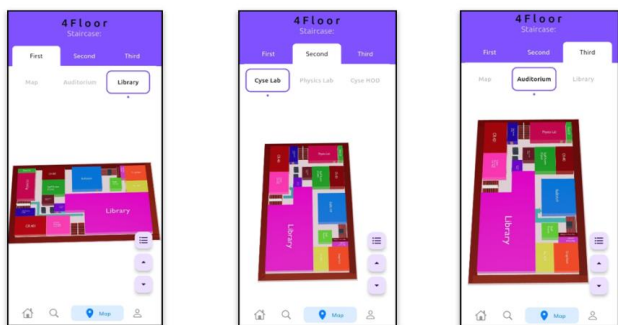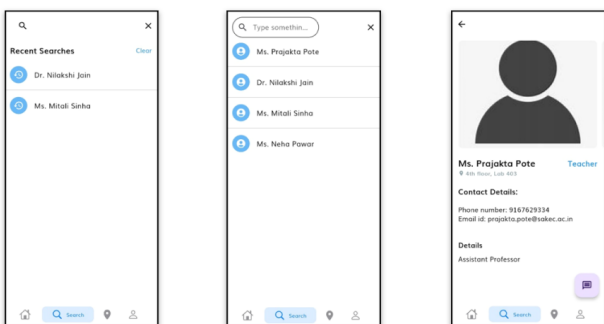
Fig. 2. Map page of PathPilot

Fig. 3. Search Page of PathPilot Application

VI. CONCLUSION AND FUTURE SCOPE

In conclusion, it has emerged as an innovative mobile application that simplifies the campus navigation. With its user-friendly interface and easy-to-use design, PathPilot facilitates seamless navigation for students, enabling them to easily locate classrooms, offices, and other campus destinations. It provides real-time updates on academic events and facilitates instant notification alerts, thereby enhancing connectivity with the campus. Moreover, the interactive campus map feature of PathPilot, along with the addition of a 3D map, provides users with a more immersive and engaging experience. It offers a realistic depiction of the campus environment, enhancing navigation and exploration.

Future Scope:

- Integrating indoor positioning systems (IPS) for enhanced navigation accuracy.
- Integrating augmented reality (AR) features.
- Development of a chat page to enable interaction between students and teachers.
- Optimize the algorithm for real-time performance to provide instant route suggestions.
- Implementing encryption and blockchain technology to improve security levels.

- Features like student progress tracking, displaying results and attendance records, etc. can be added.

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