VELS

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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PROJECT PHASE I

IntraVista - AR driven Indoor navigation for College Campus

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ABSTRACT

- ✓ Indoor navigation technology plays a vital role in helping individuals find their way within complex environments like university campuses, shopping malls, and airports, where traditional GPS is ineffective.

- ✓ It is specifically designed to ease navigation for new students, parents, and visitors, addressing the common challenge of locating specific rooms, even for those familiar with the university.

- ✓ This app provides an interactive campus map that clearly displays all blocks, departments, and facilities, along with detailed guidance down to the floor and room level. By utilizing augmented reality (AR) and street view technology, the system offers an immersive 360-degree visual experience, guiding users through hallways, staircases, and rooms with precision.

OBJECTIVE

- ✓The objective of this project is to develop a comprehensive indoor navigation system utilizing augmented reality (AR) technology, with a focus on integrating machine learning for accurate floor detection. By employing TensorFlow and deep learning algorithms, such as Convolutional Neural Networks (CNNs), the system will leverage barometric sensor data to precisely identify the user's current floor. The project also aims to incorporate Google API for seamless indoor mapping and Enhance user experience by incorporating AR and street view technology for immersive guidance. Ensure accessibility by offering features like alternate routes and voice-guided navigation.

SCOPE

- ✓ Interactive Campus Map: An interactive map that details all buildings, rooms, and facilities within the university campus, ensuring easy navigation.
- ✓ Augmented Reality (AR) and Street View: Integration of AR and street view technology to provide an immersive visual experience, guiding users through hallways, staircases, and rooms with high precision.
- ✓ Machine Learning for Floor Detection: Implementing a machine learning-based altitude detection system using TensorFlow and CNN algorithms. This system will automatically identify the user's current floor based on real-time barometer sensor readings and display the corresponding map.
- ✓ Detailed Navigation: Providing precise and detailed navigation instructions to essential locations like the admission office, library, dining hall, and classrooms.
- ✓ Accessibility Features: Ensuring the app is user-friendly, cross-platform, and accessible via mobile devices developed using Flutter. Accessibility features will include voice-guided navigation and alternate routes for individuals with disabilities.

PROBLEM STATEMENT

- ✓ Navigating large, complex environments such as university campuses poses significant challenges, particularly for new students, parents, and visitors. Traditional GPS solutions are ineffective indoors, leading to confusion and difficulty in locating specific rooms or facilities. Additionally, the challenge of accurately determining a user's current floor in multi-story buildings without manual input hampers efficient navigation. This lack of an intuitive and accessible navigation system can result in wasted time, frustration, and anxiety, especially during critical events like admissions or campus tours.

DISADVANTAGES OF THE EXISTING SYSTEM

- ✓Ineffectiveness of Traditional GPS Indoors: Traditional GPS systems fail to provide accurate guidance within indoor environments, leading to a lack of direction for users.
- ✓Manual Floor Selection: Existing systems often require manual input for selecting the correct floor, which is inconvenient and prone to errors.
- ✓Lack of Detailed Room-Level Navigation: Most existing systems do not offer detailed navigation down to the room level, making it difficult for users to find specific locations.
- ✓Static Campus Maps: Many campus maps are static, lacking the interactivity needed for effective navigation.
- ✓Lack of Accessibility Features: Existing solutions often fail to provide necessary accessibility features, such as alternate routes and voice-guided navigation, for users with disabilities.

PROPOSED METHODOLOGY

✓ Data colllection:

Use the barometer sensor in mobile devices to gather altitude data. Barometric sensors measure atmospheric pressure, which can be converted to altitude. Record altitude data from various floors within the building, ensuring each data point is labeled with the corresponding floor number.

✓ Preprocessing the Data:

Normalize the altitude data to ensure consistency and enhance model performance. This involves converting raw altitude readings into a standardized format. Apply techniques such as subtracting the mean and dividing by the standard deviation to normalize the data.

✓ Designing the Machine Learning Model:

Choose a suitable deep learning model, such as Convolutional Neural Networks (CNN) or a simple feedforward neural network, based on the complexity of the altitude data.

The model will be trained to predict the floor number based on the normalized altitude data.

✓ Integration with the Mobile App:

Integrate the trained model into a Flutter-based mobile app to enable real-time floor detection based on live altitude measurements. The app will use the model to automatically determine the user's current floor and display the corresponding floor map.

✓ Map Display and Navigation:

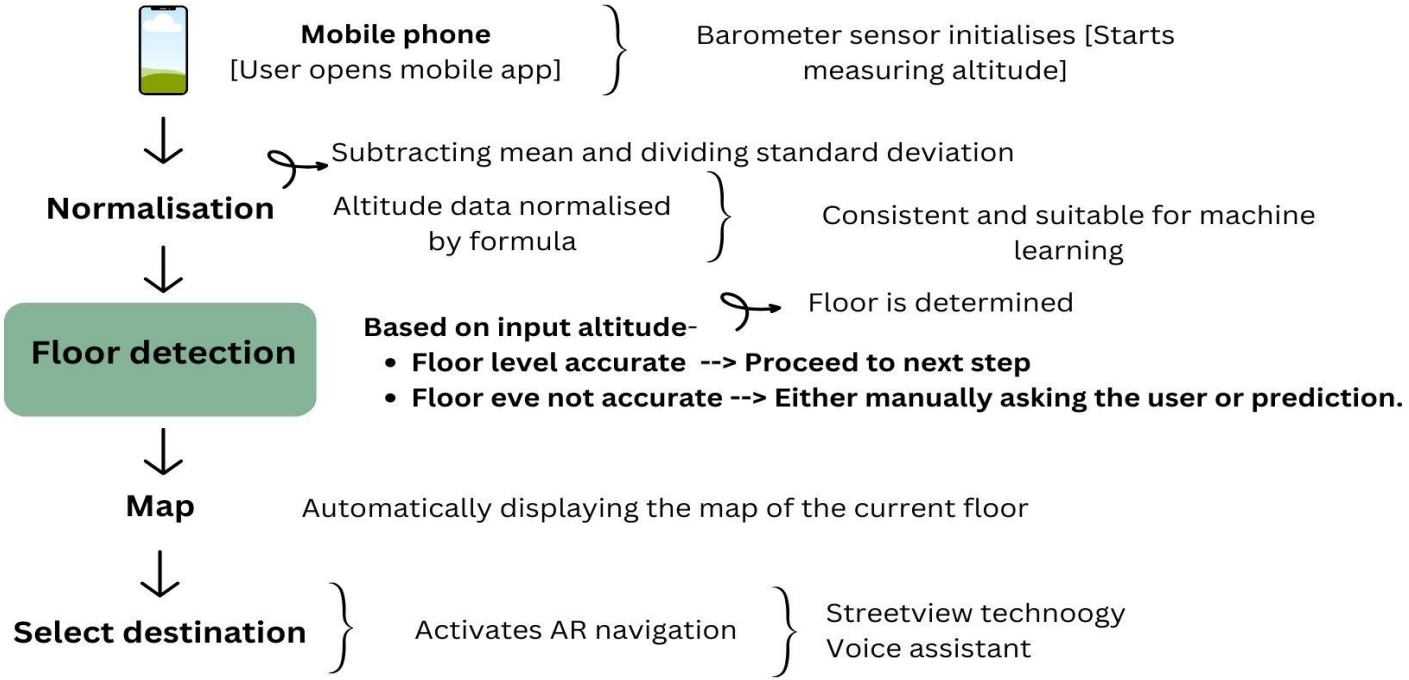
Interactive Map: Automatically present the appropriate floor map once the floor is detected, allowing users to select their destination.

AR and Street View Integration: Implement ARCore to provide visual guidance and street view features for enhanced navigation within the building.

SOFTWARE REQUIREMENT

- ✓Development Platform: Flutter for cross-platform mobile app development.
- ✓Programming Languages: Python for machine learning.
- ✓Machine Learning: TensorFlow Lite, using CNN for altitude-based floor detection.
- ✓AR Software: ARCore for implementing augmented reality features.
- ✓Database: Firebase for storing campus map data, user preferences, and related data.
- ✓API Integrations: Google Maps API for basic map functionalities, alongside custom APIs for altitude-based floor detection and campus-specific data.
- ✓ IDE : Visual Studio Code

ARCHITECTURE



CONCLUSION

- ✓The Indoor Navigation System is an essential innovation for enhancing navigation within complex indoor environments like university campuses. By combining interactive mapping, augmented reality, and machine learning for altitude-based floor detection, the system provides a robust, user-friendly solution. This project addresses the significant limitations of traditional navigation systems, ensuring that all users, including those with disabilities, can navigate the campus with ease and confidence. The system is adaptable and scalable, making it applicable to a variety of indoor environments beyond university campuses.

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THANK YOU