



UTM
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PROJECT PROPOSAL

ARNAVI

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1. Introduction

Navigation System for The Faculty of Computing: NABC Framework

Need(N)

The proposed system, ARNAVI, addresses the challenge of navigating the Faculty of Computing, a large and complex academic environment. Students, staff and visitor often struggle to locate classrooms, labs, faculty offices and other facilities efficiently. For instance, surveys have shown that more than 60% of students sometimes have a problem navigating the faculty of computing [1]. This issue leads to wasted time, delays in classes or meetings and frustration for first time visitors or those unfamiliar with the layout.

Approach (A)

ARNAVI leverages Augmented Reality (AR) technology to provide an immersive intuitive, and interactive navigation experience

How it works:

- User access ARNAVI through a mobile app compatible with both iOS and android devices.
- The app uses the device's camera and AR overlay to guide users in real time, projecting directional arrows, virtual signboards and contextual labels onto the live camera view.
- **Indoor navigation:** Employs beacon technology and AR markers placed strategically across the campus, enabling precise room level guidance even in multi-story buildings.
- **Interactive features:** Users can tap on AR objects to get additional information such as faculty member's office hours, details about labs or real time event updates.
- **Personalized routes:** The system creates routes based on the user preferences, accessibility needs such as wheelchair friendly path or proximity to amenities like elevators and restrooms.

Benefit(B)

ARNAVI offers numerous benefits:

- **Immersive guidance:** AR overlays provide clear, visual directions, reducing confusion and making navigation effortless.
- **Enhanced accessibility:** The app caters to diverse user groups, including individuals with disabilities, through features like audio guidance and accessible route suggestions.

- **Improved engagement:** The navigation is really engaging especially with the AR interactive elements, especially for first time users and visitors.
- **Efficiency:** Save time and stress by finding their destinations quickly even if unfamiliar areas.

Competitor(C)

- **Google maps:** Effective for outdoor navigation but unable to provide indoor room level guidance or AR enhanced directions [2].
- **Campus maps:** Outdated and non-interactive, these fail to meet the dynamic navigation needs of modern academic environment.
- **IndoorAtlas:** A sophisticated indoor navigation tool but does not integrate AR features for enhanced user engagement [3].

ARNAVI sets itself apart with AR based real time guidance, interactive features and focus on personalized, accessible and seamless indoor and outdoor navigation.

2. Existing Systems

1. Manual System

Currently, navigation within the Faculty of Computing building relies on:

- **Signage:** Physical signs indicating room numbers and facilities.
- **Issues:**
 - Can be confusing for first-time visitors unfamiliar with the building layout.
 - Lack of multilingual support.
 - Static information that doesn't adapt to changes, such as room relocations or event-based setups.
- **Directory maps :** Displays the building layout with a "You Are Here" marker to help users orient themselves.

Issues:

- Static and cannot provide real-time or interactive guidance.
- Difficult to update when room locations or building layouts change.

- Relies on users' ability to interpret the map, which can be confusing for first-time visitors.
- Limited accessibility, as users must locate the map on the wall to use it.

2. Existing Digital Systems

While no specific digital navigation system is tailored for the Faculty of Computing, broader solutions are used:

- **Google Maps:** Can guide users to the building but lacks detailed indoor navigation and context-specific features like finding specific rooms or labs.

Issues:

- Ineffective for indoor navigation.
- Requires user knowledge of room labels and layout.

Table 1: Comparison of existing systems

Features	Manual signage	Directory maps	Google maps
Indoor Navigation	No	No	No
Real-Time Updates	No	No	Yes (outdoor only)
AR Capability	No	No	No
Multilingual Support	Limited	No	Limited

3. Proposed System

The **AR-based Navigation System (ARNAVI)** for the Faculty of Computing is an innovative platform that uses **Augmented Reality (AR)** to guide users through the building. It is designed to enhance user experience by providing real-time, interactive, and intuitive navigation assistance for students, faculty, staff, and visitors.

Integration with a Larger System

The ARNAVI navigation system is part of a **smart campus ecosystem** and interfaces with existing university systems such as:

1. **Student Information System (SIS):**
 - a. Integrates schedules and room information for students and faculty.
2. **Event Management System:**
 - a. Displays directions to event venues like seminars, conferences, or workshops.
3. **Campus-Wide Navigation System:**
 - a. Offers seamless transitions between the Faculty of Computing and other buildings on campus.

System Description

The ARNAVI navigation system overlays virtual directions, markers, and labels onto the user's smartphone or AR-enabled device screen, enhancing navigation with real-world interactivity.

Key Features:

1. **AR Pathways:**
 - a. Displays virtual arrows and indicators in the user's camera view, guiding them to their destination.
2. **Location Search:**
 - a. Users can search for specific locations (example: "N28a-BT3" or "Dr. Iqbal's Office") and follow the directions.
3. **Personalized Schedules:**
 - a. Students and faculty members can access their schedules and receive AR guidance to their next location.
4. **Accessibility Routes:**
 - a. Highlights wheelchair-friendly pathways and elevators for differently-abled users.
5. **QR Code Integration:**
 - a. Users can scan QR codes placed outside rooms for quick access to inform that the room is occupied or navigation assistance.
6. **Offline Support:**

- a. Allows users to download building maps for offline ARNAVI.

User and Their Roles:

1. Students:

- a. **Roles:** Access ARNAVI to classrooms, labs, study areas, and faculty offices.
- b. **Functions They Can Perform:**
 - i. Search for and locate their lecture halls.
 - ii. Use AR to visualize their path in real-time.

2. Faculty Members:

- a. **Roles:** Navigate to lecture venues, offices, and meeting rooms.
- b. **Functions They Can Perform:**
 - i. use AR directions to classrooms.
 - ii. Search for and collaborate with other staff members.

3. Administrative Staff:

- a. **Roles:** Manage room assignments and assist visitors using ARNAVI guidance.
- b. **Functions They Can Perform:**
 - i. Update room allocation and building maps.
 - ii. Guide visitors with AR-based directions.

4. Visitors:

- a. **Roles:** Use ARNAVI assistance to locate offices, seminar halls, or meeting room.
- b. **Functions They Can Perform:**
 - i. Search for specific locations and follow ARNAVI pathways.
 - ii. Access event details and find corresponding venues.

Advantages of the ARNAVI system

1. **Enhanced Navigation:** ARNAVI provides an immersive experience for all users especially for the new student in UTM.
2. **Improved Accessibility:** Give an accessibility for differently-abled individuals.
3. **Real-Time Updates:** Can notified the user about room availability instantly.
4. **Reduce Headache:** ARNAVI system can easily help student to find specific room efficiently without any issue due to the complex infrastructure of faculty.

4. References

- [1] **Academic research paper:** problems in navigating the faculty of computing.
https://docs.google.com/spreadsheets/d/16ZTjKmbvZX5udJwaxEqI09FGPa_1h5OQ46i44ysEn_c/edit?usp=sharing
- [2] **Google maps.** Retrieved from <https://g.co/kgs/r6vH7fr>
- [3] **Indoor atlas.** Retrieved from <https://www.indooratlas.com>

Appendices

<https://www.zerogpt.com>



