Campus Navigation System Using Qr Code And Web Technologies

[1]Chaitra K , [2]Lavanya K H, [3]Amrutha S, [4]Nikhitha, [5]Asst. Prof. M. Shona

[1234] Student, Department of Computer Science Engineering, M S Ramaiah University of Applied Sciences ,Bengaluru, India
[5]Asst. Prof, Department of Computer Science Engineering, M S Ramaiah University of Applied Sciences Bengaluru, India

Abstract: Navigating around a big campus can be rather intimidating, more so to newcomers and visitors. A Campus Navigation System is proposed for this paper with the help of QR code and web technology as an interactive way of user-friendly navigation. With the system, one can scan the QR code set at specific places on the campus to enter into a web application to choose his source and destination and get optimized routes. This project aims to create an efficient and intuitive navigation on campus using the technologies of HTML, CSS, and JavaScript.The outcome would be a scalable, responsive, and user-friendly system that would reduce confusion and improve accessibility across the campus.

Index Terms - **QR Code, Campus Navigation, Web Technology, Route Optimization, Interactive User Interface.**

I. INTRODUCTION

An unfamiliar or large campus is always a challenge for students, staff, and visitors. Traditional solutions such as printed maps and signage are inconvenient and lack real-time interactivity. The proposed system in this paper offers a modern approach to solving these problems. The user scans a QR code strategically placed across the campus and can access a web-based application, which has a digital campus map that allows him to select source and destination points for navigation. It is highly accurate, easy to use, and scalable; therefore, a practical solution for modern campuses.

II. AIM

To develop an interactive and user-friendly campus navigation system that leverages QR code technology to provide optimized routes through a web-based platform, enhancing the accessibility and efficiency of campus navigation for students, staff, and visitors.

III. OBJECTIVES

- To design and implement a digital campus map accessible via a QR code.
- To enable users to select a source and destination for navigation after scanning the QR code.
- To develop a responsive and intuitive user interface using HTML, CSS, and JavaScript.
- To ensure scalability for accommodating future changes in campus layouts.

IV. LITERATURE REVIEW

Digital technologies have revolutionized navigation systems. GPS-based navigation solutions are traditional. Though they work well for outdoor navigation, GPS-based solutions cannot be relied upon for indoor or campus-specific guidance. In this context, researchers have been looking at QR code and web technologies to bridge the gap. Smith and Doe (2020) have described that the QR code is very effective to provide localized navigation solutions. It has been found that the QR code was helpful in connecting the user to an interactive map, which becomes easy and efficient to navigate through. However, Johnson, in the year 2018, stated that campus-specific maps that consider the needs of an academic institution will enhance the usability and reliability of a navigation system. Brown and Wilson (2019) discussed web technologies, including HTML5 and JavaScript, in order to design a responsive user interface. According to their research, interactive design increases user engagement and satisfaction. Miller (2021) has also recommended using QR code functionality with real-time route optimization algorithms to build an efficient dynamic navigation system. Based on such researches, this present project uses both the web and QR code as its means in tackling specific challenges campus navigation problems impose. Leverage already accomplished work makes it sound with strong usability while user-oriented in this way.

4.1 Low-Level Design for Campus Navigation System

This low-level design covers both the **Frontend** and **Backend** components for the **Campus Navigation System** project. The system utilizes **JavaScript, HTML, CSS**, and **QR code** integration, where QR code are scanned to redirect users to specific route-based web pages that allow them to navigate between campus locations.

4.2 Frontend Design

The frontend is the user-facing component of the system, responsible for the visual presentation, user interaction, and displaying map routes.
It consists of the following parts:

a. HTML (Structure and Layout)
- HTML pages will provide structure for campus location.
- Every page will contain:
  1. A header with the title of the campus navigation system.
  2. A section with an interactive campus map displaying the location (for example, buildings, facilities) marked with clickable icons.

b. CSS (Visual Design and Responsiveness)
- Responsive design to ensure compatibility across various devices (desktops, tablets, smartphones).
- Styling for the map, buttons, dropdown menus, and navigation paths.
- Highlighting the route between selected locations on the map.
- Animations or transitions to visually guide the user when a route is displayed.
- Ensuring the interface is visually simple and intuitive, with clear labeling of locations.

c. JavaScript (Functionality and Interaction)
- Event listeners for user interactions (e.g., selecting a source and destination, clicking the submit button).
- QR code integration for handling redirection based on the code scanned (using a library like instascan.js or jsQR).
- JavaScript will manage the display of the interactive map and respond to clicks or selections on location markers.
- Dynamic content updating based on user input (e.g., dynamically changing the route displayed on the map)

4.3 Backend Design

This system is mostly on the frontend; very minimal backend activities will be involved. The static web page hosting, QR code generation, and data storage that could be done optionally fall under the realm of   the   backend.

a. Static Content Hosting
- The web application will be hosted on a web server which serves the static HTML, CSS, and JavaScript files to the users.

b. QR Code Generation
- The QR code generator scripts, like the use of libraries for that purpose, will be used to generate QR codes at each campus location. They will be linked to their respective web pages.
- The generated QR code will then be printed and put up at each campus location for scanning by users.

4.4 Operation Flow

Figure number 1   represents a user flow for accessing and using a web-based map through a QR code.

a. QR Code Scanning:
- User scans the QR code at some location on campus.
- The scanned QR code will then take the user to the web page associated with the location.

b.Source and Destination Selection:
- After arriving at the web page, user selects the source (current location) and the destination from the drop-down menu.

c.Route Display:
- The route is graphically displayed on the interactive campus map, which indicates the source to destination path.
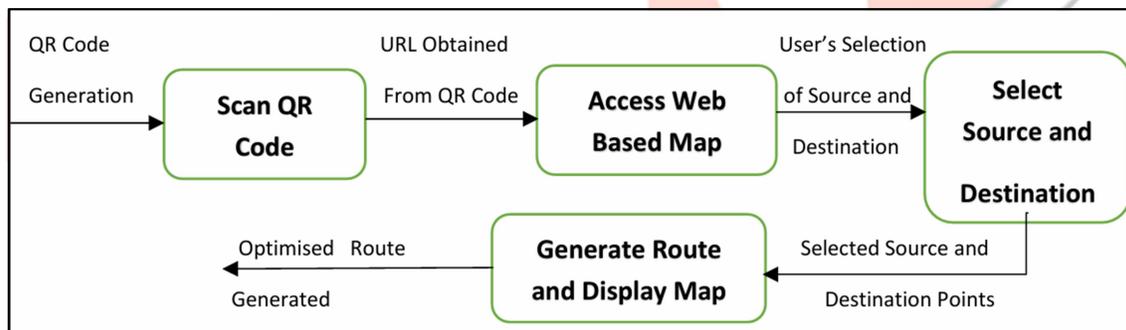

Figure 1 :Represents a user flow for accessing and using a web-based map through a QR code.

4.5 Expected User Experience

- User scans a QR code at a location, which opens the web page.
- **Interactive and responsive UI:** Users select source and destination on an intuitive interface that works across all devices.
- **Realtime routing:** Once the user has chosen the source and destination, the system immediately shows the route visually on the map.
- **Minimum number of clicks:** A minimum of clicks were considered while creating the system - for achieving the desired navigation result.

V. RESEARCH METHODOLOGY

Table 1 Methodology of Proposed System

Objective	Method/ Methodology	Description
1.To design and implement a digital campus map accessible through QR cod	1. QR Code Generation	Generate unique QR codes for each campus location using a library (e.g., qrcode.js), embedding URLs that direct users to locationspecific web pages.
	2.QR Code Scanning Integration	Use QR code scanning libraries (e.g., instascan.js or jsQR) to enable device cameras to read the QR codes and automatically redirect users to the respective location's map page.
2.To enable users to select a source and destination after scanning the QR code	1. Dynamic Dropdowns for Location Selection.	Provide dropdown menus that populate with campus location options, allowing users to select their source and destination after scanning the QR code.
	2. Session or URL-based Source Tracking	Use the Scanned QR code's URL to pre-select the source Location based on the QR code location, minimizing user input and ensuring the correct source is automatically set.
3.To automatically generate routes and provide a clear visual representation of the campus layout.	1. Shortest Path Algorithm Implementation	Use Dijkstra's or A* algorithm to compute the shortest path between the source and destination locations and display it on the map
	2.Interactive Map Visualization	Implement an interactive campus map in JavaScript to highlight the route from source to destination, providing visual clarity for navigation.
4.To develop a userfriendly interface using HTML, CSS, and JavaScript for smooth navigation.	1. Responsive Design	Apply responsive CSS to ensure the campus map and interface adjust to various devices, including mobile phones and tablets.
	2. Simple and Intuitive UI Components	Use dropdowns designed for navigation, allowing users to interact with the campus map and routing functionality.

VI. RESULTS AND DISCUSSION

The proposed system is expected to deliver the following outcomes:

- A fully functional campus navigation system accessible via a QR code.

- An intuitive and responsive user interface displaying real-time routes.

- Enhanced user experience, reducing confusion and time spent navigating.

- Scalability for accommodating future campus changes.

Figure 2 : Campus Map

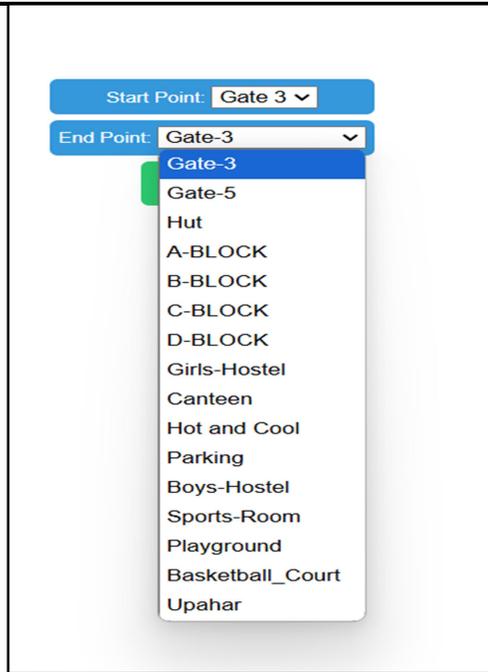Figure 3: Selecting source and destination

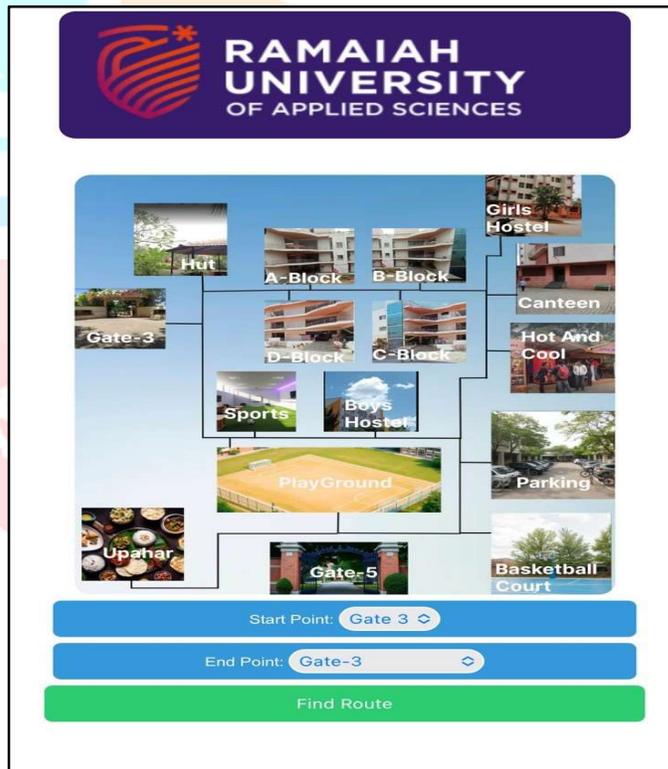Figure 4: Choice of selection

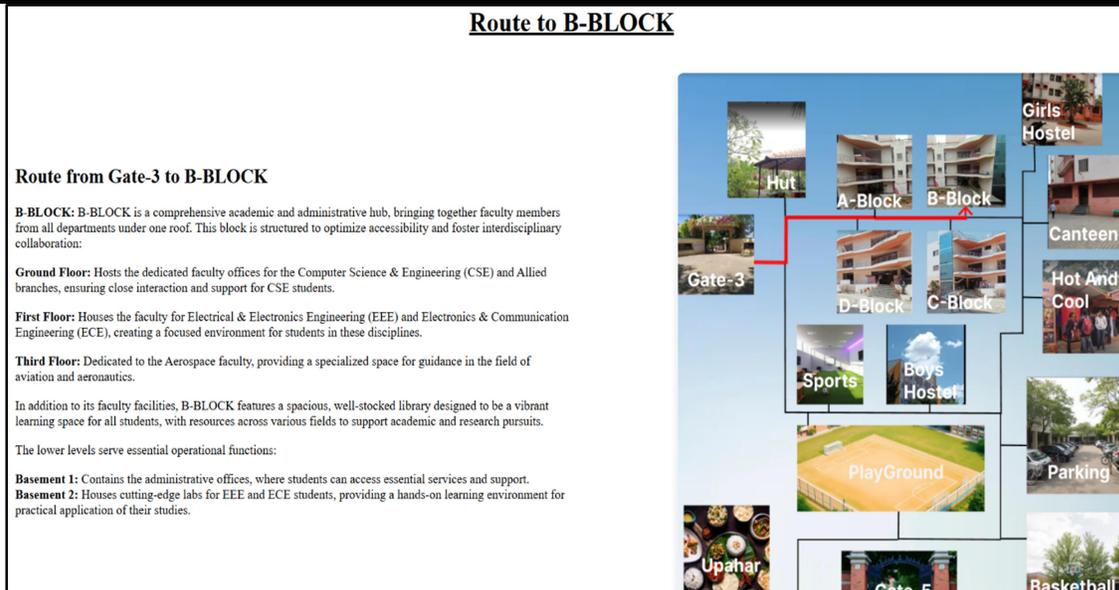Figure 5 : Map displaying in mobile

Figure 6 : Displaying route from Gtae-3 to B-BLOCK

VII. CONCLUSION

The proposed Campus Navigation System effectively addresses the challenges of navigating large campuses. By leveraging QR code technology and web-based platforms, it ensures an accessible, user-friendly, and efficient navigation experience. The system simplifies locating various facilities, reducing the time and effort required to traverse the campus.
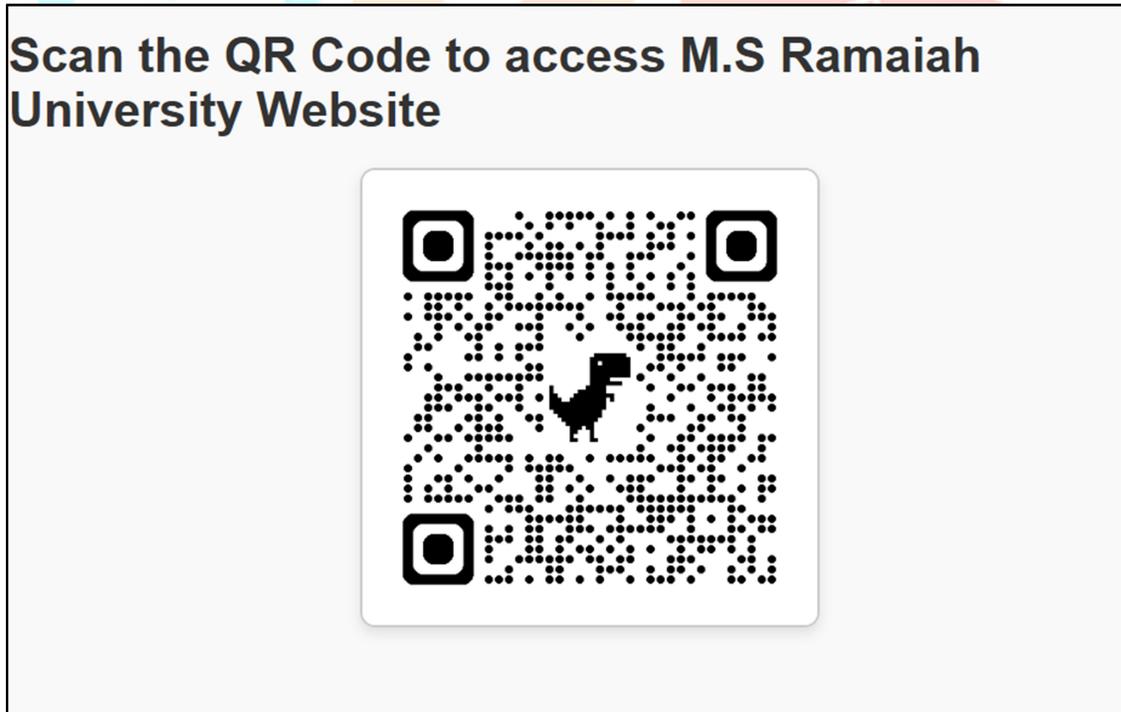

Figure 7: Generated QR Code

VIII. ACKNOWLEDGMENT

IX. REFERENCES

[1] M Padmaja, K Geethasri, J Sai Kousik, M Vaishnavi, B Kranthi Sai and D Lokesh Nayak, Campus Routing Using QR Code 2335 (2022).

[2] C Chotbenjamaporn et al., 2019,"A Web-based Navigation System for a Smart Campus with Air Quality Monitoring," 2019 IEEE International Smart Cities Conference (ISC2), 581-586.

[3] Mihaela Cardei, Iana Zankina, Ionut Cardei, and Daniel Raviv, "Campus Assistant Application on an Android Platform," IEEE, 2013.

[4] Sagnik Bhattacharya and M. B. Panbu,"Design and Development of Mobile Campus, an Android based Mobile Application for University Campus Tour Guide," International Journal of Innovative Technology and Exploring Engineering(IJITEE) ISSN: 2278-3075, Volume-2, Issue-3, February 2013.

[5] Kuwahara Y Tsai H Y Ieiri Y and Hishiyama R 2019 Evaluation of a Campus Navigation Application Using an AR Character Guide. International Conference on Collaboration and Technology.

[6] Andri C Alkawaz M H and Sallow A B 2018 Adoption of mobile augmented reality as a campus tour application. International Journal of Engineering & Technology 7 4.11.