**THE POLYTECHNIC, IBADAN**

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**PROJECT TOPIC:**

**DESIGN AND IMPLEMENTATION ON MAP MOBILE APP**

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**PROPOSAL TO DESIGN AND IMPLEMENTATION MAP**

**MOBILE APP**

* 1. **INTRODUCTION**

The rapid proliferation of mobile technology has revolutionized how individuals interact with their surroundings, making map mobile applications indispensable tools for navigation, exploration, and spatial awareness (***Johnson, 2022)***.

These applications, such as Google Maps, Waze, and Apple Maps, have evolved significantly, transitioning from static images and basic GPS functionality to sophisticated tools offering real-time traffic updates, personalized recommendations, and comprehensive navigation services. Despite these advancements, several critical issues remain unaddressed, including varying GPS accuracy, limitations in real-time data integration, and insufficient personalization tailored to individual user behaviors and preferences. Modern map mobile applications must integrate advanced GPS technology, real-time data, machine learning algorithms, and user-centered design principles to meet the growing demands of users. The ability to provide accurate, timely, and personalized navigation services is paramount, especially in densely populated urban areas where signal interference and rapidly changing traffic conditions can significantly impact navigation accuracy and user experience ***(Doe, 2022)***.

Furthermore, as these applications handle sensitive location data, robust security and privacy measures are essential to protect users from potential breaches and misuse. Ensuring data security and user privacy while maintaining high functionality presents a significant challenge that must be addressed through innovative solutions and stringent protocols. This study aims to explore and enhance the design and implementation of map mobile applications by developing a prototype that incorporates these advanced features ***(Brown, 2023)***.

By conducting thorough usability testing and performance evaluations, this research seeks to provide valuable insights into the potential for improving the accuracy, personalization, and overall user experience of map mobile applications. The findings will contribute to the ongoing development and optimization of these essential tools, ensuring they meet the evolving needs and expectations of users in an increasingly connected world ***(Harris, 2022)***.

**1.2 STATEMENT OF THE PROBLLEM**

Map mobile applications face several critical issues that impact their effectiveness and user experience:

* **GPS Accuracy:**

Varying accuracy of GPS data can lead to navigation errors.

Signal interference in densely populated urban areas exacerbates the problem.

* **Real-Time Data Integration:**

Inaccurate and untimely real-time traffic conditions and road closures.

Points of interest data often lack reliability, reducing the utility of navigation guidance.

* **Security and Privacy:**

Susceptibility of users' location data to breaches and misuse.

Insufficient measures to protect user privacy and data integrity.

**1.3 AIMS AND OBJECTIVE**

The aim of this project is to design a Mobile Map Application for efficient navigation and location-based services. After evaluating the needs and requirements, the following objectives were established for the development of the system:

1. To provide a system that enhances user experience through accurate and up-to-date mapping information, and facilitates seamless navigation.
2. To offer a system that enhance user to add favorite places and picture.
3. To deliver a scalable system capable of handling a large number of users and extensive map data within reasonable time limits.

**1.4 SCOPE OF THE STUDY**

The scope of this study is to create a mobile map application in which a user can add a favorite location, view recent places and add pictures of their favorite places.

**1.5 JUSTIFICATION OF STUDY**

This project work brings seamlessness to the operation involving accurate and up-to-date mapping information, and facilitates seamless navigation. After successful implementation of this system, user can add favorite places and picture, and perform other task.

**1.6 LIMITATION**

Due to the scope of this project work as mentioned above, this project work is limited to it, other function such as finding location of a dictated address, viewing places that are not added are out it functions.

**1.7 METHODOLOGY**

This refers to the method of collecting useful information for the development of new software.

Some of the method includes;

ii. Checking through related documents

iii. Visiting the relevant websites

However, the methods adopted in this project are;

* **Visiting the relevant website:** some useful websites were visited, so as to get the relevant and useful information on the area of study.

**1.8 DEFINITION OF TERM**

1. **GPS (Global Positioning System):** A satellite-based navigation system that provides location and time information anywhere on Earth where there is an unobstructed line of sight to four or more GPS satellites.

2. **User-Centered Design (UCD):** An iterative design process that focuses on the needs, preferences, and limitations of end-users at each stage of the design process to create highly usable and accessible products.

**3. Usability Testing:** A method used to evaluate a product by testing it with representative users. It involves observing users as they attempt to complete tasks, to identify usability issues and areas for improvement.

4. **UI/UX (User Interface/User Experience):** UI refers to the design of the application's interfaces, focusing on looks and style, while UX refers to the overall experience of a user when interacting with the application, including ease of use, efficiency, and satisfaction.

5. **Points of Interest (POIs):** Specific locations that someone may find useful or interesting, such as restaurants, landmarks, or gas stations. These are often integrated into map applications to enhance user experience.

**6. Performance Evaluation:** Assessing the functionality and efficiency of the prototype under various conditions to determine its effectiveness and identify any areas needing improvement.

**CHAPTER TWO**

**LITERATURE REVIEW**

**2.1 BACKGROUND THEORY OF THE STUDY**

A mobile map application, also known as a navigation app, is designed to assist users in locating and navigating to specific destinations while providing a timely sequence of location data for real-time guidance. The advent of mobile map apps has transformed how individuals interact with their environment, facilitating seamless travel and exploration. Mobile map applications have been widely adopted in various sectors, including transportation, tourism, and urban planning ***(Smith, 2022)***. The core functionality of mobile map apps revolves around the integration of geospatial data with user-friendly interfaces to provide accurate, real-time navigation. These applications typically utilize global positioning system (GPS) technology to pinpoint the user’s location and offer route suggestions based on current traffic conditions and user preferences ***(Johnson, 2022)***. GPS technology, initially developed for military and intelligence purposes during the Cold War, has become a ubiquitous tool in civilian navigation since the launch of the first experimental Block-I GPS satellite in 1978 ***(John Hopkins, 2020)***.

Mobile map apps offer various features to enhance user experience, including real-time traffic updates, voice-guided navigation, and the ability to download offline maps for use in areas with limited internet connectivity ***(Martinez, 2021)***. These features are essential for ensuring that users can navigate efficiently and safely, regardless of their location or network conditions ***(Garcia, 2019)***. The types of navigation services provided by mobile map apps have evolved significantly over time. Initially, these apps offered basic point-to-point directions, but they have since expanded to include multi-modal transportation options, public transit information, and personalized route recommendations based on user behavior and preferences ***(Nguyen, 2020)***. The incorporation of real-time data and advanced algorithms has allowed these apps to provide more accurate and dynamic navigation solutions ***(Moore, 2021)***.

Mobile map apps also play a crucial role in urban mobility and smart city initiatives. By integrating with various data sources, such as public transit schedules and traffic monitoring systems, these apps help to optimize urban transportation networks and reduce congestion ***(Wilson, 2020)***. Additionally, features like geofencing and location-based alerts can enhance safety and convenience for users ***(Green, 2020)***. The development of mobile map applications has been driven by advances in mobile computing, data analytics, and geographic information systems (GIS). These technologies have enabled the creation of sophisticated mapping solutions that cater to a wide range of user needs and scenarios ***(Perez, 2021)***. The continuous improvement and innovation in these fields promise to further enhance the capabilities and applications of mobile map technology in the future.

**2.1.1 Mobile Map Application**

A mobile map application is a system designed to facilitate navigation and location tracking for users on the go. This technology is becoming increasingly essential for various industries, offering real-time information about locations, routes, and points of interest. By providing seamless navigation and location-based services, mobile map apps enhance user experience and operational efficiency. Many sectors, including transportation, logistics, and tourism, are leveraging these apps to improve service delivery and customer satisfaction. An effective mobile map application continuously updates the user's location, offers route optimization, and provides contextual information about the surrounding area. These apps enable organizations to boost productivity, enhance safety, and reduce operational costs.

**2.1.2. Real-Time Location Tracking**

Real-time location tracking is the cornerstone of mobile map applications. It provides users with immediate information about their current location and navigational guidance. GPS technology is at the heart of this feature, ensuring that users can track their movements and find the best routes to their destinations. Real-time tracking is crucial for applications ranging from everyday commuting to emergency response and logistics management ***(Smith, 2022)***.

**2.1.3. Customizable Alerts**

Customizable alerts are a vital feature of mobile map applications, allowing users to receive notifications about traffic conditions, route changes, and points of interest. These alerts help users avoid delays, find the quickest routes, and stay informed about their surroundings. For example, alerts about traffic congestion or road closures can help users adjust their travel plans, improving efficiency and reducing travel time **(Johnson, 2022)**.

**2.1.4. Route Optimization and Scheduling**

Modern mobile map applications offer advanced route optimization and scheduling capabilities. These features help users plan their trips efficiently by providing the best routes based on real-time traffic data and user preferences. This reduces the time spent on the road and minimizes the risk of getting lost. For businesses, route optimization can lead to significant savings in fuel costs and improved delivery times ***(Brown, 2021)***.

**2.1.5. The Public Adoption of GPS Technology**

GPS technology, initially developed for military use, became available for civilian applications in the 1990s. President Bill Clinton’s policy directive in 1996 marked a significant shift, promoting the development of GPS technology for public use. This led to widespread adoption and the integration of GPS in various consumer devices, including mobile phones and navigation systems. By 2006, the GPS network was fully operational, providing global coverage and enabling the development of sophisticated navigation apps ***(John Hopkins, 2020)***.

**2.1.6. Modern Day Mobile Map Applications**

Today’s mobile map applications utilize advanced GPS technology to provide comprehensive navigation and location-based services. These apps offer detailed maps, real-time traffic updates, and personalized route recommendations. They also integrate with other data sources, such as public transit schedules and local business directories, to offer a complete travel solution. Modern mobile map applications include:

* **Mobile Tracking:** Utilizes cellular networks to provide real-time GPS data through smartphones, enabling users to track their movements and find directions instantly.
* **Satellite Tracking:** Ideal for users in remote areas without cellular coverage, satellite tracking ensures continuous navigation support through direct communication with GPS satellites.
* Passive Tracking: Offers periodic location updates rather than continuous tracking, suitable for monitoring asset locations and ensuring security.
* **Person Tracking:** Uses unique identifiers, such as RFID tags or biometric data, to track individuals’ locations for purposes ranging from safety to efficient service delivery.
* **Attendance Management:** In educational institutions, RFID technology can track student attendance and movement, enhancing security and administrative efficiency.
* **Mobile Phone Services:** Location-based services (LBS) combine GPS and cellular data to provide accurate positioning even indoors, bridging the gap between GPS and RFID technologies.
* **GPS Tracking:** Offers global coverage with potential limitations in urban environments. It remains a reliable method for outdoor navigation and location tracking.

**2.1.7 The Evolution of Map Mobile Applications**

The development of map mobile applications has undergone a remarkable transformation over the past few decades. Initially, these applications were rudimentary, offering basic GPS functionality and static map images. However, with the advent of smartphones and the internet, map applications evolved into sophisticated tools that provide real-time navigation, traffic updates, and personalized recommendations. Today, popular applications like Google Maps, Waze, and Apple Maps offer comprehensive navigation services that leverage advanced technologies such as GPS, real-time data integration, and machine learning.

**2.2. RELATED WORKS**

**Sachin S. Rajmane et al., 2016: "Digitalization of Management System for College and Student Information"**

Sachin S. Rajmane and colleagues (2016) developed a system designed to provide a simple interface for maintaining student information, specifically targeting educational institutions. Their work emphasizes the importance of creating and managing accurate, up-to-date information about students' academic careers, which is crucial for universities and colleges. The system encompasses various student details, including academic reports, college details, course information, curriculum, batch details, placement details, and other resource-related information.

The system's key features include:

* Tracking all student details from enrollment to graduation.
* Secure online interface integrated into the college's website for reporting purposes, tracking attendance, academic progress, exam details, project assignments, and final exam results.
* Management of faculty details, batch execution, student details, and academic notifications.

The authors used data flow diagrams, detailed flow graphs, requirement analysis, and the design process for both the front and back ends of the student information management system. They also conducted a thorough system requirement analysis, which included:

* Unique user identities and login facilities.
* Users' ability to update personal information and access notices, results, placement, and exam updates.
* Administrative capabilities for faculty, placement, and exam sections to update information.

The system's implementation relied on a Database Management System (DBMS) that allows users to create and maintain databases, manipulate functions like querying, updating, and generating reports, and access the database through application programs.

Technologies used: HTML5, PHP, CSS, SQL, and JavaScript.

**Uka Kanayo Kizito and Ekwonwune Emmanuel Nwabueze, 2019: "Students Record Management System for Imo State University Owerri"**

Kizito and Nwabueze (2019) presented a Web-Based Students' Record Management System for tertiary institutions to address issues related to student academic record management, such as improper course registration, delayed result release, malpractices in student clearances, inaccuracies due to manual processes, and difficulties in record retrieval. The system aims to:

* Develop a portal for online registration, profile creation, final clearance, payment processing, transcript requests, and result checking.
* Reduce paperwork and automate the record generation process.
* The methodology used was the Object-Oriented Analysis and Design Methodology (OOADM), with programming languages HTML, PHP, CSS, JavaScript, and MySQL.

System modules include:

* User Module: Allows users to sign up, check results, make payments, and create profiles.
* Admin Module: Enables admins to create new users, maintain databases, and view reports.
* Course Registration Module: For semester course registration and obtaining printouts.
* Verification Module: For verifying certificates.
* Result Upload and Check Module: For uploading and checking semester results.
* Parent Module: Allows parents to check their wards' academic performance and make reports.
* Final Year Clearance Module: For final clearance payments and statement downloads.
* Transcript Request Module: For requesting transcript processing.
* Payment Module: For making various school-related payments.

The benefits include increased processing speed, accuracy, reduced file misplacement, enhanced record generation, and online clearance and result checking.

**Hong Zhang, 2019: "Information Management System of Student Status Archives"**

Hong Zhang (2019) designed a system to manage student status archives, digitizing paper archives and storing them using computer network and database technology. This approach addresses issues with traditional paper archives, such as yellowing, mildew, damage, space requirements, and inefficiency in access and queries.

The system's design includes:

* Architecture Module Design.
* Functional Design of C/S and B/S Architectures.
* Data Backup and Recovery.
* Student Status Archives Inquiry.

The system improves efficiency by providing accurate information and quick inquiry capabilities, simplifying manual archive management, reducing staff workload, and enhancing work efficiency.

**Kalmegh et al., 2016: "Design and Implementation of a Comprehensive Student Information System"**

Kalmegh and colleagues (2016) proposed a system for maintaining student information that includes academic details, college information, course details, and resource management. The system tracks all student details from enrollment to graduation, providing a secure online interface for reporting, tracking attendance, academic progress, exam details, project assignments, and final exam results.

Key features:

* Faculty and batch execution details.
* Academic notifications for staff and students.
* Generation of various reports and queries based on students, courses, faculty, exams, and semesters.

The design uses data flow diagrams, requirement analysis, and both front and back-end development.

Technologies used: HTML5, PHP, CSS, SQL, and JavaScript.

**Yu-Fang Tang and Yong-sheng Zhang, 2009: "Design and Implementation of College Student Information Management System Based On Web Services"**

Yu-Fang Tang and Yong-sheng Zhang (2009) developed a college student information management system using ASP.NET, Visual C#, and JavaScript, with a Microsoft SQL Server 2005 database. The system employs Role-Based Access Control (RBAC) for high security, allowing user authentication and secure data access.

**S.R. Bharamagoudarl et al., 2013: "Student Information Management System"**

S.R. Bharamagoudarl and colleagues (2013) created a system to manage student information, facilitating the maintenance of records such as attendance, academic progress, and exam results. The system ensures up-to-date information through an online interface and generates various reports.

Key technologies: HTML, CSS, JavaScript, PHP, and SQL.

**Kartiki Datarkar et al., 2016: "Design and Implementation of a Comprehensive Online College Management System and User Interface"**

Kartiki Datarkar and colleagues (2016) developed an online college management system to replace paper records. The system integrates student information management, faculty details, and academic notifications, using a DBMS to create and maintain a secure database, improving record management efficiency.

**Megha Goel, Ankita Wasnik et al., 2017: "College Monitoring System"**

Megha Goel and colleagues (2017) designed a web-based application for college monitoring, integrating information exchange between students, teachers, and administration. The system provides modules for administrators, students, and faculty, facilitating tasks such as personal data management, fee details, placement information, and scholarship details.

Technologies used: HTML5, CSS3, and PHP6.

**Olatunji E.K., 1998: "Web-based Solution for Student Information Management"**

***Olatunji E.K. (1998)*** emphasized the need for a comprehensive student information management system that integrates student-related activities with administrative functions, aiming to provide a single-vendor solution for managing student information and school administration.

**2.3. CURRENT METHOD IN USE**

Currently, the method in use for navigation and location tracking by the general public is largely manual and inefficient. Most users rely on traditional paper maps, verbal directions, or generic smartphone-based applications like Google Maps, which may not provide specialized features tailored to specific needs of diverse environments such as educational institutions, business complexes, parks, and other public areas. There is no dedicated mobile application that caters specifically to the navigation needs of various user groups within different types of environments.

**2.4. APPROACH TO BE USED IN THE STUDY**

The approach to be used in the development of the new system is to;

* Build a Dynamic Mobile Application
* Utilize Location Services
* Programming Languages and Frameworks: ReactNative, Javascript