



## Campus Identification System (CIS): An Android-Based Visual Campus Navigation System

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### ABSTRACT

Location of places is the reason behind the development of place maps. Signboards and physical directional maps have, overtime, been a source of direction to travellers and new members of a society, however the ability to recognise a place remotely cannot be handled by signboards and physical maps hence the need for mobile and remote maps. On campuses, new students have found maps to be helpful especially at dire times like examination and lecture periods. Identifying buildings and lecture halls should be part of the student's orientation and this could be aided by developing a system that includes location maps for various places on campus. This paper features a mobile application developed to aid campus navigation via the use of visual maps on mobile devices. The app, Campus Identification System (CIS), is designed to provide users with information as regards the name, location, and image of relevant structures on campus. Using the iterative waterfall methodology, the mobile application was produced using Sketchware, a rapid app development workspace. CIS is compatible with Android devices running KitKat (Version 4.0) and above.

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### INTRODUCTION

Directories are boards that contains title and description of places. These days, directories have evolved into many other forms. There are directories that now include floor plans and categorized views. This can be found in complex buildings such as shopping malls. The advancement in technology created directories that implement floor plans into website or mobile applications to provide ease of access for visitors and general users and then metamorphosed into becoming an indoor navigation system. The evolution of directories show that people, especially visitors depend on signboards or navigation systems to know where they are and to go to places, they want to go (Singhal, 2015).

In an environment of higher learning, especially in a campus setting, where buildings and structures are spread all across the landmass, the importance of maps or a building identification system cannot be overstated. Maps in general assist both old and new and even visitors to find their way around the campus premises easily.

A campus identification system in this regard is a mobile application that uses building information and description to help students locate a particular campus building on the campus. Because of the advancement in modern technology, especially the ever-increasing use of smart phones which have maps and location sensing capabilities built in them, the use of directory boards which are normally stationed at a central location to help students find places have become obsolete. This is because board directories are time consuming and sometimes complex to understand.

Students are supposed to easily identify classroom building; this means that these buildings are supposed to have some sort of identification on them with road maps to help students quickly locate the classroom they intend to go without having to ask anyone. A good navigation system with such ease of access is however, lacking.

The actual situation of the case study, the Federal Polytechnic, Bida is that students, find it difficult to locate classroom buildings outside the place they are familiar with. In cases

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of urgency like during examinations, students find it difficult to locate the classrooms allocated to them and might end up missing the examination or arriving quite late. The scenario described above is a problem, though it may seem small and negligible. The goal of this is to design a user-friendly android application that will provide a descriptive map of these classroom buildings. With the application, students can easily search and locate the classroom building they intend to go to as well as get there on time.

### LITERATURE REVIEW

Describing the location of a building to someone can be a tedious activity especially when they are new or not familiar with the environment. Every year, new students are admitted to the campus, according to (Jing, Shibghatullah, & Ling, 2019) the campus environment can be quite large and confusing, visitors, new students and staff have a difficult time getting around. Hence there is a need for a proper navigation system that will ease the movement of students as well as provide proper direction guidance. The addition of picture to the description of classroom building makes it easy for identification. In addition to pictures, the use of popular landmark also helped in description of classroom building.

A review of Maps and types of maps by ("maps and types", 2015) shows that; there are millions of unique maps used all over the world, most of these maps can be placed into one of two categories namely reference maps and thematic map, while reference map show the location of geographical boundaries, physical earth features or cultural features such as places, cities and roads. Few examples of Reference maps are Political maps, physical maps, roadmaps, topographic maps, time zone maps and so on. A thematic map shows the variation of a topic (the theme) across a geographical area. Examples are weather maps, income maps, resource map etc. with focus on the reference map and in particular physical map, we define a map as a visual representation of an entire area or a part of an area typically on a flat surface.

With the advancement in technology and the improvement of various online mapping services such as Google earth, Bing maps, Mapquest, Qwant map and so on. One would think that locating building in the campus

environment would have been much easier but this is not the case. Jing et al., (2019) further explains that Google maps and global positioning system (GPS) system have become indispensable in recent years, with so many users depending on them for directions. These GPS systems have worked well for drivers both public and private, but the functionality of these online maps and GPS system have not been fully implemented or applied to campuses. Directions within the campus environment are not available on Google or other online maps.

Management of large campuses provides board directories to serve as guide that gives direction for locating various building on the campus for their students, staff as well as visitors. "Without the implementation of a directory board, people could be lost or taking a lot of time to find their way around complex structures" (Jing et al, 2019).

The problem with the directory boards available on campus is that they are not mobile and may be really difficult to locate, "Some of the directory boards are difficult to find especially in a complex area" (Dahlan, 2015). More so, directory boards are slow, costly and difficult to update, it is less convenient in the sense that it requires student to find the board directory at a central location. Without the sense of direction, a student can be easily confused or misdirected by static directory. Jing et al., (2019) further states that people could go all the way around the facility if there exists a misunderstanding of sign board. Another drawback of the sign board directory is that it may be located at various points and people may not be able to find them accurately. Finding a directory board or street map in a complex area is a huge task, most of the times visitors expects such maps to be at the gate or entrance and are mostly disappointed. Others expects it to be at a central place where it can be easily accessed but the tasks of interpreting and understanding such static maps are often discouraging.

With all the setbacks associated with the local directory board, street map or road map as it may be called; there is a need to implement a mobile directory or navigation system. Because according to Singhal, (2010) the ability to sense location is one aspect where a mobile device distinguishes itself from a traditional personal computer in terms of benefits and utility. A mobile phone can be

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easily carried by the user and conveniently accessed for location-based application such as looking up driving directions, maps and so on. The form factor and portability of a mobile phone makes it ideal for such application. Not surprisingly, most smart-phones now have location sensing capabilities built in them. Some people are most likely to use mobile phones when on-the-go and away from home or office hence apps that leverage location-based services can add real value to the uses and thus provide a good return on investment for mobile devices.

In all it is of great advantage to implement navigation system for campuses on mobile phones, it is a concept that takes advantage of the available technology in the sense that it does not require any new technology. The factor that led to the implementation of the navigation system on the Android platform aside other operating system is as a result of the large number of people using the Android operating system especially on campuses. ("Android (Operating System)", 2019) Android is a mobile operating system designed primarily for touch screen mobile devices such as smart phones and tablet. The usage and market share statistics of Android operating system worldwide according to ('Statistics', 2019), shows that from 2012 to 2019 Android has been the leading operating system maintaining 76.08% market share in July 2019. Aside the dominance of android operating system, Android is free and open source. It was explained that Android is open to everyone; developers, designers and device makers. ("Android", 2019) That means more people can experiment, imagine and create things that the world has never seen.

This study seeks to develop an android application for campus identification, which can easily be accessed by all the students of the Federal Polytechnic Bida. The use of the application will be of great benefit to the institution in the area of classroom identification and location helping the students to know where they are going to and get there on time.

### **The Existing System**

The existing system are titled signboards, one of which is positioned immediately after Polaris Bank and the other is located before the Admin block after the Central Mosque. A large number of students are

unaware of the existence of this system. Those that are aware find it difficult to understand or use it. The existing system is not positioned in a strategic place, it is almost invisible with its current position. The street map is a sketch of the Polytechnic premises. It shows roads and other important buildings that can easily be identified. At a glance one cannot easily understand its content but with careful study and analysis one can point out and identify some areas and buildings identified on the street map.

### **Analysis of the Proposed System**

Information regarding classroom building are collected, such as the picture of the building and the exact location. Each building is a page, containing a picture of the building, a description of its location and a list of all the classrooms available in that building. Each of the classrooms on the list also contain a brief description of the location in the building via a dialog box, classroom information is also saved in the database to ease search.

The flow diagram in Figure 1, explains the steps that will be taken by a user to get to a desired classroom building. First, the user decides which of the areas is the particular building located, according to the school's arrangement, buildings are categorized into two areas that is the Lagos and Abuja area. Upon users specifying the area, the user is presented with a list of all the buildings available in that area containing classrooms and the user is expected to select a building after which a picture of the building, a description of the location of the building name and a list of all the available classrooms in the building is presented to the user. All the available classrooms are presented in a list view with each of them containing a short description as to where in the building it is located and the easiest means of accessing it.

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## PROCESS FLOW

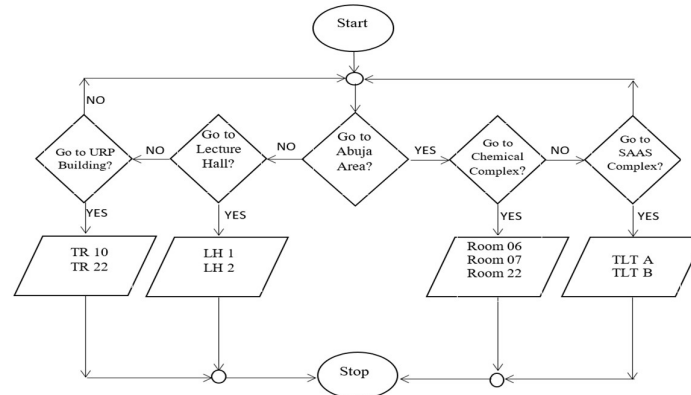


Figure 1: A Flow diagram depicting how to get to a classroom using the proposed system

The proposed system is an android application designed using Sketchware. Android operating system was chosen because of its wide usage among students of the Federal Polytechnic, Bida. The new system is designed to be a solution to all the problem of the existing system. The new system uses a simple graphical user interface (GUI) that is user friendly and easy to use to present classroom building identification and their description to the users. The proposed system presents users (students) with varieties of option from which they can locate classroom buildings, they can either sort out the desired building through the directory arrangement or they can search or check from a list of compiled classrooms. The proposed system does not necessarily require the use of internet or other special permission therefore users can access it anywhere and anytime to get the needed information about various classroom building. The new system also incorporates landmarks in form of "important places", these are building that do not contain classrooms but are identified because of their popularity and importance as

well as their closeness to target classrooms building hence they are used to easily describe the location of classroom buildings around them such Places include the Admin Block, Polaris Bank etc.

### SYSTEM SPECIFICATION AND DESIGN

The requirement for the installation and smooth running of the proposed system are subdivided into hardware and software requirements and are stated below;

**Hardware Requirement:** The computer to install and run the application should have a minimum of 1.0 GHz of CPU speed and RAM of 1GB or higher.

**Software Requirement:** The version of Android Operating System should be no less than Jelly Beans 4.0. Also, Google play services is required. An Android emulator will be needed if it will be installed on a computer running Windows Operating system.

The images below show the output design of the new system.

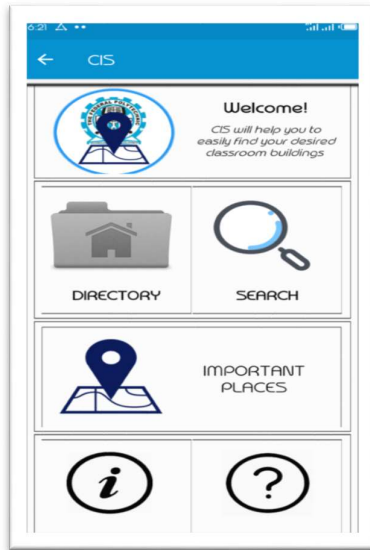


Figure 2: The proposed System's home page



Figure 3: A list of classrooms building in Abuja area of the

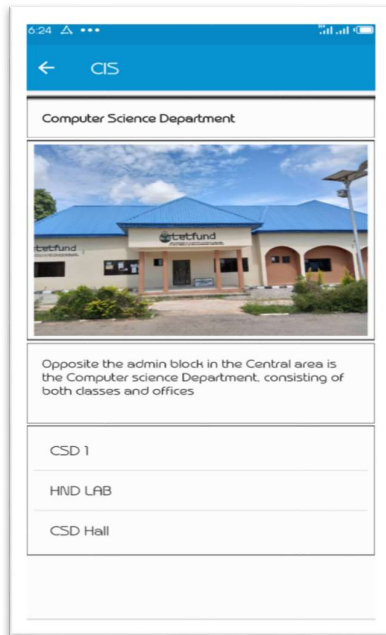


Figure 4: Description of a classroom building and a list of classrooms

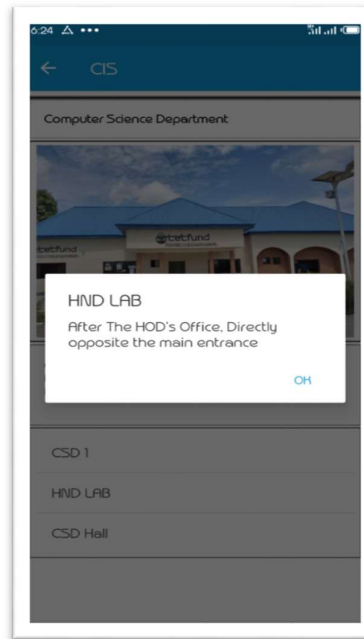


Figure 5: Description of a selected classroom

#### INPUT SPECIFICATION AND DESIGN

This section describes the input required by the system to produce the required output. For this system's design the major input

required to get desired output is decision from users, options are provided to the users from which they are to select. The choice of the user determines the system output. One form of input for the system is the use of keyboard to supply

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text. This is required during search for a classroom. A user is required to enter the desired classroom's ID which is an alpha-

numeric input. The images below describe the input design of the system.

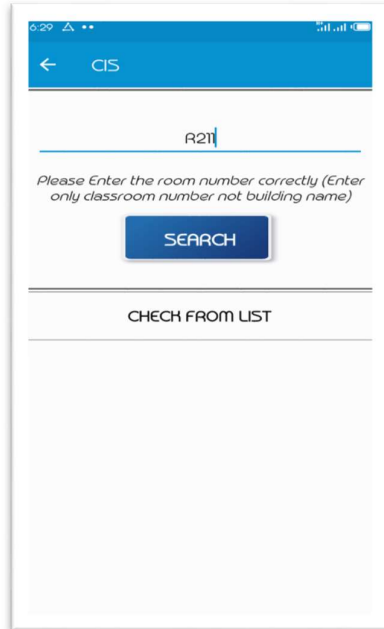


Figure 6: The search page



Figure 7: The Result page

#### DESIGN APPLICATION USED

Sketchware was used for the design of the system. Sketchware is an Integrated Development Environment (IDE) which allows a developer to develop, compile and build an android application directly on their smart phones without the help of a personal computer. It provides a simple and user-friendly drag and drop interface which ease the complexity of writing tedious programming codes. Sketchware uses simple programming and logic.

1. The choice of Sketchware for the development of this system include the following:
2. Sketchware provides a platform for programming on the go; while using Sketchware for application developments, the source codes are compatible with android studios therefore a developer can easily move his code to and from android studio and program on the go
3. Application designed on Sketchware are tested directly on the mobile phone thereby eliminating the need

for an android emulator as with the use of PC and android studios

4. Sketchware helps developers to easily publish their application on Google's play store

#### CONCLUSION AND RECOMMENDATION

Campus Identification System (CIS) was developed to solve the problems posed by the existing system of navigation around the school premises. With a proper assessment and analysis of the design, it is safe to conclude that the proposed system is efficient, usable and reliable to aid navigation around the premises of the campus.

For ease of student's navigation and identification of various building within the school's premises, this study recommends that the scope of the system should be further expanded to cover other buildings in the campus premises aside classrooms. Also, that satellite maps can be incorporated for proper location and live captures when the user is not on campus.

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