

# Developing a Web-Based Location Navigation System in the Context of Covenant University

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## ABSTRACT

More often than not, people are faced with a number of challenges while considering the environment where they are vis-a-vis locating the exact place they are going at a particular instance. A location-based navigation system, however, helps out by providing direction to the desired location through the use of subjective rating. However, users preferring a combination of maps and photographs of the desired places render such location-based navigation systems inadequate. This paper addresses these challenges by presenting a web-based destinations 'directions' system that assists users locate their desired destinations on the campus by navigating their way using the map provided by the audio navigator as the navigator tells the users their locations and how to get to their destinations on the campus.

## Keywords

*Navigation system, Audio system, User interface, Map.*

## 1. INTRODUCTION

More often than not, people are often faced with a number of challenges while considering the environment where they are vis-a-vis locating the exact place they are going at a particular instance. In order to overcome these challenges, a number of researches have been carried out on location-based navigation system with the use of mobile devices. Location-based services denote services provided to mobile users according to their geographic locations [1, 2]. Such services use the ability to dynamically determine and transmit the location of persons within a mobile network by means of their terminals [3]. These services include capabilities to search for information about physical location, and have features that support finding routes to specified destinations. Mobile devices have therefore removed the limitations associated with location destinations such that one can personalize and suggest content in a manner suitable for users while considering their environments [4].

This work presents a web-based location guidance system that assists visitors locate their destinations on the Covenant University campus. The rest of the paper is organized as follows. Section 2 presents a brief insight to location-based systems. Section 3 discusses the system architecture of the proposed location-based system. Section 4 presents the system design and implementation. The paper is concluded in Section 5.

## 2. LOCATION-BASED SYSTEM

Location-based systems are becoming increasingly popular with the widespread availability of handheld devices with on-

board Global Positioning System (GPS) units [5]. It is one of the most popular applications in the field of mobile Internet [6]. Location-based systems are systems that exploit and leverage the concept of mobility in context of local or remote environmental conditions and factors, and are founded on the core principle of anyplace as the driving rationale [7]. Essentially, these systems deliver information that is relevant to users in the context of their location at any particular point in time and where the focus or contextualization of information and services is governed by location [8, 9]. Location-based systems are value-added systems in which position information is used to present diverse and interesting services to users. These services include emergency services, vehicle navigation services, tourist broadcasting services and, searching in country-wide or urban sites data banks using maps [4].

Developments in location-based systems have been driven by regulatory requirements such as international legislation and a growing awareness of the commercial opportunities which is facilitated by exploiting the technical ability to provide value-added information and enhanced experience to mobile consumers, and through emerging demand levels, typical services and associated business models [10]. Location-based systems are strongly coupled to the concept of context within mobile computing systems and form a special class of context-aware systems [11]. The design of a location-based system typically consists of two sub-tasks. The first is to determine the location of the user. The second is to provide relevant information based on the location [12].

## 3. THE SYSTEM ARCHITECTURE

The system architecture is a three factor architecture metrics, that is, physical, functional and communicational layers. With these three types of architecture descriptions, a complete description of the system's components is given, including the working and relations as shown in Figure 1. The physical layer depicts the map service.

The map service displays the current position of the user and points of interest on a map. A basic map has been proven to be the most effective method of providing location information [5]. A user's movements are represented on the map and additionally, a user can select points of interest on a map and receive additional information. The functional layer provides information service for the users. It displays textual and visual information related to points of interest. The Communication layer provides a recommendation service for the users. The recommendation service detects semantic correlations between points of interest and recommends related points to the users with an online audio navigator system to ease navigating around Covenant University.

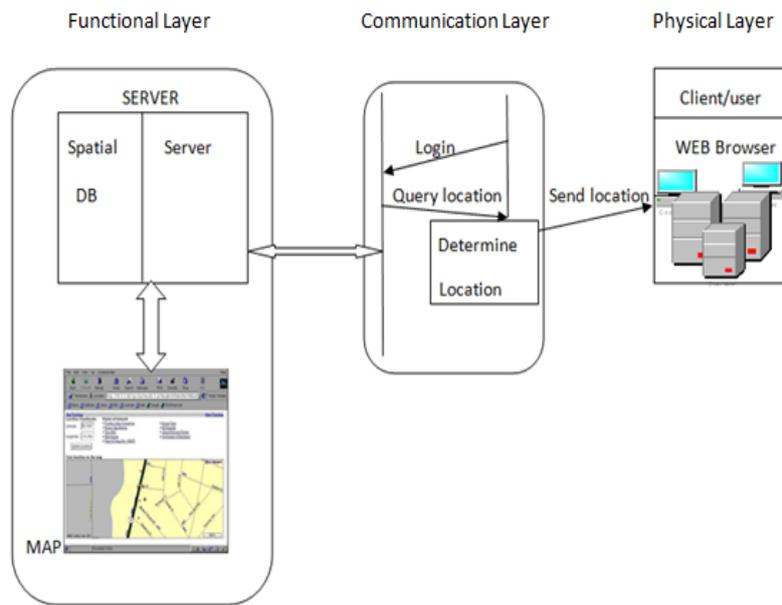


Figure 1: System Architecture for Location-Based Navigation System

As users walk through the campus, they can navigate their way using the map to access information according to points of interest at their current location as the audio navigator system tells them where they are and how to get to their respective destinations around the campus.

#### 4. SYSTEM DESIGN AND IMPLEMENTATION

Cascading Style Sheet (CSS) and HTML were used to design the Web interface and to integrate the audio aspect of the navigation. CSS is a style sheet language used for describing the presentation semantics (the look and formatting) of a

document written in a mark-up language. Its most common application is to style web pages written in HTML and XHTML, but the language can also be applied to any kind of XML document, including plain XML, SVG and XUL. CSS is designed primarily to enable the separation of document content (written in HTML or a similar mark-up language) from document presentation, including elements such as the layout, colours, and fonts. Google API (Application Programming Interface) alongside with XML (Extensible Markup Language) were used to develop the mapping aspect of the system, and Natural Reader (Text to Speech Software with natural sounding voices) was used to develop the audio aspect of the system. Unified Modelling Language tools (use case model and activity diagram) were used, as shown in Figure 2a and 2b respectively, to represent how the users interact with the proposed system.

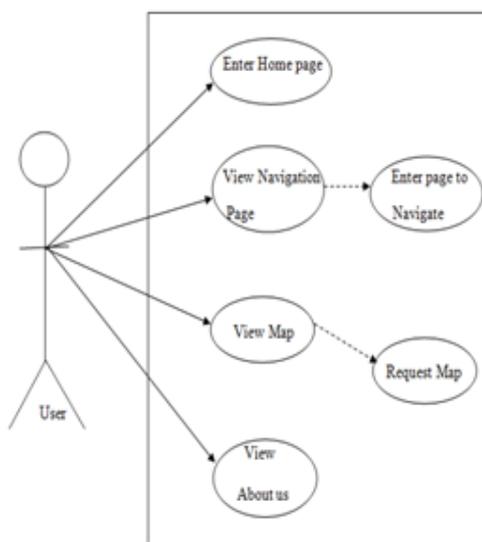


Figure2a: Use Case Diagram for the LBNS.

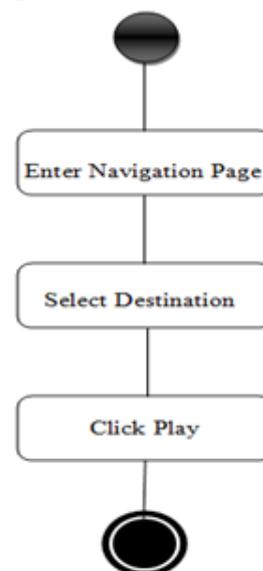


Figure2b: Activity Diagram for the LBNS

### 4.1 Navigation Design

The user is given navigation information by a map interface as well as a textual description of their current navigation instruction with an online audio navigator system. As users starts the system, the system operates as shown in Figure 1 above such that when a client/user is connected to the Internet uses its browser to log onto a server available on the web. After login, the server will initiate a separate side-channel socket connection to the client to make request on the available locations on the campus. Once the server has received the requested location data, it will generate web pages that contain hyperlinks based on that location. These pages are derived from a spatial database with the university location information which is guided by the map.

### 4.2 Interface Design

The interface is the connection between the system and the user. The user can insert its destination and preferences through the interface and gets information about the location and route. The navigation system uses audio-visual components to communicate with the user to give directions. When the program is started, users are first taken to home page of the application where they are presented with the main interface navigation links; that takes users to the other pages including Home, Navigation, Map and About Us (see Figure 3).



Figure3: View of the Home Page for Covenant University Navigation System

The navigation menu when clicked, takes the user to the various pages that contain a pictorial view of the destination, a map for the destination, an audio direction to the destination, and a textual direction to the destination. For instance, when a user wants to get to the university Guest House, he/she will click on the guest house sub-menu.

The view of the guest house is displayed alongside with the map showing the direction to the guest house. As the user is viewing the picture of the Guest House, an audio system gives an audible description of how to get to the Guest House (see Figure 4 for a screen shot of how to get to the Guest House).

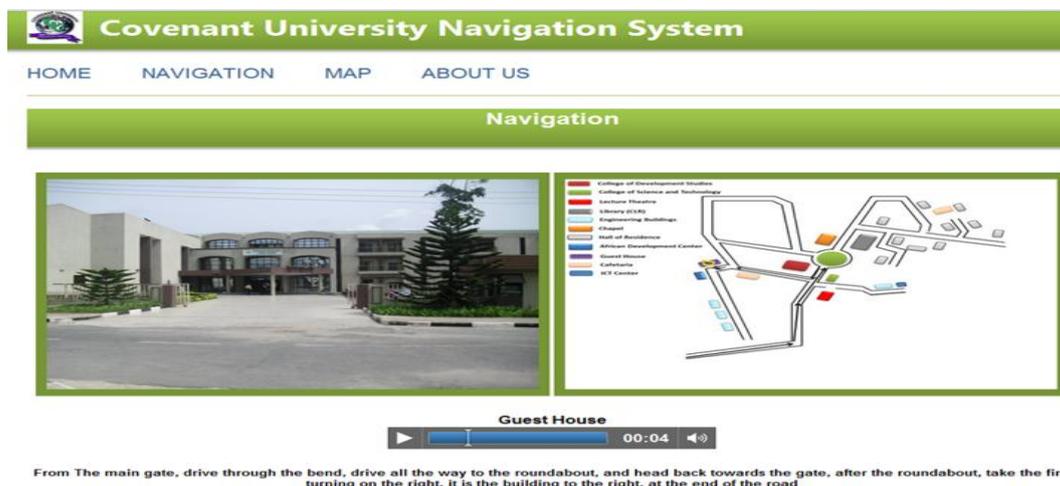


Figure 4: Screenshot Showing the Guest House, its Directional Map and Audio System

## 5. CONCLUSION

The design and development of a web-based location system around a user's current location in Covenant University campus has been presented in this work. The users are guided around the campus through the navigation information by a map interface with textual description of their possible locations. The context-sensitive information presented to the users on the map as well as the audio system provide guidance when no human guides are available. This system has solved problems like inconveniences and time wastage associated with locating places unknown to visitors to the school. It will also eliminate the bother imposed by visitors on those they ask guidance from on the campus. This work is the first step towards developing a corresponding mobile version and testing its acceptability and usability.

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