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GIS BASED LOCATION INFORMATION ENQUIRY SYSTEM (GISBALIES)



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ABSTRACT

The convergence of the internet and wireless communication has led the popularity of using handheld devices. People have now started demanding services that can be delivered any time anywhere, called Location Based Services (LBS). This paper deal with development of location based services with integrating handheld devices that apply to emergency services. Handheld devices suffer from serious constrains in three areas: memory size, processor speed and screen size. Because of this heavily resource constraint, no application code is installing on handheld devices. This application uses the client server concept within wireless internet environment. The positioning service such as GPS is used to know the position of the user. The objective of this research is to display special query on the required spatial information within handheld devices using different operating systems such as WinCE, Palm OS and Symbian. Hence the system assists people e.g. at the time of emergency to find the shortest path to the hospital. The application will be access through the wireless internet. Only the related location in the entire map will be downloading to the handheld devices, which gives the economical usage of bandwidth and resources for real time response. This technology uses mobile internet as web browser embedded in the handheld devices.

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LIST OF ABBREVIATION

2G	Second Generation
3D	Three Dimensions
3G	Third Generations
ADT	Abstract Data Types
A-GPS	Assisted GPS
API	Application Programming Interface
ASP	Active Server Pages
BS	Base Station
CAD	Computer Aided Design
DHTML	Dynamic Hypertext Markup Language
ملاک DWG	Pronounced drawing, a binary file format used by AutoCAD.
DXF UNIVE	Data Exchange Format ALAYSIA MELAKA
E911	Enhanced 911
ESRI	Environmental Systems Research Institute
E-TOD	Enhanced Time of Different
GIS	Geographic Information System
GISBALIES	GIS Based Location Information Enquiry System
GPRS	General Packet Radio Services
GPS	Global Positioning System

GSM	Global System for Mobile
HLR	Home Location Register
НР	Hewlett Packard
HTML	Hypertext Markup Language
НТТР	Hypertext Transfer Protocol
ISO	International Standard Organization
JDBC	Java Database Connectivity
LBS	Location Based Services
LIF	Location Interoperable Forum
MLP	Mobile Location Protocol
MSC	Mobile Switching Centres
OGC	Open Geospatial Consortium
OMA	Open Mobile Alliance
OpenLS	Open Location Services
ملاك os	ويتور سيني ترك Operating System
PC UNIVE	Personal Computer MALAYSIA MELAKA
PCMCIA	Personal Computer Memory Card International Association
PDA	Personal Digital Assistant
POI	Point of Interest
RAM	Random Access Memory
ROM	Read Only Memory
SDI	Spatial Data Infrastructure
SDRAM	Synchronous Dynamic RAM

SOAP	Simple Object Access Protocol
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SQL Structured Query Language

TOA Time of Arrival

USB Universal Serial Bus

UTM Universal Transverse Mercator

VLR Visiting Location Register

WAP Wireless Application Protocol

WCDMS Workplace Claims and Disability Management Solutions

WLAN Wireless Local Area Network

WWW World Wide Web

XLS

XML

System of style sheets for use with XML



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CHAPTER 1

INTRODUCTION

1.1 Project Overview

Advances in wireless communication technologies and mobile Internet enabled devices like smart phones and PDAs, have enabled global internet connectivity and ubiquitous Web based computing and service distribution. The recent convergence of Internet, wireless communications, mobile positioning and geographic information systems (GIS) has given rise to a new class of location based applications and services. GISBALIES to which this project is addressed deliver geographic information and geo-processing power to mobile and static users via the Internet and wireless network in accordance with current location of mobile user. The implementation of GIS into LBS technologies has led to an idea to develop our project entitled "GIS Based Location Information Enquiry System (GISBALIES). Although considerable attention within location based services technology has been placed to its constituent technologies like wireless web, mobile Internet enabled devices and mobile positioning, the heart of the whole system represents Internet enabled GIS [1]. In this regard, the fast data sharing medium like Internet is taken into consideration, so the spatial data can be shared and viewed on web browser.

Advancement in Internet technologies provided new opportunities for delivering spatial data information to remote users through HTTP protocol [2], but did not address the interoperability. This implies that spatial data delivered through Internet is limited only static and proprietary structures. To enable information flow between GIS applications a standard and portable data modeling approach is necessary. An interoperable spatial data service should provide open interface to access distributed geographic information services from diverse user applications without any restrictions on platform or programming language. However the issue of interoperability is not treated in this particular project.

1.2 Motivation

Refer to [3] the Malaysia handheld market will continue to see very healthy growth throughout the forecast period. The steady growth in the PDAs market can be effected of the fastest growing location based services. The main function of a location based services is the possibility to retrieve information about the features in the proximity of a mobile user, utilizing positioning technique. The route guidance to a destination location is also part of basic characteristics. Due to its ability to provide quick and easy access, the Internet is the preferred platform of such a location based services. This mean the data can be shared and viewed on web browser. Location based services for various applications have been developed by a multitude of companies all over the world. Standards are being defined in order to unify these information providers for such a large number of mobile user devices with different mobile operating system. Recently the Open Location Services Initiative (OpenLS) has been proposed [4]. It is devoted to the development of interface specifications that facilitate the use of location and other forms of spatial information in the wireless Internet environment. Lack of standard data representation and exchange standard leads to limited sharing and hence poor utilization of data. Further, the use of web technologies, server interfaces and communication protocols dictate the level of spatial data interoperability [5].

This research can be seen as a first step in the development of GISBALIES for the mobile user in Melaka Tengah area. Its numerous mobile users can need online help about the location of the hospital, and how to get there. They can access the website designed specially for the location based services prototype via the wireless network. In such a case, the website can access by the user from multiple mobile operating system.

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1.3 Problem Statements

The basic problem is that the Internet today is designed to be accessed from a PC. Most content assumes a high-resolution screen with sophisticated graphical capabilities. Anyone who has tried to access the web from a wireless connected PDAs knows that either it does not work well because the PDAs browser cannot handle a complex page, or that after a painfully long loading time, the page cannot be properly rendered because of the PDA's small screen. A small display window limits the extent and amount of detail that can be represent in a single field of view. Limited display- geographical images can be hardly slowed.

The second problem is related with the efficiency access to multiple operating systems in PDAs. To develop an application for each of these web-enabled devices separately is not feasible due to the high development cost involved. Since existing mobile GIS mapping for Location based services were develop independently, there is no interoperability to support multiple mobile Operating System such as Windows CE, Palm OS, Symbian and embedded Linux [6].

Wireless connectivity is highly variable in performance and reliability. Compared with wired communication, wireless communication is characterized by lower bandwidth, higher error rates and more frequent disconnection. These factors cause long latency in transmitting data and high cost and frequent disconnection for users. Wireless technology

has been developing to provide high speed wireless connection. Some buildings may offer reliable, high-bandwidth wireless connectivity while others may only offer low-bandwidth connectivity. Outdoors, a mobile client may have to rely on a lowbandwidth wireless network with gaps in coverage.

Portability, to be portable, mobile devices must be small and light. The result is that mobile devices are typically resource-poor relative to static desktop computers. They have low processor speed, small memory space and limited battery power. Due to these constraints, a lot of desktop systems and applications cannot port to mobile devices directly. When designing mobile systems and applications for mobile devices, these factors must be taken into consideration. The obvious and direct results of the above constraints are that mobile computing applications suffer from bad performance and mobile users suffer long latency and frequent disconnection. Research efforts are needed to address these issues.

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1.4 Objectives

The system is designed to achieve a few objectives were mainly to publish in multiple mobile operating system. The solutions would be the goals for the new system to be developed. So, here are the objectives for the system.

To develop a prototype of *location-based emergency* online information service targeting users from multiple mobile devices with different OS.

To design a user friendly user interface for GISBALIES application which considered only the important spatial data will be display to give the maximum clarity and readability.

To allow system work in all available PDA's technologies within different OSs in other words for use same application, with different PDA operating systems. In a mobile service environment there will be a plethora of terminal with different operating systems. Services must be able to present themselves on many of these, with consistent functionality and understandable interface.

GIS analysis should be possible through any browser without GIS software installed. So it makes totally application and browser independent.

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1.5 Scopes

In this research, the map which specified on Melaka Tengah area is created. User may view the area of around Melaka Tengah in this map together with the important landmarks, hospitals, road and residential area. This research developed online system, using client server concept. The client side GISBALIES components are the end user hardware devices that can display maps or provide analytical results of GIS operations. The server side components provide comprehensive spatial data and perform GIS operations based on request from the client side components. Between the client and the server there are various types of communication networks to facilitate the exchanges of geodata and services. For the prototype this research is limited only on Wi-Fi communication.

This research focused on emergency vehicle routing services. The prototype was build for the general user with mobile devices who was in emergency and to find the shortest path between their current positions to the hospital.

1.6 Significance of the Project

This research proposes a framework, serving as a generic work guide, for the development of GISBALIES applications that can be accessed by different PDAs Operating System, which avoids the development of a separate Location Based Services application for each mobile Operating System type.

The report consists of six chapters. Brief introductions of the remaining chapters are as follows:

In Chapter 2, the definition of the terms that will be used in this report will be clarified. Besides that, fundamental aspects of Location Based Services are briefly introduced. Then, the system architecture of Location Based Services is described. Location Based Services are composed of three most important parts: Wireless Communication, Client, and Server. Wireless Communication, Client, and Server are then compared according to their role definitions, functions, and possible choices in the market. The comparison between different mobile Operating System is discussed in this chapter. As a result, this chapter concludes that two types of mobile operating system will be choosing as a prototype of this research. The Portable Device discussion is focused on a broad overview of the technology with an emphasis on PDA and PDA based smartphones with different Operating System while the wireless discussion is focused on technologies currently available to users

Chapter 3 concentrates on investigating and analyzing the current advance of mobile operating system and what the most suitable software to make sure the services able to present themselves on many Operating System with consistent functionality and understandable interface. A discussion of how well these technologies and software can serve GISBALIES is given in terms of both their mobile Operating System factors and network factors.

In Chapter 4, the proposed system design was introduced. In this chapter, raw data for map and architecture client server application will be discussed. The principles of design and methodology for Client Server Framework are introduced first and then applied to the development of a framework for GISBALIES that focuses on different mobile Operating System.

Chapter 5 focuses on implementation of the prototype system. This phase basically, apply the whole project that has done in technically.

Conclusions and recommendations for further research are finally presented in Chapter 6.

1.8 Conclusion/ERSITI TEKNIKAL MALAYSIA MELAKA

Location Based Services in this new era will be very useful for all users from all sort of life. In this research, the main aim is to overcome the existing Location Based Services so that mobile user from different type of mobile device and different mobile Operating System can easily access the same application and get the same information for emergency vehicle routing services in Location Based Services.

CHAPTER II

LITERATURE REVIEW AND METHODOLOGY

2.1 Review of Interoperable System and Location Based Services

Interoperability and Location Based Services is not entirely new but they are interrelated. It has been discussed within the broader information system communities and certain aspects have been implemented outside of GIS for years. Interoperability in GIS has received a significant research attention in recent years. The variety of different systems has raised the question of connectivity and interoperability between systems. The term interoperability is used to denote co-operation or communication. The standard ISO 19104 Geographic Information—Terminology defines the interoperability as: "The capability to communicate, execute programs and transfer the data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristic of those units"[7].

It has been considered that interoperability is a "capacity to transfer data from one computer to another without the transformation loss" [8]; though this can be understood in a number of ways, but the basic idea is to provide a modern information systems environment that can communicate openly. The concept of interoperability came in to existence due to number of distributed heterogeneous systems. According to [8], the era of interoperability can be divided in to three generation. Generation 1: approximately covering the period of roughly 1985 mainly dealing with the interoperability in multidatabase systems and federated databases systems. Generation 2: a decade long ending in 1995, dealt with the propagation of the structured databases, & semi-structured data, and then with the help of visual media spreading it onto the World Wide Web. Some of the advantages of this era were the achievements in system interoperability dealing with the heterogeneity of systems, data, and other representational levels, support to a broad variety of data, metadata and lastly the use of knowledge representation, reasoning for handling different terminologies. This generation, also helped in achieving increased standardization, which, significantly helped in achieving syntactic and structural interoperability.

Generation 3 started in 1996 and is still continuing. This generation is semantically more challenged with the increase in global connectivity and variety of heterogeneous digital

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data in to existence. This generation brought many organizations helping in standardization of the data, protocols, languages, interfaces etc. some of the main organizations are, OGC (open Geospatial consortium) in the field of web services, OpenLS (Open Location Services initiatives) for the standardization effort in Location based services (started in October 2002) and the ISO (International standards organization) initiatives.

2.1.1 Emergency Location Based Services and Standardization Initiatives at International and National Level

Now that abundant of geospatial data is available under one roof, the question is, how it should be used for the benefit of the general public. On the other hand location based emergency services is the kind of service that requires spatial data apart from location accuracy. As stated by [9] "Location-based services historically were built as stand-alone applications that didn't communicate easily with other applications and systems. Open standards, therefore, will be a necessary catalyst for LBS growth."

Likewise, in any requirement of LBS, interoperability is imperative [10] and also, geographic data is fundamental requirement to LBS. It is believed that to make LBS a reality, one has to make use of existing geospatial data that are organized and maintained in different software and are located in different servers of mapping organization [11]. Interoperability in LBS is closely related to the development of interoperable distributed