

THE DEVELOPMENT OF A CITY ROUTE GUIDE SYSTEM
(CRGS) USING MULTIMEDIA MOBILE COMMUNICATION
TECHNOLOGY

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Abstract

In today's Malaysia major cities, the building and transportation infrastructure has increasingly become complex. The road guides' board placed besides the road may not well fulfill the road users' needs especially for those who are not familiar with the city. Thus, an additional guide may need to exist in the most convenient way to assist the road users in saving their time and reducing the road accident. In today's the mobile phone application plays the important role in daily human communication. Mobile phone is extremely convenient and able to connect people every way. Consequently, mobile phone could be the most appropriate tool for solving the problem mentioned above accomplish with a CRGS. The development of this project is concerned with the design and implementation of a CRGS prototype. The CRGS prototype accepts user geographical information search keywords through SMS (Short Message Service) or mobile internet access and then process and display the result output to the mobile phone screen. Beside, the CRGS prototype will able to provide various geographical information search such as areas, hotels, some Malaysia places of interest for tourist and driving direction guides search for user interactivity while driving or else access from home.

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The rapid growth of technology and economy in Malaysia has brought in the big improvement in our country major cities structure especially in transportation infrastructure such as new highways, new Light Rail Transit (LRT) route have been built around the cities. Consequently, the transportation infrastructure in our country major cities has increasingly become more and more complexity. The road guides' board placed besides the road may not well fulfill the road user's needs especially for those who are not familiar with the city. Consequently, this will waste the road user's time in reaching their destination and they may lose some where in the city, this may lead to road accident when their felt panic in their drive. Thus, an additional guide may need to exist in the most convenient way to assist the road users in saving their time and reducing the road accident. Besides, a discussion in a local forum (myvicclub, 2006) and blogs such as thetraverspage(2007) , VirtualMalaysia(2007) has claimed there are a lot of inaccurate map information in those manual printed maps. In other words, the rapid development of building infrastructures in Malaysia major cities may lead to unawareness of local residents and this were resulted inappropriate use of the manual paper based method to record geographical information as this method unable to support dynamic changes of map contents. Moreover, the needs of the most updated geographical information for Malaysia major cities have been increased by road users since information of geographical infrastructures change so rapidly. Therefore, there is a need of a road guide system to keep local residents always updated of local route information and provide them a convenient way to search for certain route information they need. With this road guide system, tourists from oversea will also able to gain advantages of knowing Malaysia city route information in detail.

Today's Malaysia is in a rapid development on IT infrastructure and this has brought in the revolution of paper based system into Computer Based Information System (CBIS). Many traditional paper files and maps have turned into computer based database management system for reliable storage. Just a simple mouse click is needed for retrieving resources from the database. People are now preferred to look at faster, more effective and larger system process rather than slow and only effective for small transaction which is happened in manual system. Besides, computerized system is able to deal effectively with dynamic data changes without taking time in data editing and restoring. So with the benefits found in CBIS, Geographic Information System (GIS) is indeed necessary to be computerized since GIS is a complex system that need large storage, fast and accurate search response as well as deal with dynamic geographical information change. Beside, the Global System for Mobile Communications (GSM) mobile technology has rapidly becoming common and widespread in human lifestyle and plays the important role in daily human communication. Mobile phone is extremely convenient and portable since it is small in size and able to connect people every way. Many of local companies use the advantages of GSM mobile technology to change their business model to become E-Commerce or M-Commerce model. Nowadays, the knowledge of information technology has changed the expectations of users, which request for faster speed and more effective performance, user friendly and manageable system control. As a response to new system expectations, this City Road Guide System (CRGS) project is planning to have GSM mobile technology for the system access and a manageable back-end system control.

1.2 Research Problems

There are a few problems that identified regarding road guidance system in Malaysia. Building a complete City Road Guide System (CRGS) for all cities in Malaysia is not easy since it involves a large number of geographical information to be stored in the system database. Therefore, the development of this project is concerned with the design and implementation of a CRGS prototype that limited for a small scope of some areas in Puchong city is using as the GIS fundamental database records. It would be a challenge to convert paper based geographical information into computerized database system using maps and mapping concepts for new insertion, information editing and effective information searching capabilities. Besides, the system database is also necessary to support and storing customers or members details for controls and manipulations.

Before building and implementing the system database, a few questions should be answered correctly:

- 1) What type of database management system (DBMS) is appropriate for supporting the system data?
- 2) What and what type of geographical information need to be stored?
- 3) What member details need to be stored?
- 4) How to make the member and system administrator identifiable in the system and assign the different level of system accessibility to them?
- 5) How to design and build a database that able to map into the system?
- 6) How to design the database that able to separate the system data from system processes and presentation?
- 7) How to make the database easy manageable for all types of system data?

1.3 Research Objectives

The objectives of this research are:

1. *To study and evaluate on existing Geographic Information System (GIS).*

This objective is planned to be achieved by carry out the existing GIS research activities. The research activities would be carried out on internet research and some local examples research. The activities cover reading relevant GIS literature to seek for problem and opportunity and observe on some existing GIS examples to find out their system features and functionality as well as technology uses in system deployment. This is essential for determining the proposed system functionality requirements, technology uses and necessary enhancements.

2. *To survey and reviews the software and hardware as well as technologies that is needed for implementation*

The activities involved are reading literature on the technical aspects of wireless application development and hardware requirements to find out technology and architecture design that support the proposed system. Besides, a wireless SMS technology through GSM mobile phone research also would be carried out to determine its usages, advantages and limitation. Finally a survey for the most suitable programming language and development tools uses for wireless application development would be conducted as required in the proposed system development.

3. *To design and implement a wireless GIS.*

To achieve this objective, a set of activities would be carried out such as selecting appropriate methodology, building design models using UML / Object-Oriented Modeling technique, designing the GIS with Geographic Information Database and CRGS mobile gateway, evaluating the system design followed by testing the system for functionality and quality assurance.

There are some other details objectives associate with proposed system features and functions need to be addressed for the project development. There are:

1. To produce the most appropriate solution for the project scopes for achieving the project high level objectives.
2. To plan and manage the project workload on schedule with appropriate CASE (Computer Aided Software Engineering) tools and methodology.
3. To design and construct a flexible and multiplatform system architecture model with appropriate modeling techniques.
4. To design an interactive relational Database Management system that able to map into system objects and support geographical data.
5. To design and implement a CRGS Mobile Gateway system that able to respond automatically to users' input.
6. To design and construct a back-end system administration application that easy to manage and with access protected for administrators.
7. To complete and deliver the system product successfully within the scheduled timeframe.

1.4 Significance of the Study

The development of this project, City Route Guide System (CRGS) with using multimedia mobile communication technology is introducing a new architecture of GIS development. The CRGS prototype accepts user geographical information search keywords through SMS (Short Message Service) or mobile internet access and then process and display the result output through MMS (Multimedia Messaging Service) to the mobile phone screen. This increases the flexibility and mobility of the system access and makes it more convenient to the users. GSM mobile phone is quite common in Malaysia nowadays and it is very simple and user friendly. Thus it reduces the complex steps involved to use the system. System users can also avoid the complex system access requirements and installation as well.

As we know the geographical infrastructures in the major cities of different part of Malaysia have changed rapidly due to rapid country development. So this CRGS system will solves the unawareness of the change of geographical infrastructures problem, provides users the shortest and correct route on the road to prevent them from making mistake on the road.

Apart from this, the CRGS assist users to locate city area by area name or zip code. It also helps system users to find the possible ways to that particular area. This system also provides details on hotels and places of interest. Tourists who are interested to know more about Malaysia geographical information will find it convenient for them to search for hotels and places for visit on their own. The CRGS is able to access in anywhere and wirelessly and it does not involve any complicated setting or installation, therefore it is very suitable for home users and for hotel room usage as an advance geographical information guides service to tourists.

This project uses wireless SMS (Short Messaging Service) technology as the system input and MMS (Multimedia Messaging Service) as system output to the mobile screen. For the system input, a GSM (Global System for Mobile Communications) and wireless mobile technology research will be carried out for getting the GSM hardware and Software Development Kit (SDK) requirements as well as its working architecture and necessary configurations involved. The GSM hardware and SDK requirements is expected to be platform dependent. Thus, the challenge here is to identify extensible architecture for the CRGS main system for the purpose of permitting the CRGS main system working in multiple platforms and environments. In the effort of achieving the goal, a powerful Object-Oriented architecture is planned to be developed that able to supports multiple programming languages in system objects communication.

There are some critical questions need to be answer properly before the design process of system architecture, for example like which type of GSM hardware and SDK is appropriate for the system, at the same time study must also carry up on how to build an auto respond Short Messaging Systems (SMS) and Multimedia Messaging Systems (MMS) control application for controlling the GSM hardware, which is necessary for the system SMS input and simple system SMS or MMS output. Beside, CRGS mobile gateway connects to the CGRS main system and communicates in each others and what intermediate medium is required is also important to know before the actual implementation.

1.5 System Assumptions and Limitations

There are several assumptions need to be made in regard for the system to be working fully in real live deployment.

- 1) All the system users must have a GSM mobile phone (with SMS and MMS enabled) and very familiar with the use of SMS and MMS technology.
- 2) All the system users are aware of the place name and zip code for the CRGS search since the system will not help the users to find the place name.
- 3) All the system users are able to understand English well since the system is built completely in English version.
- 4) The GSM service is always available for SMS and MMS transmission.
- 5) The speed of SMS / MMS sending and receiving is always remaining fast and stable and not time consuming. This is important since part of the system response time is depended on the SMS / MMS transmission rate.
- 6) The system will not address much on customer relation management (CRM) and accounting issues since the system is intended to be developed in a flexible way for modification with assumption that the CRM requirements are vary and depend on business usages.

The project developed comprises of four elements, there are the system database with its MS Access 2003 DBMS, a database managements application or back-end administration system, a SMS and MMS control application and the CRGS main system. The system database is divided into two parts: normal relational database and the Geographic Information database. The system database is used to store customers or members personal details and system administration control details. Besides, the second part of the database is used to hold geographical information data such as map ID code and coordinates.

The database management application is used by data entry clerk for manipulating member's records such as insertion, modification and deletion. It also used by system administrator for

geographical data insertion into Geographic Information database and for geographical data modification as well. The manipulation of system administration controls records such as annual member fee and maximum channels limit are also handled by this application but limited only for the access of system administrators. The application also allows data entry clerk to print out member's details and list member's records by member registration date. However, this application will not act as data mining tools.

All the members and geographical data are able to enter manually into the system database through the application interface. As for the GIS implementation, some geographical data of major area in Puchong city are entered manually into the Geographic Information database for prototype testing. However, this does not mean that the CRGS main system is only limited to these geographical data. The GIS scope for the geographical records is able to enlarge whenever as needed. This can be done through the database management application.

The SMS and MMS control application is designed as the sub system for the CRGS main system. It receives the GIS SMS input command from user's mobile phone and passes it to the CRGS main system for further operation. The CRGS mobile gateway is also responsible for the input validation. It checks the user's SMS input for valid system command before pass it to the CRGS main system for process. If there is an invalid input command or unauthorized user detected, it will automatically send an error SMS message back to the user. However the CRGS mobile gateway will only work properly if the GSM service for SMS is available. The current system project will not involve and manage the operation for any GSM service. The CRGS main system enables users to search for specified geographical information through SMS technology and bring the result as the system output for display through MMS.