Map Interactive Guide using Palm Kuala Lumpur (MIGuP-KL)

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Abstract

There are many web sites provide information about map for certain places in Malaysia. However, from the study I have done, there is no significant number shown that any of the website provide service on Palm. This study has been the idea to develop a website or more accurately a web clipping solution for Map Interactive using Palm-Kuala Lumpur (MIGuP).

Before developing MIGuP, several subject keywords related to the project have been covered. Among the subject keywords are *map, interactive* and *Palm device*. Discussion with my supervisor, Cik Rafidah Mohd Nor has been carried out to understand the current requirements and desired system to be developed.

MIGuP contains two main modules that are User Module and Administrator Module. User Module will displays information to client or user. The Administrator Module maintains the MIGuP system to make sure the services are available at any time.

MIGuP will be developed based on the client/server architecture, which included web server, database server and development workstation. Personal Web Server (PWS) will be used on the Microsoft Windows 98 platform with connection to the Microsoft Access 2000.

At the end of the project, MIGuP is expected to be an online interactive web-base system to obtain and distribute information dynamically within the usage of Palm device. The successful of MIGuP will widen the usage of the Palm OS device and at the same time encourage the tourism industry in Malaysia.

Acknowledgement

First of all, I would like to express my deepest gratitude to my project supervisor, Cik Rafidah Mohd Nor who has spent her invaluable time to have discussion with me. Her guidance, advices and encouragements through the entire project are indeed appreciated.

Special thank to Puan Nornazlita Husin, the project moderator for suggestions, comments and her useful informative feedbacks to the project.

My special thanks also goes to all of my fellow course mates for sharing their knowledge throughout the duration of this project.

Last but not least, I would like to thank to my lovely family for their supports and encourages.

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Chapter 1: Introduction

1.1 Project Introduction

Map Interactive Guide Using Palm (MIGuP) is a system, which is especially dedicated to the Palm OS hand-held device (Palm) as a guide to tourists in their tour in Kuala Lumpur. In this system, information about Kuala Lumpur provided such as map, roads and transportation.

Tourists can access MIGuP-Kuala Lumpur using their Palm device from any location and can easily make route to destinations. MIGuP also can be accessed from desktop computer which it is made on-line.

1.2 Project Objectives

The objectives of this project are:

- To provide facilities for tourists to locate the attractive places around Kuala Lumpur. Interactive map provide map of Kuala Lumpur and shows roads that linked the attractive locations. This will help tourists to manage their holidays and search the most attractive places in Kuala Lumpur.
- To allow interactive map to be accessed through Internet using PDA (personal data assistant) or Palm.
- To encourage the tourism in Malaysia.

1.3 Project Scope

Scope in this MIGuP project focus to area around Kuala Lumpur. The scope of this project is small since Kuala Lumpur is center of attraction that has many attractive places. Therefore in this project, the system is restricted to:

- Provide interactive map of Kuala Lumpur.
- Provide layer that display roads linked to certain locations in Kuala Lumpur.
- Provide categorized and easy to find information about any location on the map.

1.4 Target User

The development of MIGuP is to provide facilities for tourists and local residents on searching the attractive places in Kuala Lumpur.

1.5 Project Limitations

In MIGuP, some unavoidable constrains will limit or affect the system development process. The project limitations are divided into three categories, those are:

- **Area limitation**

  The area focused in the map is only around Kuala Lumpur. Area outside Kuala Lumpur will not be displayed in the map. Tourists who want to search for location outside Kuala Lumpur will have to find other interactive map.

- **Device limitation**

  Palm has disadvantages compare to desktop computer. Palm has smaller screen and resolution. The small screen limits the information display on palm. Palm as a handheld device have small memory space that creates limitation during system implementation and application writing.

- **Cost limitation**

  Cost of a Palm device is too expensive (about 2 to 3 thousand ringgit), which I can't afford it. To overcome this problem, I will be using a software called 'Palm OS Emulator' to replace the real Palm device. Palm OS Emulator acts as a real Palm device in desktop computer and it has the same feature as the real Palm device. This software will be used in system testing phase.

1.6 Project Schedule

This project will be carried out in two stages. First stage involves activities such as concept definition, research and literature review, requirements and specifications analysis and the system design. This first stage will explain and schedule the project development process. Second stage is prototyping, integration and testing activities. The schedule for the activities of the project is as follows:

ID	Task Name	Start	Finish	Duration	March 2002		April 2002	
					18-24	25-31	1-7	8-15
1	First stage	18 March 2002	15 April 2002	29 days				
2	Concept definition	18 March 2002	21 March 2002	4 days				
3	Research and literature review	22 March 2002	26 March 2002	5 days				
4	Requirements and specification analysis	27 March 2002	3 April 2002	8 days				
5	System logical design	4 April 2002	15 April 2002	12 days				

Table 1.1 Project timeline for first stage

ID	Task Name	Start	Finish	Duration	Jun	Jul	Aug	Sept	Oct
1	Second stage	03 June 2002	11 October 2002	131 days					
2	Prototyping, incremental and system coding	03 June 2002	09 September 2002	99 days					
3	Integration and testing	10 September 2002	01 October 2002	22 days					
4	Documentation	02 October 2002	11 October 2002	10 days					

Table 1.2 Project timeline for stage two

1.7 Conclusion

This chapter provides a general description about the proposed project. Statement of problem, project objectives, significance, scope and limitation are stated. Schedule of the project and its report layout are described before ending with summary. The next chapter will discuss literature review of this system.

Chapter 2: Literature Review

2.1 Map Definition

According to The Oxford English Reference Dictionary, Second Edition, definition of map can be divided into two:

- *Flat representation of the earth's surface, or part of it, showing physical features, cities etc.*
- *A diagrammatic representation of a route.*

The word interactive may be referred as *a word to describe a system or a mode of working in which there is a response to operator or user instructions as they are input. The instructions may be presented via an input device such as keyboard or mouse, and the effect is observable sufficiently rapidly that the operator or user can work almost continuously.*

From the definition given above, an interactive map may be referred as map that need response from user, which there is an interaction between the map and user. The interactive map itself not only represent the earth's surface but can provide many layer that give more detail information about the surface or locations. An interactive map also can display additional information (maybe in text format) about the locations such as description of attractive places and the culture of the community of the place.

2.2 Existing Map On The Web

There are many web sites that provide online map. Most of them are fully interactive. Stand-alone map system also available, which it is used for personal computer and do not have any link to the Internet. In general, we may categorize map into two major groups, interactive map and non-interactive map. The difference between these two kind of map are shown below:

Interactive map	Non-interactive map
Need interaction between user and the system (map).	No interaction between user and the map.
Provide multiple layers for detail information.	Only one layer.
Provide additional information for places in the map.	No additional information.

Table 2.1 Differences between interactive and non-interactive map

2.2.1 Map of Malacca (non-interactive)

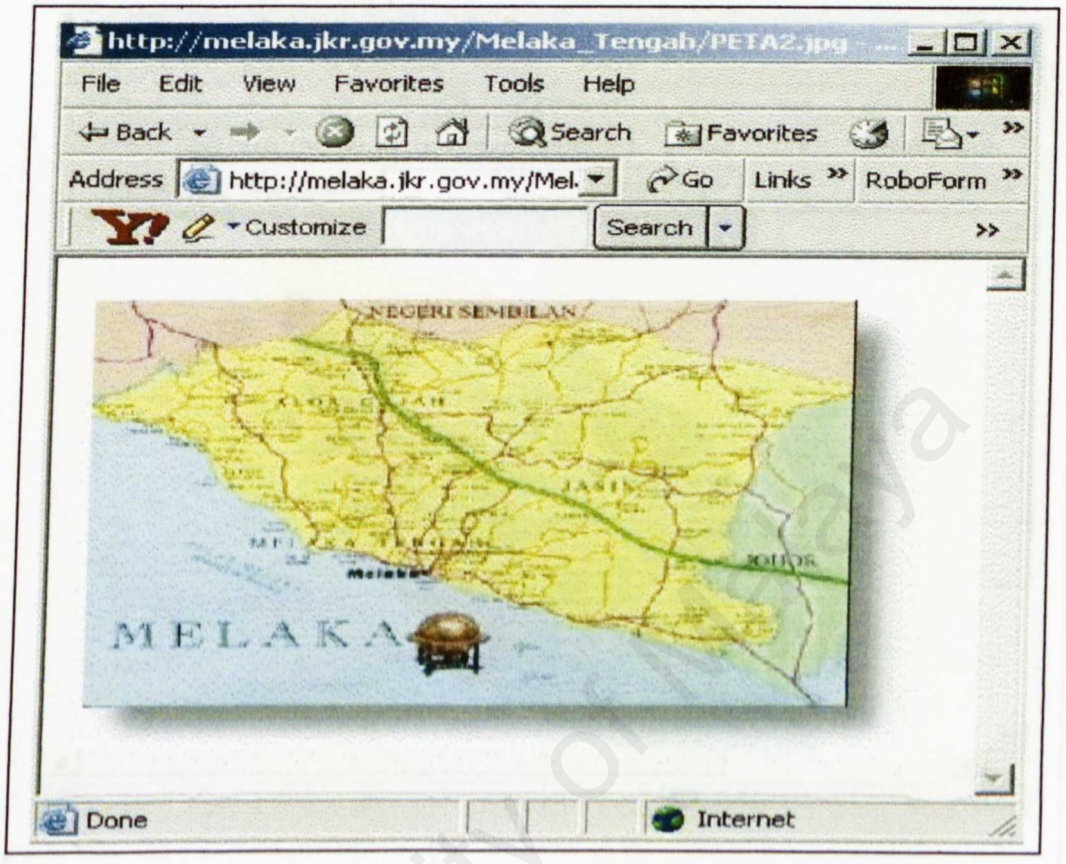


Figure 2.1 Malacca web site

This map is a non-interactive map. The map only displays one layer of state of Malacca. There is no other layer that focus on districts of Malacca. This map also has no information about Malacca itself.

Web site: **http://melaka.jkr.gov.my/Melaka_Tengah/PETA2.jpg**

2.2.2 Map of Malaysia (interactive)

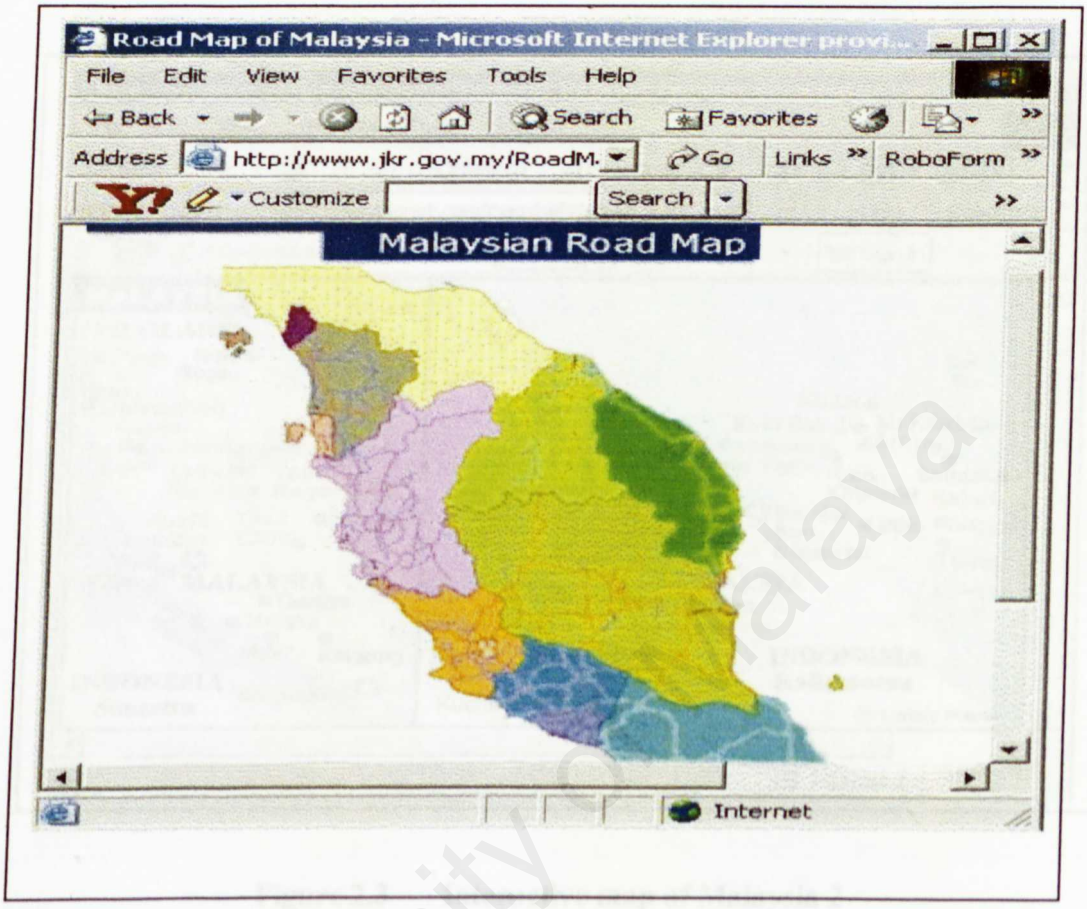


Figure 2.2 Interactive map of Malaysia 1

This web site provide interactive map of Malaysia. The map has two layers that provide information about places in Malaysia. Since the map is interactive, it has one disadvantage – there is no information about places or locations in the map.

Web site: **http://www.jkr.gov.my/Road Map/**

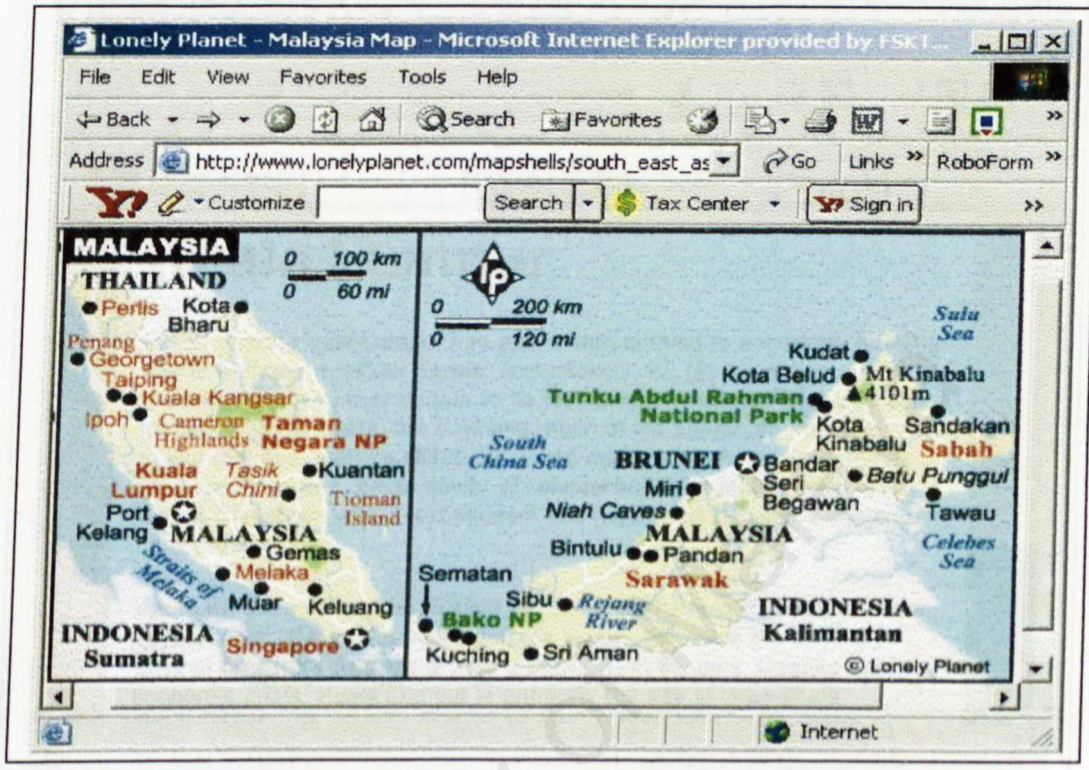


Figure 2.3 Interactive map of Malaysia 2

This web site provide interactive map of Malaysia. The map is similar to the previous map but it has information about attractive places in Malaysia.

Website:

http://www.lonelyplanet.com/mapshells/south_east_asia/malaysia/malaysia.htm

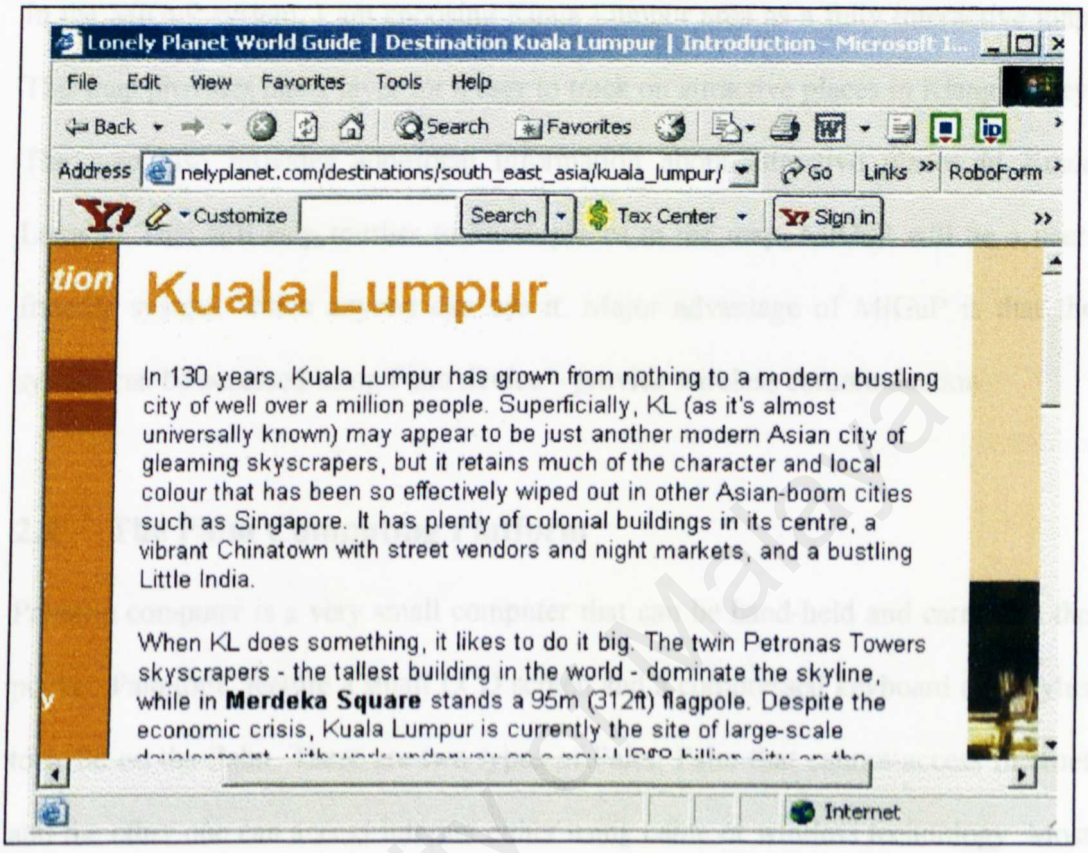


Figure 2.4 Information about Kuala Lumpur

2.3 MIGuP System Approach

In the MIGuP system, I am choosing Kuala Lumpur area as a fully interactive map. This map provides many layer for a user to track on attractive places in Klang Valley. The map also provides additional information about attractive places in Kuala Lumpur. This will help tourists to know places in the map. MIGuP will be a user-friendly system, which anyone can use it. Major advantage of MIGuP is that the system can be accessed using Palm device – provide wireless communication.

2.4 The Palm Computing Platform

Palmtop computer is a very small computer that can be hand-held and carried in the pocket. Palmtops' feature a small LCD screen and a compressed keyboard or a stylus to write on the Palm. There are two types of Palm, Palm that cannot access Internet and the other one can access Internet either using cable or wireless technology. Most of the first models offer personal organizer, diary, address list and calculator. Some models are programmable and can support file transfer and using wireless application to access the Internet or for communication use.

2.4.1 Ten Reasons to Use Palm Device

1) The de facto standard

With over 20 million Palm OS®Powered devices in the market the Palm OS has outsold its nearest competitor by more than eight to one and has 90% US and 72% worldwide market share.

2) A wide variety of devices to choose from with prices for any budget

A wide variety of devices to choose from with prices for any budget. From handheld to smart phones to all-in-one communicators Palm OS Powered devices come in all sizes and start at just $99.

3) The most software

You wouldn't buy a PC that didn't have lots of software that runs on it and the same should be true for a handheld. With the over 191,000 registered Palm OS developers working on new programs you'll have the software you need both now and in the future.

4) Easy to use where you are

The Palm OS was built from the ground up specifically for the way a handheld mobile device is used so that you can do what you want quickly and easily.

5) Great compatibility with your PC and your life

The built-in Date Book, Address Book, To Do List, Memo Pad, and Mail are Intuitive and powerful and synchronize with Palm Desktop or Microsoft Outlook. Easily view and edit Microsoft Word and Excel files with products like DataViz®, Documents to Go®, Blue Nomad WordSmith™ and Cutting Edge® QuickOffice®. Store, view and share video clips and images with MGI PhotoSuite Mobile Edition or access AOL Mail and AOL Instant Messenger with an Internet access account.

6) Long battery life

Because it was designed for mobility the Palm OS uses power very efficiently so you won't have to replace batteries or re-charge your device very often.

7) Fast, compact and efficient

The Palm OS is optimized to use very little memory. Programs take minimal space and can be beamed quickly through infrared to others.

8) Hundreds of hardware add-on products

Using SD (Secure Digital) Expansion Cards, Handspring Springboard modules, Sony Memory Stick, sleds, or compact flash expansion options turn your Palm OS device into a digital camera, MP3 player, cell phone, or GPS (global positioning system). Add wireless 802.11b high-speed LAN connectivity, a wireless modem, a portable folding keyboard, travel guides, memory expansion, back up, games, or a dictionary and thesaurus.

9) The enterprise standard that fits in

Because of its low total cost of ownership and tremendous popularity the Palm OS has become the operating system of choice for Enterprise customers. Of the US Fortune 1000 companies that have standardized on a hand-held operating system 91% of them have chosen the Palm OS. Palm OS fits in with hundreds of enterprise solutions with many from leading vendors like Oracle, Peregrine, Siebel, Tivoli, Lotus, Sun, and others.

10) The hassle-free "No-Brainer" solution for consumers and small businesses

With affordable entry-level hardware devices, easy to learn and use software, hassle-free synchronization with desktop computers, and a wide choice of software Palm OS is the only way to go.

2.4.2 Palm OS Philosophy

The Palm Computing Platform has a lot to recommend it, but it can be frustrating for experienced object-oriented programmers. Programmers are limited by small stack and heap size. The Palm OS is also very low-level, which means that programmers are required to take care of a lot of the overhead of working with system resources. This is especially true of the Palm user interface. In general, this makes for lots of developer time, fragile code (memory leaks and bus errors are endemic, for example), and little reusability. The Palm design philosophy is that less is better — smaller user interface, tighter coding, and fewer overheads have given the Palm its success. This is one reason why the Palm OS is not an object-oriented system. Although the Palm OS keeps logical "objects" in structs, it is written in straight C, with everything that implies.

2.4.3 Palm OS Flexible Architecture

The Palm OS platform consists of five primary components:

- Palm OS® software
- Reference hardware design
- HotSync® conduit data synchronization technology for one-button synchronization
- Platform component tools including an API that enables developers to write applications
- Software interface capabilities to support hardware add-ons

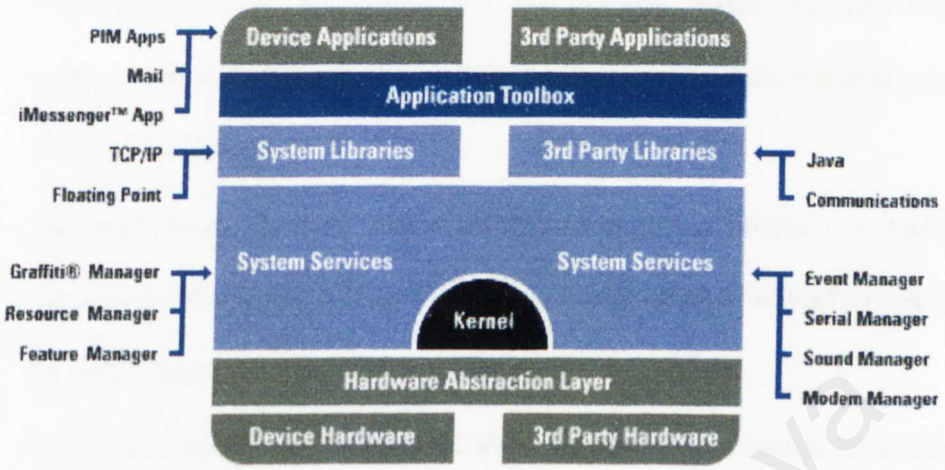


Figure 2.5 Palm OS architecture

In Depth:

- Device applications such as HTML-based web clipping applications allow websites to deliver compressed information to users in less than 10 seconds, on average. Most of the code is cached on the handheld computer for delivery without delays. And the HTML base makes it simple for sites to add web-clipping services.
- Graffiti® power writing software allows users to quickly and accurately enter information into their handheld devices.
- System libraries let developers easily extend the functionality of the Palm OS.
- An internal software map of how the hardware works, the hardware abstraction layer gives developers the flexibility to modify the Palm OS without having to rewrite code each time a change is made.

- Localization architecture makes it easy to localize an application by putting all localizable data into an overlay file. For example, adding German language support is as simple as creating a German language overlay file and putting it over the application.
- The application interface makes it easy to access a function or launch an application by pushing a clearly labeled onscreen button instead of navigating through a menu.
- Intelligent compression formats the most important information for display on a single screen, visible without scrolling.

2.5 Overview of the Palm.Net System

Before developing content and applications for the Palm device, it is useful to understand the whole Palm.Net system. The Palm device is just one part of a system that delivers data wirelessly from the Internet to the Palm device.

The system is designed to work differently from a web browser application running on a desktop computer. The Palm.Net system is designed to best support access to real-time data, not casual browsing. Browsing is possible, but the increased cost and volume of data involved with visiting most standard web sites makes it impractical over a wireless network. Typical scenarios involve users accessing the following kinds of information on the Internet: news, sports scores, weather, traffic reports, driving directions, airline schedules and flight information, stock quotes, hotel and restaurant information and email.

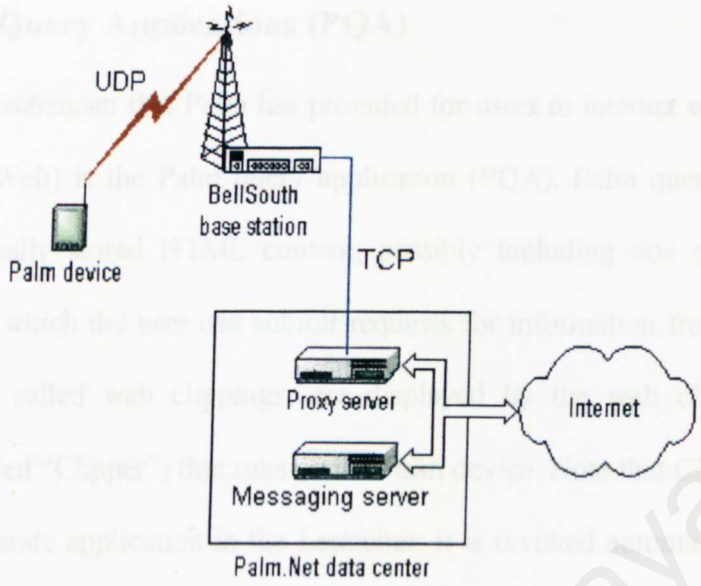


Figure 2.6 Palm.Net network

Figure 2.6 indicates the Palm device communicates via radio modem to a nearby BellSouth Wireless Data network base station. From there, data is sent over a private link to the Palm Web Clipping Proxy server in the Palm data center. The proxy server interprets user requests and passes them to other computers on the Internet, using standard HTTP protocols, to handle as appropriate.

Responses are sent back to the proxy server, which communicates them to the Bell South wireless network and back to the Palm VII device via radio modem.

The wireless radio link operates at approximately 8 kbps, so is best suited for exchanging small amounts of information. After accounting for headers, error correction, and other overhead, the effective data throughput is roughly 2 kbps, so compactness is critical.

2.5.1 Palm Query Applications (PQA)

The primary mechanism that Palm has provided for users to interact with the WWW (World Wide Web) is the Palm query application (PQA). Palm query applications encapsulate locally stored HTML content, possibly including one or more query forms, through which the user can submit requests for information from the WWW. Returned data, called web clippings, are displayed by the web clipping viewer application (called "Clipper") that runs on the Palm device. Note that Clipper does not appear as a separate application in the Launcher; it is invoked automatically when a query application is launched. End users don't see the term "Clipper" anywhere in the user interface or user documentation, so you should not confuse them by using this term in your application documentation, readme files, or help screens.

The Query Application Builder program that runs on a desktop computer creates palm query applications. This program translates one or more pages of HTML content into a single compact database (.pqa file) that the user installs on the Palm device. When creating the .pqa file, the Query Application Builder translates HTML into a compressed format. The Clipper application works with this compressed format, rather than HTML directly. The reason for this is that HTML is an inefficient format for the transmission of data over the network and storage of information. Compression minimizes the amount of information sent over the radio and reduces the size of query applications stored on the Palm device.

GIF and JPEG images incorporated into source HTML files are converted to the Palm bitmap format (2-bit graphics) before being stored in the query application file.

2.5.2 Palm Web Clipping Proxy Server

The Palm Web Clipping Proxy server is a key part of the system. This server is responsible for accepting and responding to queries sent by the Palm device.

The server supports three high-level protocols: HTTP, HTTPS, and the Palm messaging protocol (used by the iMessenger application). Requests using HTTP and HTTPS are forwarded to the Internet. Requests using the messaging protocol are forwarded to the Palm messaging server, which handles email communication to the Internet.

2.5.3 UDP

One way that Palm optimizes the limited network bandwidth is to use UDP (User Datagram Protocol). All communications between the Palm device and the wireless network use UDP. This transmission protocol is extremely efficient and lightweight, resulting in the exchange of the fewest packets possible over the wireless network. Often requests and responses require just a single packet of data each. This is much more efficient than the relatively verbose TCP (Transmission Control Protocol). Using UDP decreases user airtime costs because fewer packets are required for each request and response.

UDP does not normally function as a reliable protocol, however, the wireless connection between the Palm device and the BellSouth Wireless Data network has guaranteed delivery and reliability built into it via other mechanisms, so there is no need for the extra overhead of a full connection-oriented protocol such as TCP.

WWW requests that are passed to the Internet by the proxy server use TCP to guarantee reliability over the Internet.

2.5.4 Compressed HTML

Another way that Palm efficiently uses the limited bandwidth of the Palm.Net system is to compress HTML. Web clippings are rendered on the Palm device by the Clipper application. Clipper renders compressed HTML data. Both the query applications and WWW data returned from the Internet are compressed.

When creating Palm query applications, the Query Application Builder program compresses HTML content and combines multiple HTML pages and images into a single query application.

All HTML information returned to the Palm device from the Internet is dynamically compressed by the Palm Web Clipping Proxy server before transmission through the wireless network to the Palm device.

It's important to note that the Palm device accesses standard HTML data that resides on standard HTML web servers on the Internet. The compression by the proxy server is transparent to the user and the web server on the Internet.

If a web page that is not Palm-friendly is browsed, the proxy server removes images, scripting code, Java code, frames, and other non-supported elements before sending the content to the Palm device. Additionally, the content is truncated to prevent large amounts of unexpected data from being transmitted. The user can request more data as desired.

2.5.5 Security

All wired parts of the network support security via the SSL (Secure Sockets Layer) protocol widely used by servers and browsers on the Internet. However, SSL is impractical to run over a low bandwidth wireless network because it is quite verbose. Palm implemented a level of security for the wireless portion of the network that is equivalent to the 128-bit SSL encryption algorithms, but optimized for use on a wireless network. The wireless part of the network is protected by a security system that includes encryption, message integrity checking, and server authentication.

Message encryption is done via an elliptic curve cryptography engine supplied by Certicom Corporation. Message integrity checking protects against transmission errors or message manipulation. Server authentication prevents the wireless session between the Palm device and the proxy server from being hijacked or spoofed.

2.6 Wireless Technology in Palm

Wireless connectivity represents a quantum leap in terms of handheld utility. To get a sense of the importance of this transformation, you have to go back to the days before dial-up Internet connections: The difference between the first PalmPilot™ device and a wirelessly connected Palm™ handheld is not unlike the difference between an early stand-alone PC sitting on your desk and a PC with a modem. Since information management on the go is the very essence of the handheld, Palm has been a pioneer in PDA wireless connectivity from the beginning and already has exhibited leadership in the wireless arena. The very first wireless functionality was so popular that "beaming"

quickly became a trademark of the young and hip. Not only was the Palm VII handheld the first successful, full-featured handheld with integrated wireless, but Palm's Mobile Connectivity Kit and third-party solutions further extend wireless functionality to include most Palm Powered™ handhelds in many parts of the world. Increasingly, Palm is helping people stay connected to their information, whether they're across the hall or across the country. Today, Palm Powered handheld users can get connected to their information faster, and stay connected more of the time, in more wireless environments, than users of any other mobile operating system.

2.6.1 Personal Area Networks (PANs)

Personal Area Network link devices within close proximity of one another (about 30 feet); they replace USB cables; they're spontaneous, or "ad hoc"; and unlike the other types of wireless networks, PANs need no infrastructure.

Devices of all types, from phones and handhelds to printers, and even home electronics such as TVs and stereos, are perfectly suited to these short-range, ad hoc networks—giving an entirely new meaning to the term, "universal remote." Bluetooth is the optimal technology for PANs because of its small chipset and low power consumption, and Bluetooth will become the industry standard for personal wireless devices. The Palm Bluetooth card, which wirelessly enables any Palm handheld, equipped with an expansion slot, was one of the earliest Bluetooth products introduced.

2.6.2 Wireless Local Area Networks (W-LAN)

Wireless Local Area Network replaces the Ethernet cables that enable corporate wide networks. A W-LAN delivers connectivity throughout a localized site, such as a university or corporate campus, or a home network, by placing "access points," fixed base stations with a range of about 500 feet, along the existing infrastructure.

Wireless LANs are the biggest and fastest wireless pipes to the Internet. In addition to corporate and university campus wide W-LANs, in the past year we have seen the introduction of the so-called "café" network, a new type of W-LAN marketed as a value-added service in private clubs and in public venues, such as Starbucks and hotels.

2.6.3 Wide Area Network (WAN)

Wide Area Network is perhaps the most familiar of the three since it's the technology behind cell phones. WANs replace telephone wires. Today, WAN antennas can be spotted on rooftops around the globe. Not site-specific like W-LANs, but multiple, incompatible standards (TDMA, CDMA, GSM) prevent continuous coverage from one geographical region to another.

The WAN is what enables people to stay connected while on the road. Internet and extranet access that allows you to "pull down" essentially whatever information you want, email, instant messaging, "buddy chats"—all these are enabled by the WAN. Of PANs, W-LANs, and WANs, the WAN space is probably the area where Palm has had the greatest impact to date. Not only was the Palm VII handheld the first

successful wirelessly enabled handheld, but most Palm handhelds today can connect to the Internet using the Palm Mobile Connectivity Kit and a cell phone as a wireless modem. Palm Powered handhelds can connect via the Mobitex, GSM, GPRS, PHS, CDPD, and CDMA networks.

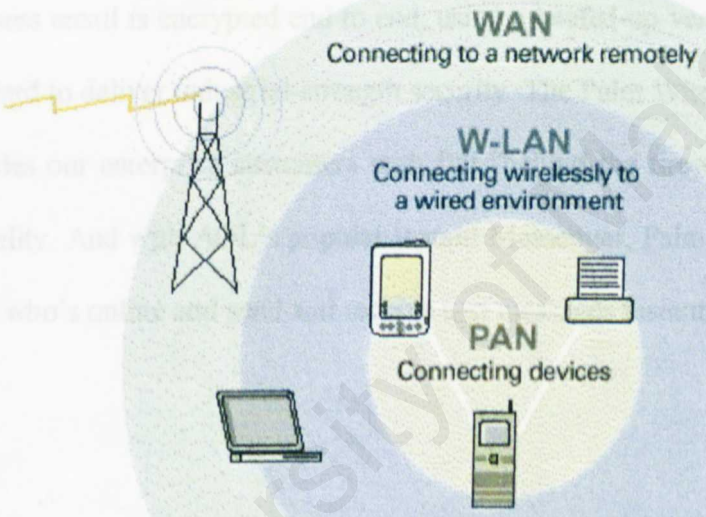


Figure 2.7 The matrix of wireless network

2.6.4 "Push" email and Instant Messaging

The Palm Wireless Messaging Solution provides users of the Palm i705 handheld with always-on, wireless email, enabling them to send email and to receive business and personal email instantly and automatically. The device also alerts the customer to the arrival of email, even when the device is turned off. The wireless email solution supports multiple industry standard protocols, and supports such popular email browsers as Microsoft Outlook and Microsoft Exchange.

Business email is encrypted end to end, using a beefed-up version of Data Encryption Standard to deliver industrial-strength security. The Palm Wireless Messaging Server provides our enterprise customers with full "behind the firewall" server-based email capability. And with AOL's popular Instant Messenger, Palm device users can check to see who's online and send and receive text messages instantly.

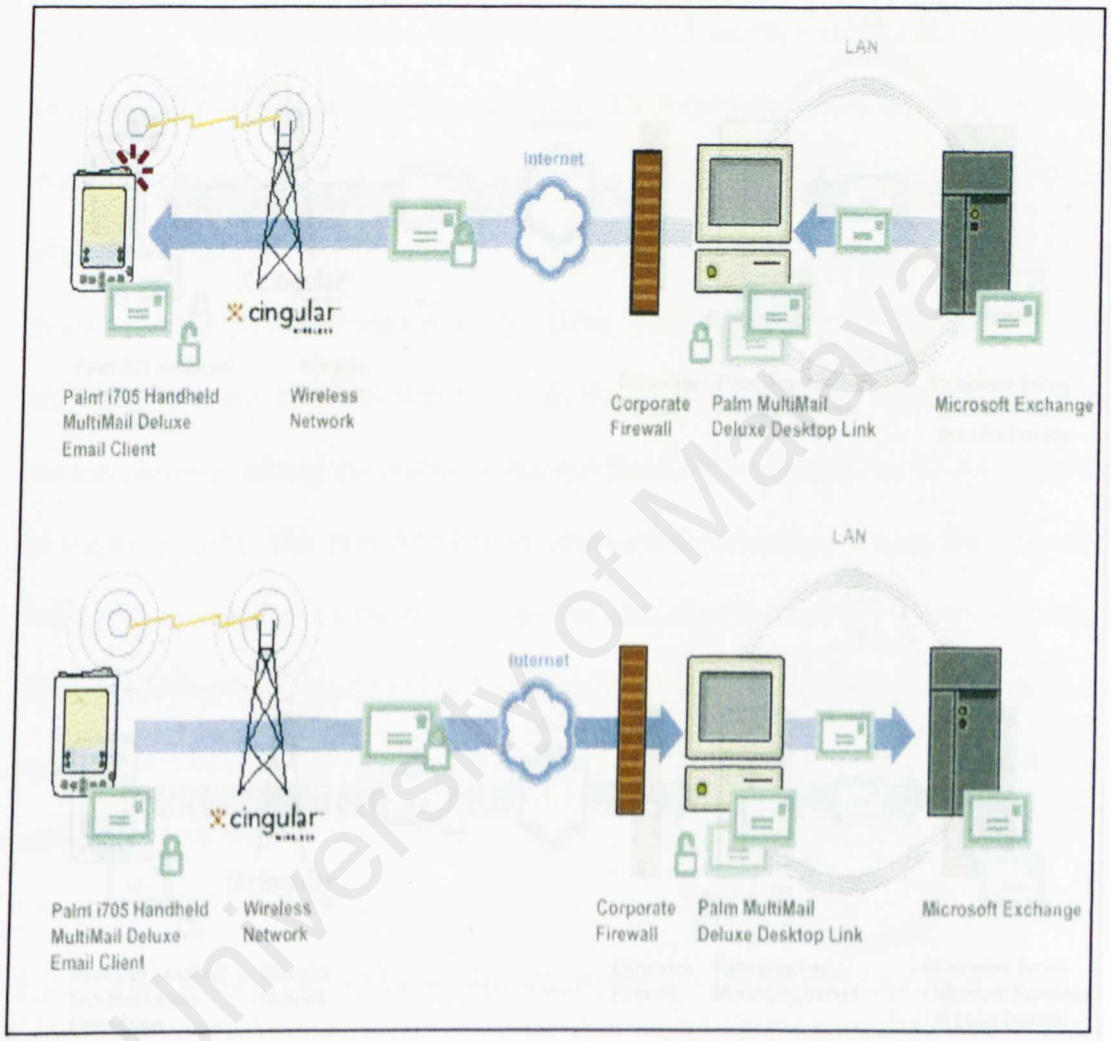


Figure 2.8 Palm i705 Handheld Solution: A secure solution for individual mobile professionals

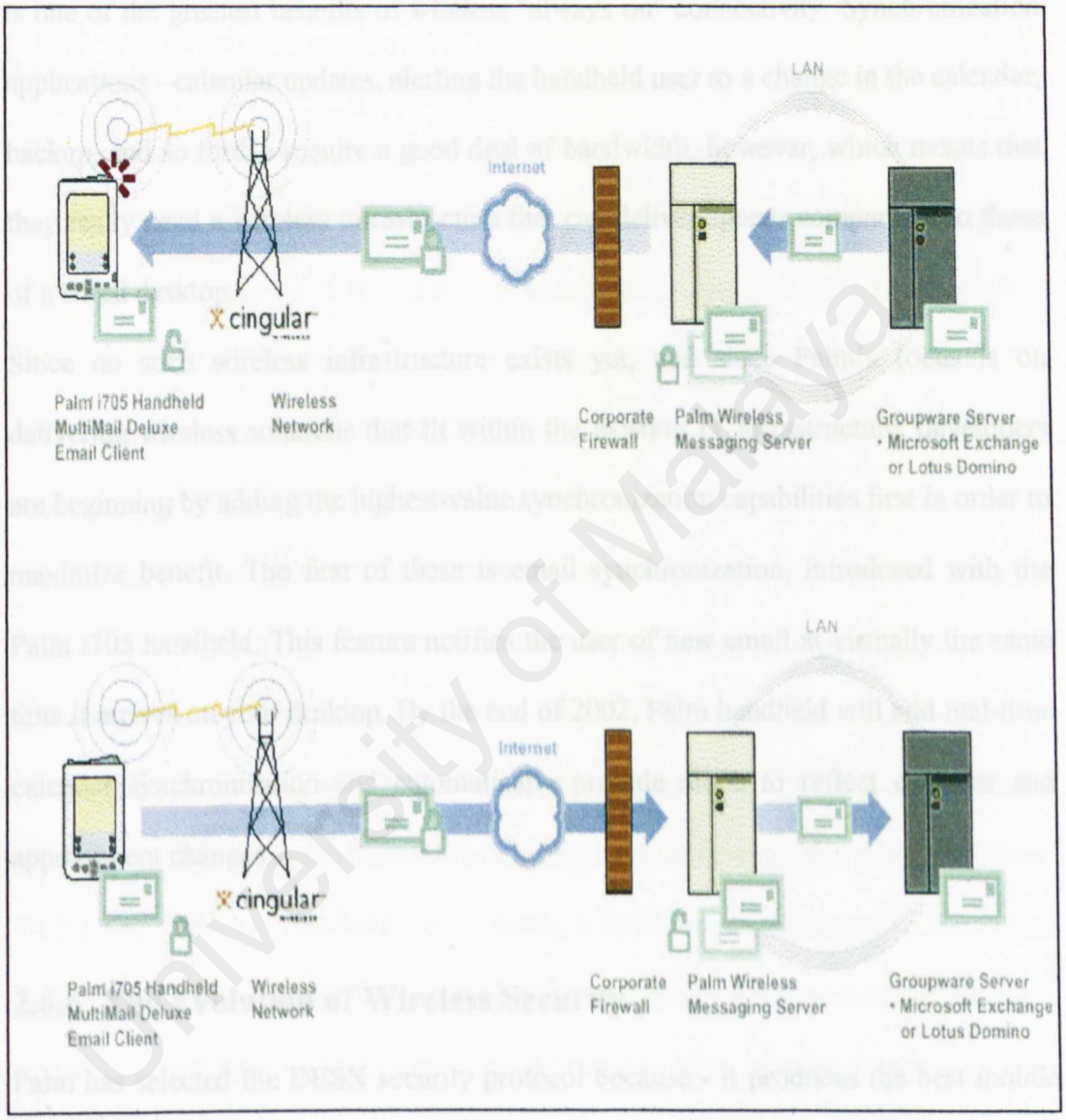


Figure 2.9 Palm Wireless Messaging Solution: A secure solution for enterprises

2.6.5 Wireless Synchronization

Real-time wireless synchronization of data on the handheld with data on the desktop is one of the greatest benefits of wireless "always on" connectivity. Synchronization applications - calendar updates, alerting the handheld user to a change in the calendar, backup, and so forth - require a good deal of bandwidth, however, which means that they really need a wireless infrastructure that can deliver speeds comparable to those of a wired desktop.

Since no such wireless infrastructure exists yet, and since Palm's focus is on delivering wireless solutions that fit within the existing IT infrastructure, developers are beginning by adding the highest-value synchronization capabilities first in order to maximize benefit. The first of these is email synchronization, introduced with the Palm i705 handheld. This feature notifies the user of new email at virtually the same time it arrives on your desktop. By the end of 2002, Palm handheld will add real-time calendar synchronization and automatically provide alerts to reflect calendar and appointment changes.

2.6.6 The Evolution of Wireless Security

Palm has selected the DESX security protocol because - it produces the best mobile experience within the wireless infrastructure as it currently exists. At the time being SSL encryption is not appropriate for wireless handheld use due to the slow transmission rates of today's WAN networks. As 2.5 and 3G networks evolve, and as wireless mobile devices evolve into true Internet-protocol devices, the security

protocols available today for the desktop will become appropriate in the wireless world and will be adopted at that time.

2.6.7 A Word About VPNs

Many enterprises are turning to the Virtual Private Network (VPN) as a way to ensure that different types of devices have the same secure access to intranet and extranet resources and data. A VPN may be launched in any of the three wireless environments, PAN, LAN, or WAN. In some cases, a VPN may not be required to reach the Internet or certain "public" portions of the network, but may be required to access a proprietary intranet or other private services.

That being the case, why has Palm chosen not to incorporate a VPN into the Palm OS when other platforms do? Unfortunately, from the customer's perspective, one size of VPN does not fit all. There are probably a couple of dozen different flavors of VPNs out there, each of which was designed to work with a different VPN gateway. So the VPN that's right for a particular organization will depend on the IT environment. That's why Palm has refrained from stuffing a VPN that might not work in your *IT* environment onto the Palm OS. Instead, Palm has incorporated security architecture into the OS and allows you to select the appropriate VPN solution for your network from among the many third-party products available.

2.6.8 Next-generation Wireless

Higher network speeds, increased bandwidth and enhanced processing power will enable a host of new capabilities and applications, especially for the enterprise, and Palm has already begun executing on its wireless strategy to take advantage of the improved wireless environment. In January 2002, Palm introduced the Palm i705 handheld, the only wireless handheld solution in the marketplace today that integrates secure, always-on "push" email with full-featured Personal Information Management (PIM) capabilities, web browsing, instant messaging, and expansion, and which allows the use of thousands of software applications.

Along with the Palm i705 handheld, Palm also announced the beta test of the Palm Wireless Messaging Solution, an end-to-end Palm-branded, enterprise-quality, secure, centrally managed solution for always-on email. The solution comprises four elements: the Palm i705 handheld, Enterprise Software Suite, Palm Wireless Messaging Server, and Palm services. Taken together, these introductions marked a major milestone in the delivery of next-generation wireless products and services, combining all the benefits of Palm's unmatched wireless integration and comprehensive information management with secure wireless email and Internet access.

2.6.9 The whole Internet on a handheld?

Microsoft OS based handheld do not offer web clipping, something that PC-centric handheld manufacturers have tried to turn into a virtue. The implication is that web clipping offers a somehow diminished experience.

The fact is, accessing the web clipping version of a website, which is specifically intended for use in handheld, is almost always going to be faster than waiting for the desktop version.

How is this possible, when everything you read says that Microsoft is so much more powerful? The answer is simple: the Palm OS was designed from the chips up for mobile use. A page that appears instantaneously when you are sitting at your desktop can take minutes to get to your handheld. And when you're using a handheld, even 30 seconds can be a very long time. What about those claim that Microsoft gives you the "whole" Internet? PC-centric applications like to say that they're industry standards; you'll see the same page on your handheld as you do on your desktop. Well, that's simply not the case. In the first place, it'll take several long minutes to download, and when it gets there you still won't be able to see the whole page. Someday, it'll probably be good, but right now? It just doesn't work very well.

But what about those great Internet experiences using Microsoft OS based handheld? Sometimes, "demonstrations" are conducted in wirelessly enabled environments using carefully selected networks or even 802.11b (which, is actually a wireless LAN connection and not a WAN at all). It is not necessary trying to download the "whole" Internet onto your handheld is like trying to swallow a Buick.

2.7 Conclusion

Based on the review that had been done, the concept of map interactive and wireless palm device is become clearer. Various types of map are discussed and the applications needed for Palm device are explained. Wireless applications in Palm device also have been discussed that is the most important thing in communication using Palm device. Chapter 3 will discuss the system methodology and requirement analysis for this project.

Chapter 3: System Analysis

3.1 System Methodology

According to FOLDOC, Free On-Line Dictionary of Computing, *methodology* is an organized, documented set of procedures and guidelines for one or more phases of the software life cycle, such as analysis or design. Whereas, Rumbaugh et al defined that a software engineering methodology is a process for the organized production of software, using a collection of predefined techniques and national conversations. A methodology is usually presented as a series of steps, with techniques and notation associated with each step.

Process model is very important during the software development process or software life cycle. It can form a common understanding of the activities, resources and constraints involved in software development. When a process model is created, it helps to find the inconstancies, redundancies and omissions in the process. As the problems are noted and corrected, the process becomes more effective and focused on building the final system.

People have developed software systems for decades. In the development process, several different models for system development have been used. For instance, Waterfall Model, V Model, Prototyping Model, Spiral Model and Transformation Model. These models provide guidance on the order in which a project should carry out its major tasks.

The methodology or process model for MIGuP project is "**Waterfall Model with Prototyping**". It is actually using waterfall model concept but the prototyping concept is added during the module development.

3.1.1 Waterfall Model

Waterfall model is a software life cycle model, described by W.W. Royce in 1970, in which development is supposed to proceed linearly through phases of requirement analysis, design, implementation, testing (validation), integration and maintenance. The phases are depicted as cascading from one to another, which means one development stage should be completed before the next stage.

- **Advantages of Waterfall Model**

- It is very straightforward and simple. Its simplicity makes it easy to explain to customers who are not familiar with system development.
- It present a very high-level view of what goes on during development process, and it suggests to developers the sequence of events they should expect to encounter.
- It has clear defined milestones. This is very useful in helping developers lay out what they need to do next.
- It also delivers structured documents at each defined milestones, which makes the process visible. No phase is completed until the documents are done.
- It has lots of reviews and evaluations, thus, some sort of output will gained after each step.

- **Disadvantages of Waterfall Model**

- There have little insight into the operation of the system such as how each activity transforms one artifact to another. Thus, it provides no guidance to developers on how to handle changes to activities that are likely to occur during development.
- Requirements must be fixed before the system is designed – requirements evolution makes the development method unstable.
- Design and code work often turn turns up requirements inconsistencies, missing system components, and unexpected developers needs.
- System performance cannot be tested until the system is almost coded, under capacity may be difficult to correct. Problems are not discovered until system testing.
- It does not reflect the way code is really developed.
- Real projects rarely flow in a sequential process. A working revision of the system is not seen until late in the project's life.
- Failed to treat software as problem-solving process due to it was derived from the hardware world.

3.1.2 Prototype Model

A prototype is partially developed product that enables customers and developers to examine some aspect of the proposed system and decide if it is suitable for the

finished products. Prototyping is such a sub process to develop a prototype. The objectives of this model are:

- To establish user interface
- To reduce communication problems and avoid misunderstanding.
- To explore potential designs.
- To evaluate performance.

- **Advantages of Prototype Model**
  - To explore user needs.

    It is difficult to imagine system from the specification, prototyping model allows all part of a system to be constructed quickly to understand or clarify needs. It also reduces misunderstanding and identifies missing functions and problems. Prototype forms the basis for a written specification.
  - To explore design.

    In this model, design requires repeated investigation to increase a common understanding of what is needed and what is proposed.
  - To help in risk management.

    This model collect information (at a cost) and reduces uncertainties in development, it also reduces chances of user rejection.

- **Disadvantages of Prototype Model**
  - Time consuming. It is a waste of time if requirements are already clear.
  - Can be a high percentage of total cost.
  - Needs experienced people to test it.

3.1.3 Waterfall Model with Prototyping

The software development process is not as linear as waterfall model, when errors in later stages are found, they are often need to feed back to a previous stage and the development is set back to that stage again. As a result, an alternative approaches; the notified waterfall that is "Waterfall Model with Prototyping" is chose to develop this MIGuP project.

The waterfall with prototyping approach was used because if the process phases were uncontrolled, developer may trash from one activity to the next and then back again, as they strive to gather knowledge about the problem and how the proposed solution addresses it. Besides, it also offer a means of making the development process more visible compare to other models.

The system consists of several phases such as requirements analysis, system design, program design, coding, unit and integration testing, system testing and operation and maintenance. Each stage is "signed-off" when it is defined and development goes on to the following stages. There is a cycle among the stages of requirement analysis, system design and program design. These three stages are keeping looping if the prototype is to be changed, as it is not as idle as what had been expected.

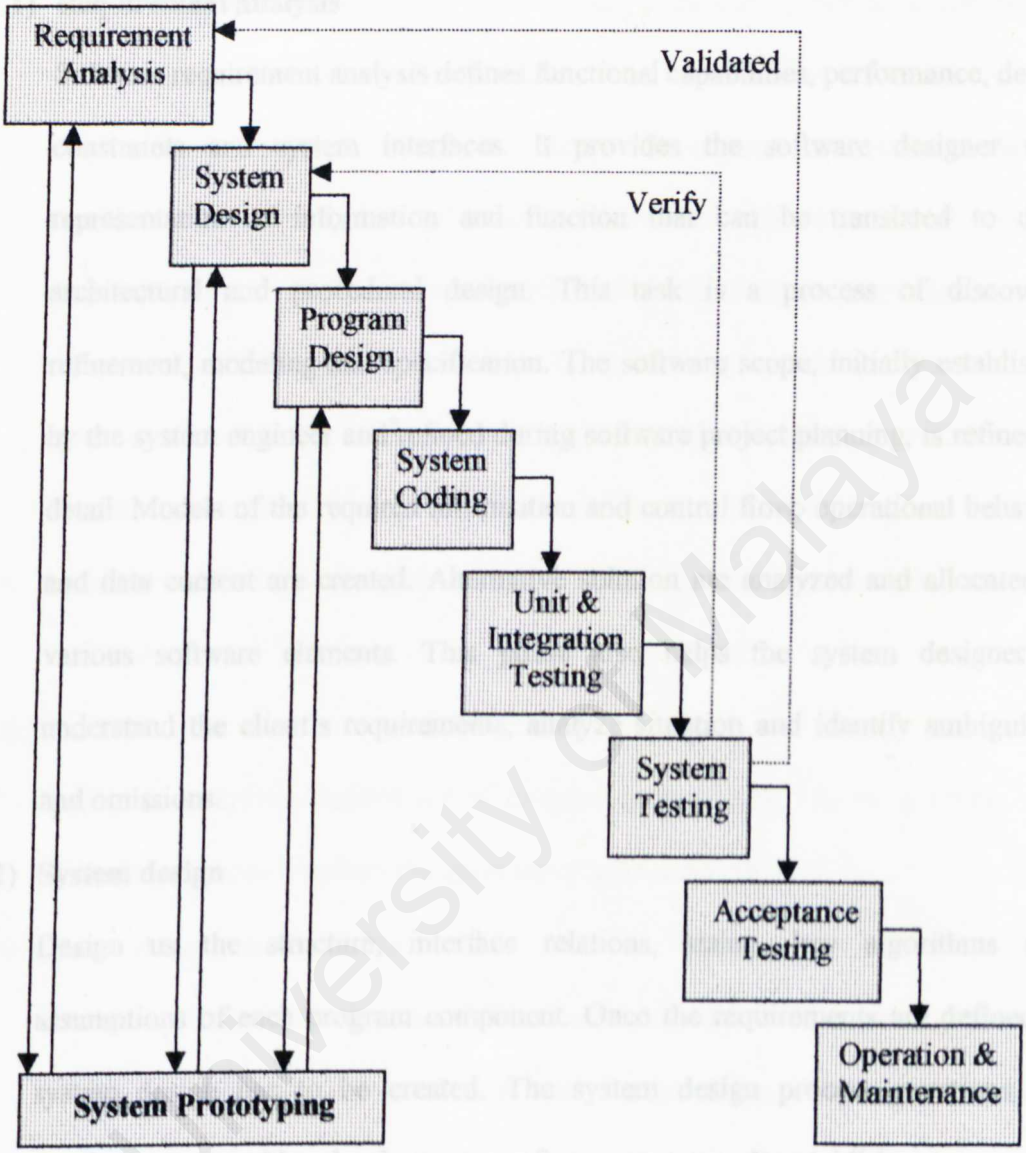


Figure 3.1 Waterfall Model with Prototyping

In this model, the fundamental development activities are:

1) **Requirement analysis**

Software requirement analysis defines functional capabilities, performance, design constraints and system interfaces. It provides the software designer with representation of information and function that can be translated to data, architectural and procedural design. This task is a process of discovery, refinement, modeling and specification. The software scope, initially established by the system engineer and refined during software project planning, is refined in detail. Models of the required information and control flow; operational behavior and data content are created. Alternative solution are analyzed and allocated to various software elements. This phase also helps the system designer to understand the client's requirements, analyze situation and identify ambiguities and omissions.

2) **System design**

Design us the structure, interface relations, sizing, key algorithms and assumptions of each program component. Once the requirements are defined, a system design has to be created. The system design process partitions the requirements to either hardware or software systems. It establishes an overall system architecture. System design involves representing the software system appearances and functions from the user's perspective. The user then reviews it.

3) **Program design**

The previous phases was approved, the overall system design is used to generate the design of the individual program involved.

4) System prototyping

In this stage, system prototyping allow all part of the real system to be constructed quickly to understand or clarify issues. The requirements or design require repeated investigation to ensure that the developer, user and customer have a common understanding both of what is needed and what is proposed. Besides, prototyping system information is worthwhile for gathering specific information about user's information requirements. The initial reactions from the users to the prototype were sought. Then the user suggestion about changing or cleaning up the prototype system, possible innovations for it, and revision plans detailing which parts of the system need to be done first or to prototype next when searched too.

5) Coding

Coding is complete, verified set of program components. The programmer will write the programs based on the approved program design.

6) Unit and integration testing

The assigned system design has more than one program. The testing involves making sure that each unit satisfied its specification. When the program has been written, they are tested as individual pieces of code, which called unit testing. Once the pieces work as desired, the system was build by adding one piece to next until the entire system is operational, which called integration testing. Integration is a properly function software product composed of the software components.

7) System testing

This stage involves a test of the whole system to make sure that the functions and interactions specified initially have been implemented properly and satisfy the specifications. Validation ensures that system has implemented all of the requirements, so that each system function can be tracked back to a particular requirement. Besides, verification ensures that each function works correctly. That is, validation makes sure that the developer is building the right product, and verification checks the quality of the implementation. After testing, the software is available for the users.

8) Acceptance testing

This phase tests whether the complete system accepted by the user or not. User-friendly interface is a main factor for acceptance testing.

9) Operational and maintenance

Normally, this is the longest life cycle phase. The real-estate system is install and put into practical use. Maintenance is correcting errors and making adaption of the software for external changes (requirement changes or enhancements) and internal changes (fixing bugs). When changes are made during the maintenance phase all proceeding steps of the model must be revisited.

3.2 Fact Finding Techniques

In developing MIGuP project, information and fact-finding are done in many kind of techniques such as interview, observation, sampling and research. The objectives of fact finding is to develop a system that is ready to use within requirements.

3.2.1 Interview

According to Oxford Advanced Learner's dictionary, the term *interview* can be defined as *meeting with somebody for formal consultation or meeting with somebody whose views are requested.*

Most of the information that gathered in this project is based on interviews or conversation with people concern. The interviews were not strictly structured, of the kind where the interviewer asks all questions and respondent answers it. They were more like conversations where the participants talked and explained several topics.

A few conversations have been carried out in order to understand the need of guidance in tourism. The respondents came from local and foreign student studying in University of Malaya and some tourists. Some of the sample questions for the interviews are:

1) Do you know anything about Palm device?

2) Do you have a Palm device?

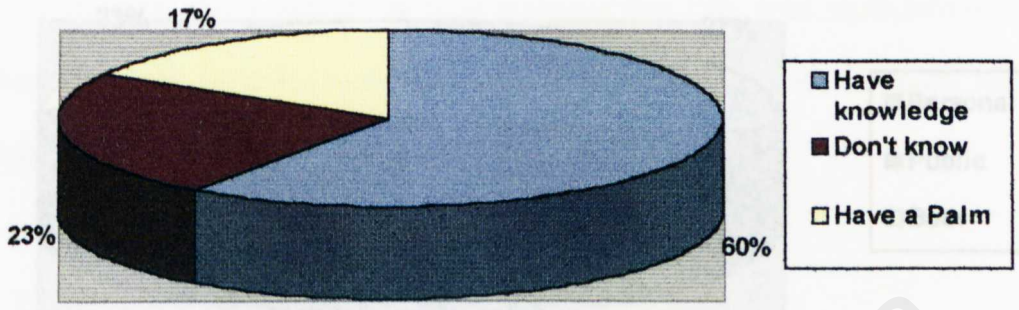


Figure 3.2 Pie chart for result about Palm

3) Do you need a portable guidance in your tour in Kuala Lumpur?

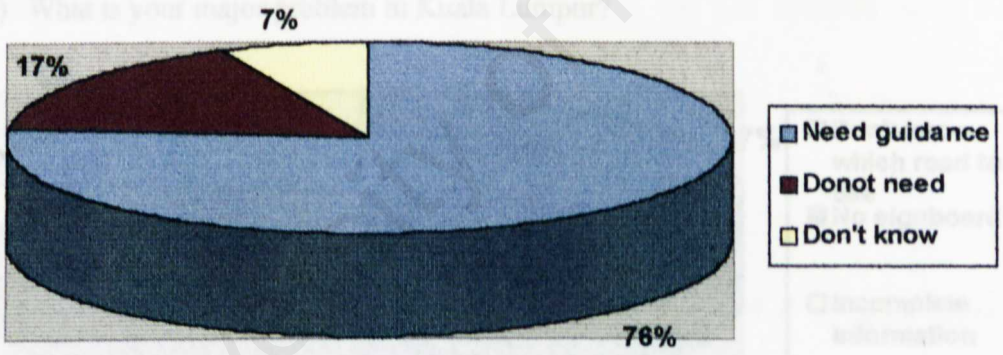


Figure 3.3 Pie chart for portable guidance

4) How do you travel in Kuala Lumpur (by personal or public transportation)?

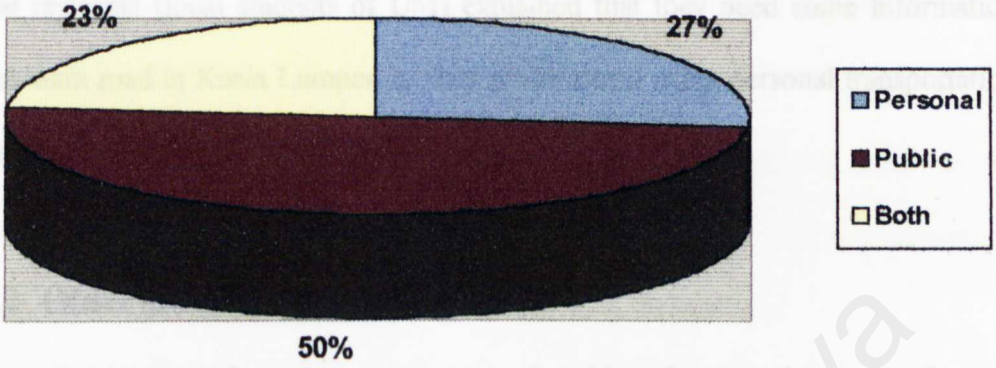


Figure 3.4 Pie chart for transportation

5) What is your major problem in Kuala Lumpur?

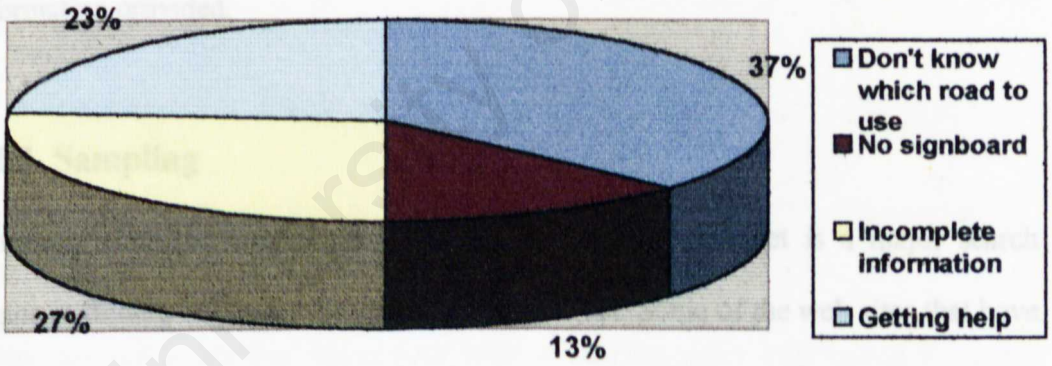


Figure 3.5 Pie chart for problems in Klang Valley

Results from these interviews are indicate that most of the tourists need a portable guidance, which will help them in finding information about Kuala Lumpur. The

tourists also noticed that they are having problem in getting information about road, destination, accommodation, distance and transportation in Kuala Lumpur.

Local residents (local students of UM) explained that they need some information about main road in Kuala Lumpur, as they prefer travel using personal transportation than using buses or taxi.

3.2.2 Observation

Observation has been done almost every time. For this technique, observation focused on city center area (around Puduraya, Central Market and KLCC) and the way the tourists get information about Kuala Lumpur. From the observation, tourists are searching for information center and some of them are not satisfied with the information provided.

3.2.3 Sampling

Sampling technique carried out using Internet surfing. Internet is a major search engine in finding information required in this project. Some of the web sites that have been visited are:

- http://statistics.gov.my (Department of Statistic's Homepage)
- http://tourism.gov.my (Malaysia Tourist website)
- http://visitormalaysia.com
- http://www.asiatravelmart.com
- http://all-malaysia-hotels.com

- http://asiatravel.com/malinfo.html
- http://www.putralrt.com.my/index.asp

3.2.4 Research

Research has been done by reading some articles, magazines and other textual medium in order to gather information related to MIGuP project and as a foundation for the discussion in this project. Some articles from newspaper are:

- Anywhere, anytime. The Star Tuesday April 16 2002 / IN.TECH.
- Palm envy? Get a grip, fellas. The Star Thursday December 13 2001 / TECH.PLUS.
- Deck the halls with iPAQ. The Star Thursday December 13 2001 / TECH.PLUS.
- Question about Palms. The Star Thursday December 13 2001 / TECH.PLUS.

3.3 Current Environment

Before the development of this project, most of tourists gather information from web sites, tourism pamphlets and articles.

There are many web sites provided tourism information, but not all tourists get access to these web sites. If a tourist wants to visit a place, let say Bangsar, and he wants to get some information about Bangsar. Does he have to get access to particular web sites every time he needs information? Therefore, it is difficult for tourists to gather information about places in Kuala Lumpur.

The use of pamphlets is not very efficient. Most of the pamphlets are not up to date. Thus, information provided in the pamphlets is not the latest information. Tourists may get confused with the outdated information in the pamphlets. The quantity of the pamphlets always not enough for the tourists. If this happens, tourists will be wasting their time searching for the pamphlets.

Tourists also having problem when make reference to articles or magazines. This is because most articles provide uncompleted information. The problems may occur when tourists searching detail information about places in Kuala Lumpur such as distance and transportation.

Last but not least, information availability problem may occur in a particular time. If a tourist needs some information after office hour, there will be no tourism center available by that time and this situation will limit the availability of the information itself.

Therefore, a system such as Map Interactive Guide using Palm (MIGuP) needs to solve all these problems. Palm ensures the availability of the information anytime and anywhere.

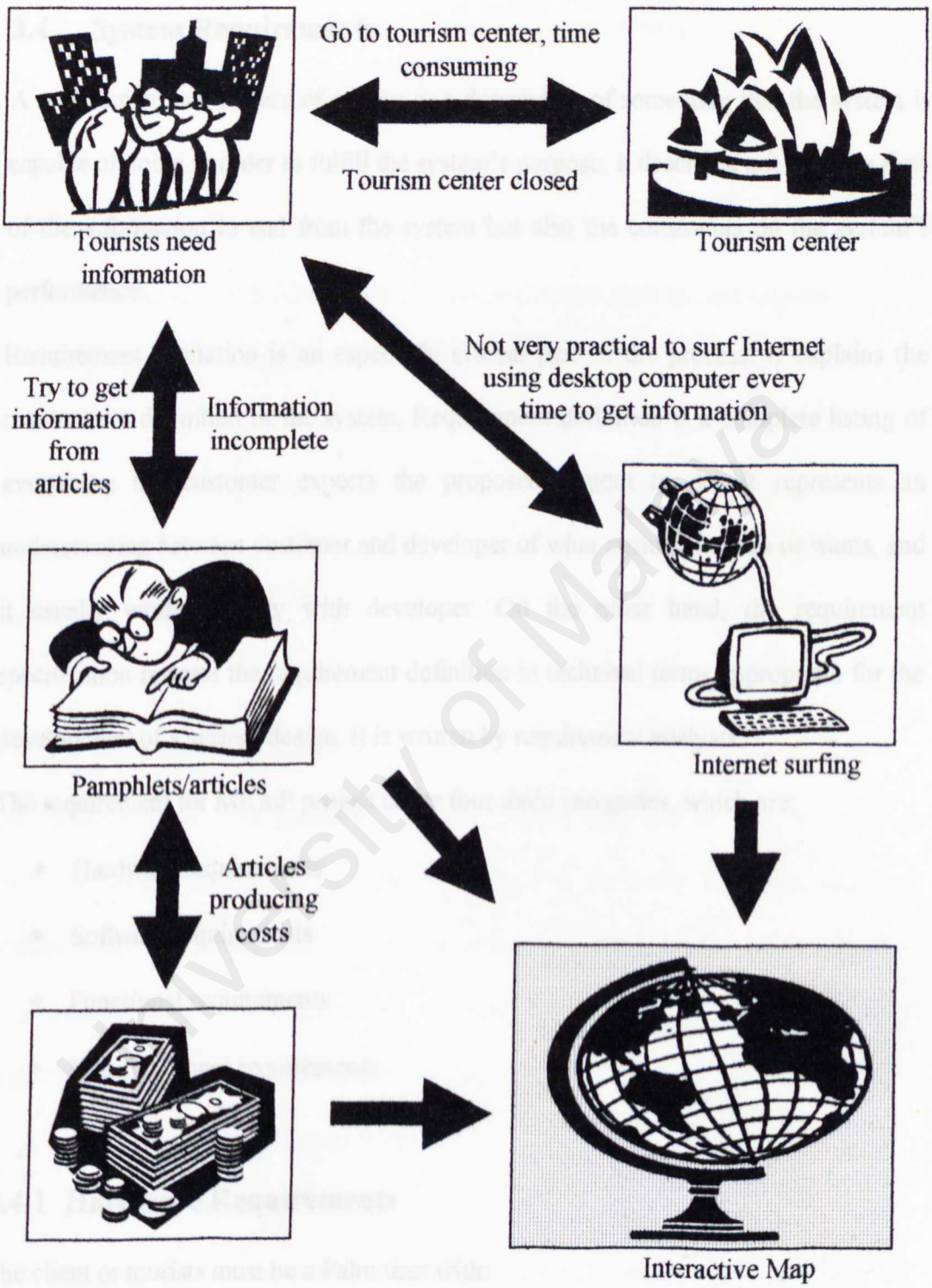


Figure 3.6 Non-structured problem analyses

3.4 System Requirements

A requirement is a feature of system or a description of something that the system is capable of doing in order to fulfill the system's purpose. It describes not only the flow of the information to and from the system but also the constraints on the system's performance.

Requirement elicitation is an especially critical part of the process. It explains the requirement definition of the system. Requirement definition is a complete listing of everything the customer expects the proposed system to do. It represents an understanding between customer and developer of what customer needs or wants, and it usually written jointly with developer. On the other hand, the requirement specification restates the requirement definition in technical terms appropriate for the development of a system design. It is written by requirement analysts.

The requirement for MIGuP project cover four main categories, which are:

- Hardware requirements
- Software requirements
- Functional requirements
- Non-functional requirements

3.4.1 Hardware Requirements

The client or tourists must be a Palm user with:

- Palm OS 3.2 or higher as computing platform.
- Clipper, a browser application resident on the palm OS device.

- Palm VII or modem adapted for wireless communication.
- PC with Microsoft Windows 95 or higher.

3.4.2 Software Requirements

In the development of MIGuP project, I chose software such as Macromedia Flash 5, HTML programming language and Microsoft Access. This is because Macromedia Flash 5 easy to use and do not require complex coding and programming, HTML is a wide use programming language to develop a web based application and it is easy to use and Microsoft Access is a relational database that compatible with most of Palm device.

3.4.2.1 Macromedia Flash 5

Macromedia Flash 5 is standard software graphic and can be used to produce attractive vector animation. The use of Flash 5 is to create attractive interface, compact and changeable size. Developer also can produce technological illusion, sequential animation and many more. Graphic and animation in Flash 5 provided high-class presentation within user screen size.

- **Advantages Macromedia Flash 5**

1) Flash Technologies

Flash provides a unique combination between quality, presentation and compactness along with available support for animation and creative

development. The main key for user to experience the advantages from Flash technology are:

- **Speed** – Flash graphic has been optimized for displaying graphic animation vector on screen in much better speed compare to traditional graphic engine (Alias Engine).
- **Compactness** – Flash's files are built small in size even animation are displayed over all screen. Flash also support-streaming applications where files can be played while system downloading other programs.
- **Beauty** – Flash is designed as a presentation format. All characters and image's corners are smooth even when animation been displayed, this is because Flash has anti-alias. Flash also has graduate-fills and transparency for producing high-resolution graphics.
- **Interactivity** – button object plays their role in construction model activities such as movement of mouse. This will give advantage for designer to produce more attractive and compact interface.

2) Independent Platform

Flash is an independent platform. Its vector format makes Flash can produce platform without any support from any external source. The features are:

- **Animation support** – Flash support timeline where it can be to produce an easy and compact animation. By using Flash, designer can create animation from graphical logos to complex animation cartoon characters.

- **Bitmap support** – Flash's feature support all JPEG (Joint Photographic Enhancement Graphic) and PNG (Portable Navigation Graphic) image and allow designer to make bitmap element available in data content. Flash also has the ability to upgrade the image quality or called interpolation.
- **Audio support** – Flash format files support audio such as AIFF and WAV. Designers can insert some audio into the image quality.
- **Fast, compact and portable player** – Flash player designed small so it can be carried anywhere to ensure browser compatible or operating system platform. The actual size for a Flash player to be downloaded is 100-kilo byte. The performance of this Flash player has been optimized for displaying static image and animation.
- **Drawing and corrections** – Flash tools are a complete collection for drawing and correct any picture. Designer can import and correct image from high-end illustration program such as Freehand.
- **Multimedia support** – Flash allows integration between bitmap image and audio. It can be stretched, replaced, deleted or inserted with WAF or IAFF audio.

However, macromedia Flash 5 has disadvantage, it is its hardware requirement. Compatible RAM is important when designing and displaying animation. High-speed processor needed when displaying Flash web based programs.

3.4.2.2 HTML

An HTML files is what web browser uses to generate a web page. At its heart, the World Wide Web is nothing but a vast collection of HTML files residing on the hard drives of computer spread throughout the world, and a transport protocol for transferring these files from computer to other computer or Palm device. These HTML files, in turn, are simply text files - files that can be easily read and understood by human.

Web browsers, such as Netscape Navigator or Microsoft Internet Explorer, interpret HTML files in order to display web pages. This is the main function of a web browser to view page on the World Wide Web, the browser has converted the web page from an HTML file. HTML files are different from other text files because they include special codes called HTML tags.

3.4.2.3 Microsoft Access 2000

MS Access is a relational database management system created by Microsoft for small office or home user to use for storing data in relational format. With data access interface paradigm such as Remote Data Object (RDO) and Data Access Object (DAO), MS Access can be used as a database in a client/server or an n-tier architecture system. It provides a good user interface with which to develop the tables and relationships. Creating a database can be done easily.

- Advantages MS Access 2000

- MS Access provides an excellent development environment with many of the capabilities of Palm.
- It has complete guidance for developer to solve any problem.
- User can share information with other user.

3.4.3 Functional Requirements

Functional requirement explains what the system will do. It describes an interaction between the system and its environment.

In MIGuP project, there are two major module ***User Module*** and ***Administrator Module***. User means tourist that use this system. In the user module, this system appears to user as a read-only system. They can read what is displayed on their screen but they cannot modify it. The administrator refers to developer or person who develop a system. This model consists process altering items or information when needed.

3.4.3.1 Information displayed

Information displays are information about Kuala Lumpur, which will display main road in Kuala Lumpur, distance between places, transportation, accommodation, services, attractive destinations and general information.

The conceptual model of user module is:

- **Main Road**

  This map displays main roads that linked places in Kuala Lumpur.

- **Distance**

  Distance between places will be displayed in this map. The distances are in Kilometer unit.

- **Accommodation**

  Type and standard of accommodation will be displayed in the map.

- **Transportation**

  Transportation information available will be displayed in the map for user or tourist to visit their destinations. It covers kind of transportation, how much time it takes to reach destinations and its costs.

- **Attractive destinations**

  Map of Kuala Lumpur will display attractive destination such as shopping complex and included short explanation about that place.

- **Services**

  Services available in Kuala Lumpur will be displayed in the map.

- **General information**

  General information about Kuala Lumpur and places will be displayed.

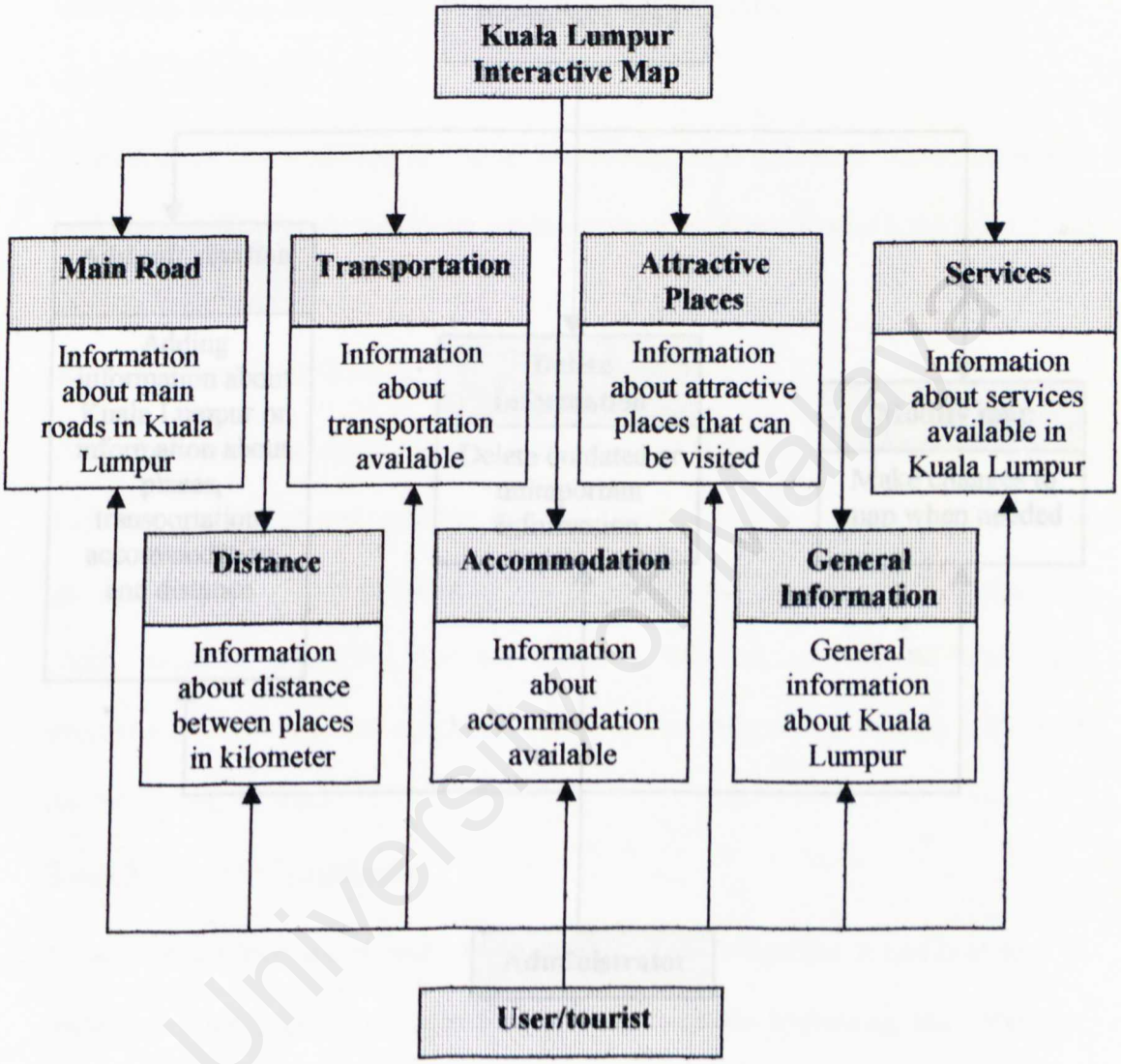


Figure 3.7 Conceptual models for user module

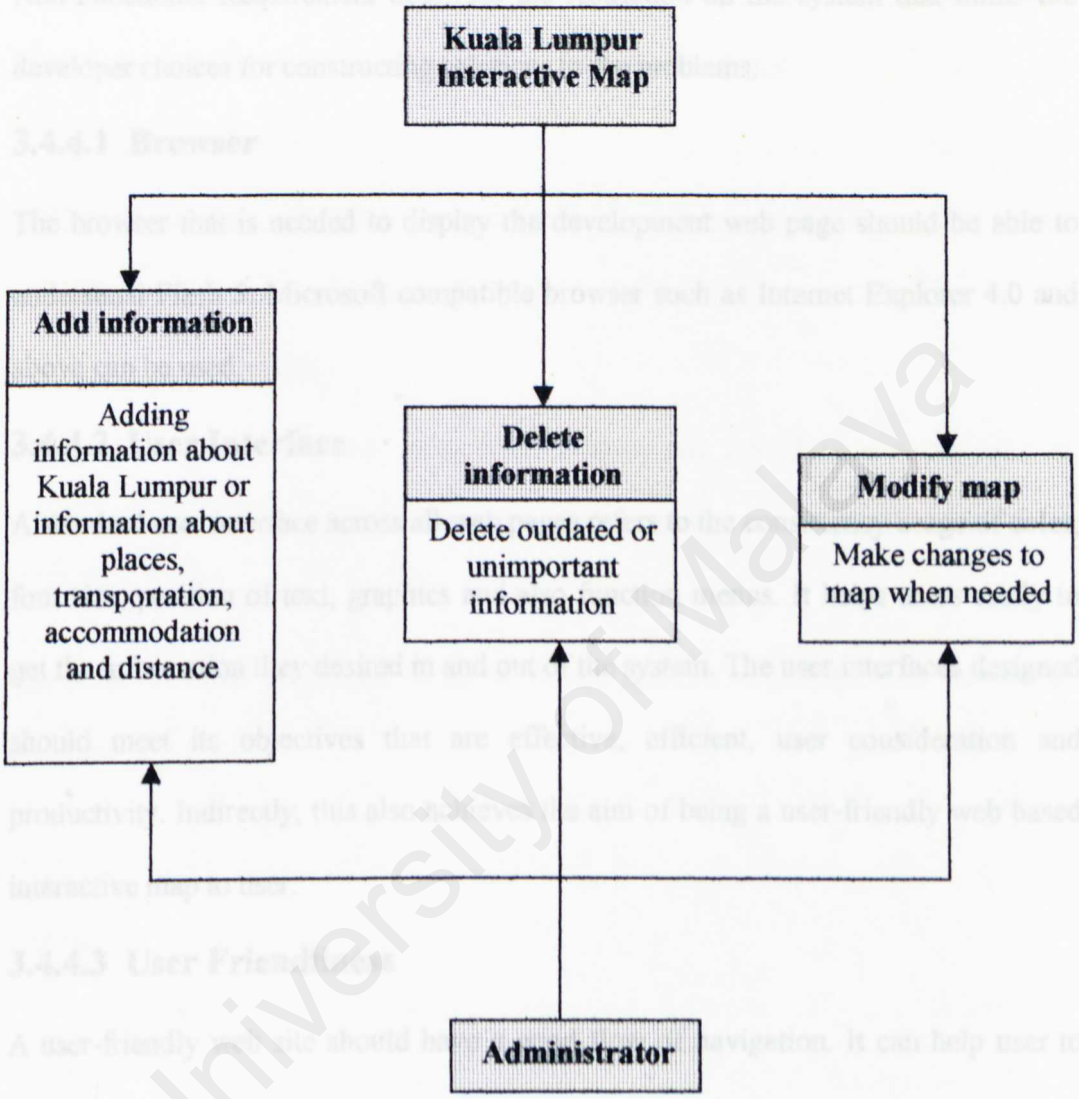


Figure 3.8 Conceptual models for administrator module

3.4.4 Non- Functional Requirements

Non-Functional Requirement describes the restriction on the system that limits the developer choices for constructing solutions to the problems.

3.4.4.1 Browser

The browser that is needed to display the development web page should be able to understand Flash 5. Microsoft compatible browser such as Internet Explorer 4.0 and above can be used.

3.4.4.2 User Interface

A standard user interface across all web pages refers to the consistency usage of color, font size, position of text, graphics and also function menus. It helps users easily to get the information they desired in and out of the system. The user interfaces designed should meet its objectives that are effective, efficient, user consideration and productivity. Indirectly, this also achieves the aim of being a user-friendly web based interactive map to user.

3.4.4.3 User Friendliness

A user-friendly web site should have a good flow of navigation. It can help user to understand what is going about and navigate through the hyperlinks and procedure steps with little effort. Besides that, it should apply the graphical user interface (GUI) approach for better visual effect to the user. The usage of suitable and meaningful captions and icons help the user to use the system with more confidence.

3.4.4.4 Reliability

MIGuP should be reliable in processing the input. The system should generate user-friendly feedback message to the user in response to their input.

3.4.4.5 Availability

MIGuP should be available in every time for tourists to get information. It is also available for Palm users to gather information.

3.4.4.6 Expandability

MIGuP should be expandable or modified if there any modification about roads or places in Kuala Lumpur. Additional places can be inserted in the map if needed.

3.4.4.7 Security

The map provided by MIGuP must be secure enough to prevent user modify its contents.

3.5 Conclusion

During this requirement analysis phase, the waterfall model with prototyping is chosen as the best methodology based on the clear development transparency and good visibility. This approach was used because if the process phase were uncontrolled, developer may trash from one activity to the next and then back again, as they strive to gather knowledge about the problem and how the proposed solution addresses it. This model consists of seven phases: requirement analysis, system design, program design, coding, unit and integration testing, system testing and operation and maintenance. There is a system prototyping cycle among the stages of requirement analysis, system design and program design.

Besides, interview, observation, sampling and research are techniques used to determine the requirements of the system or the users. Sampling and research are carried out by reading articles, books, dissertations and surfing Internet. Whereas, informal interview is done by conversation with tourists and local students of University of Malaya.

Finally, the system requirements, which are hardware and software requirement, also stated out. According to the chosen methodology, the development process is ready to proceed to the next phase, system design, which will be explained in the next chapter.

Chapter 4: System Design

System design is a process to convert the conceptual ideas from requirement specification in system analysis into more technical specification.

A design specification displays both the physical and logical design of the system. Physical design is the MIGuP architecture design. For the logical design, specifications are on the system functionality design and prototyped user interface design.

4.1 Existing Client/Server Architecture

4.1.1 Two-tier Architecture

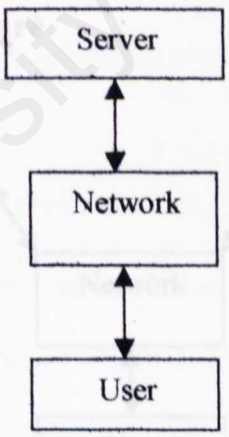


Figure 4.1 Two-tier architecture

Application components are distributed between the server and client software. In addition to part of the application software, the server also stores the data, and all data accesses are through the server. The presentation (to the user) is handled strictly by the client software.

The PC clients assume the bulk of the responsibility for the application logic. The server assumes the bulk of the responsibility for data integrity checks, query capabilities, data extraction and most of the data intensive tasks, including sending the appropriate data to the appropriate clients.

SQL is a standard used on the clients to request appropriate subsets of data from the server. Data returned from the server to the clients is manipulated by the client software for reporting, business analysis, and "what if" analysis.

4.1.2 Three-tier Architecture

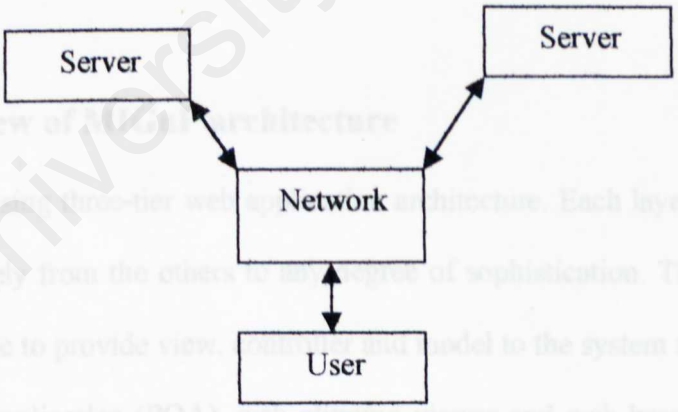


Figure 4.2 Three-tier architecture

3-tier architectures attempt to overcome some of the limitations of the 2-tier architecture by separating presentation, processing, and data into 3 separate and distinct entities. The software in the client handles the presentation (to the user) using similar tools as in the 2-tier architecture. When the presentation client requires data or processing, a call is made to the middle-tier functionality server. This tier performs calculations, does reports, and makes any needed client calls to other servers (e.g.. a data base server).

Middle tier servers are usually coded in a highly portable, non-proprietary language such as C or C++. Middle tier servers may be multithreaded and can be accessed by multiple clients. The calling mechanism from client to server and from server to server is by means of RPC's. Because the bulk of 3-tier implementations use RPC's and 2-tier implementations use SQL messaging, a careful examination of the merits of these respective request/response mechanisms is warranted.

4.2 Overview of MIGuP architecture

The MIGuP is using three-tier web application architecture. Each layer is allowed to develop separately from the others to any degree of sophistication. The presentation tier is responsible to provide view, controller and model to the system user. It consists of palm query application (PQA), web clipping viewer and web browser. The palm query application is combination of compressed HTML content with multiple HTML pages and images. The Palm user will use the PQA to send query to the web proxy server. All HTML information will be displayed on the Palm device with the web-

clipping viewer. However, the users need to download the PQA from the Internet using web browser on desktop. For the administrator, he may update the map content or information in the database using the web browser via Internet.

The middle tier, functionality tier processes requests from users and send back responses to the users. The web server is responsible to process requests from web browser and web clipping proxy server as well as in the form of HTML. The web clipping proxy server will response to the Palm users query. For the data repository tier, the map of Kuala Lumpur stored in the data repository tier for access by clients and administrator.

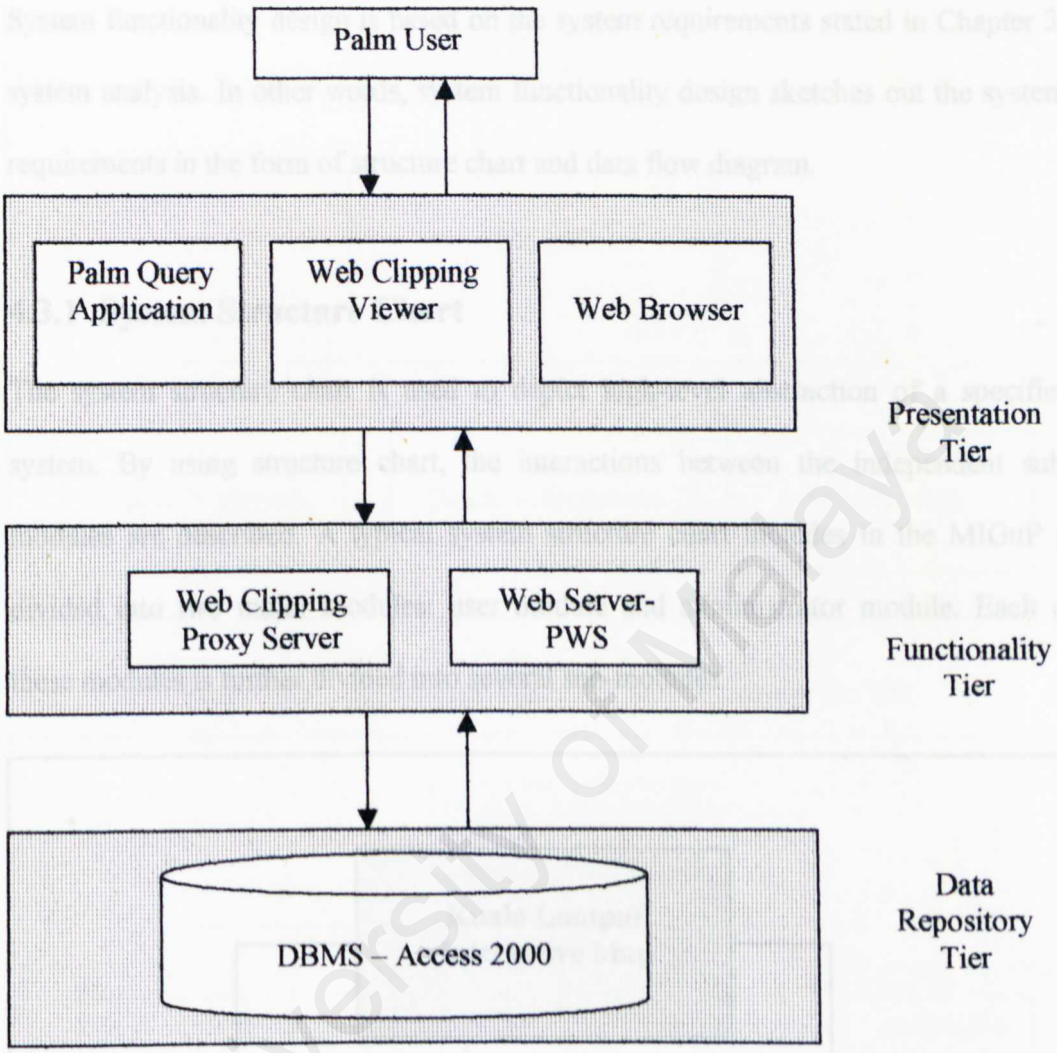


Figure 4.3 MIGuP architecture

4.3 System Functionality Design

System functionality design is based on the system requirements stated in Chapter 3, system analysis. In other words, system functionality design sketches out the system requirements in the form of structure chart and data flow diagram.

4.3.1 System Structure Chart

The system structure chart is used to depict high-level abstraction of a specified system. By using structure chart, the interactions between the independent sub-modules are described. A typical system structure chart includes in the MIGuP is divided into two major modules: user module and administrator module. Each of these modules is further divided into several sub-modules.

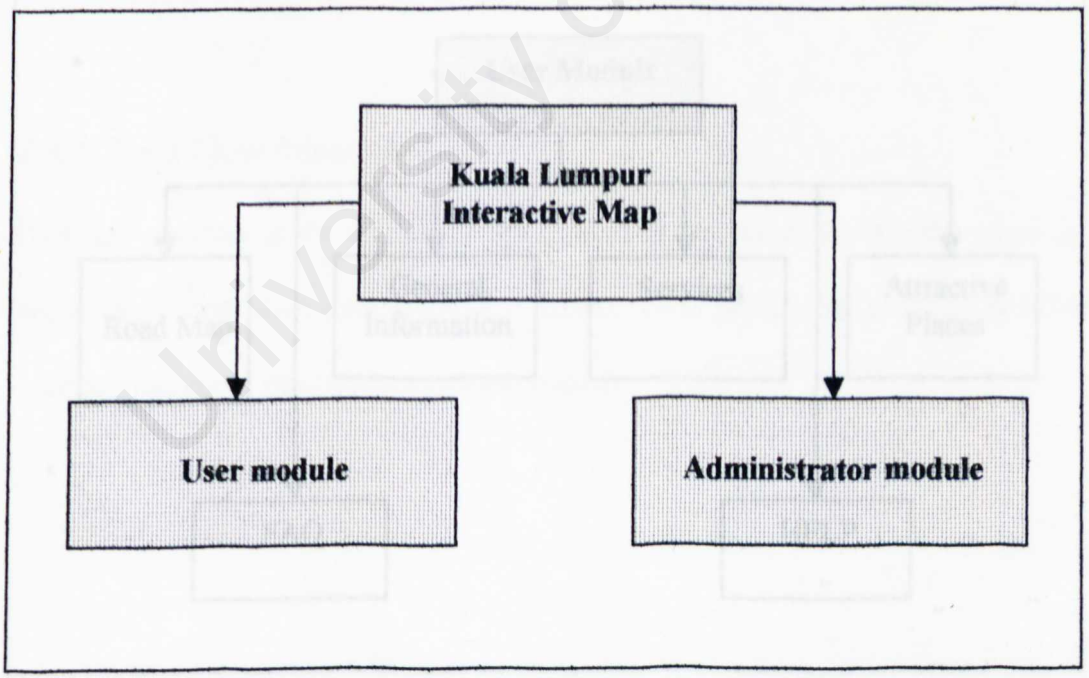


Figure 4.4 Structure chart for MIGuP system

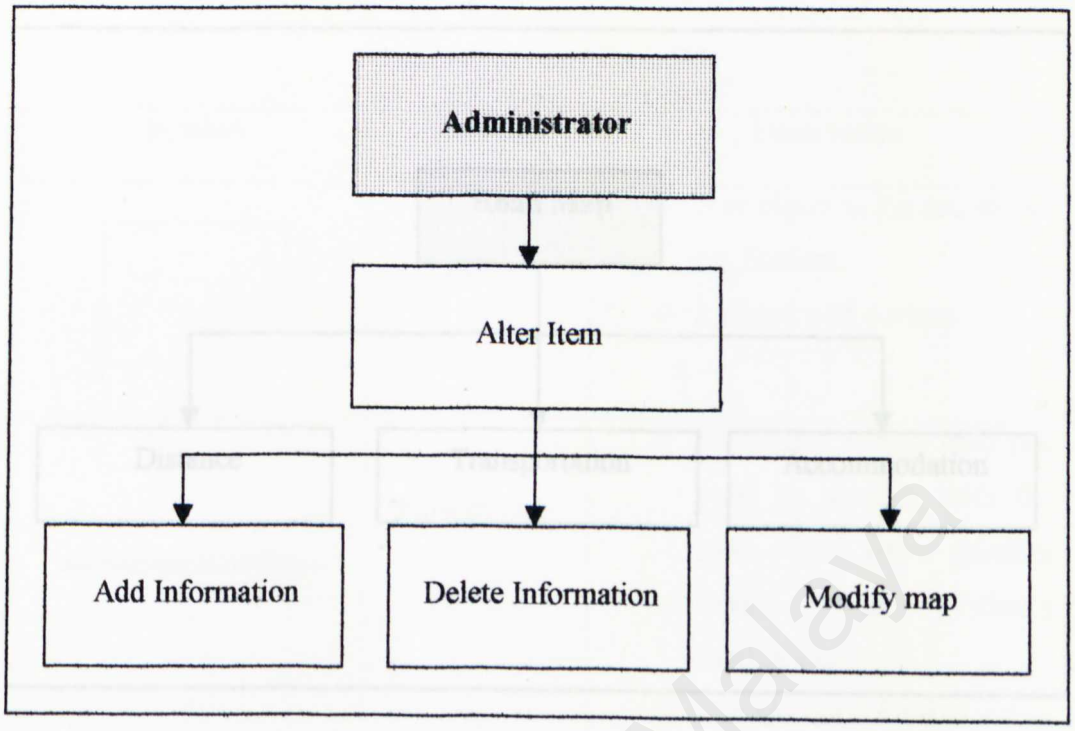


Figure 4.5 Structure chart for administrator module

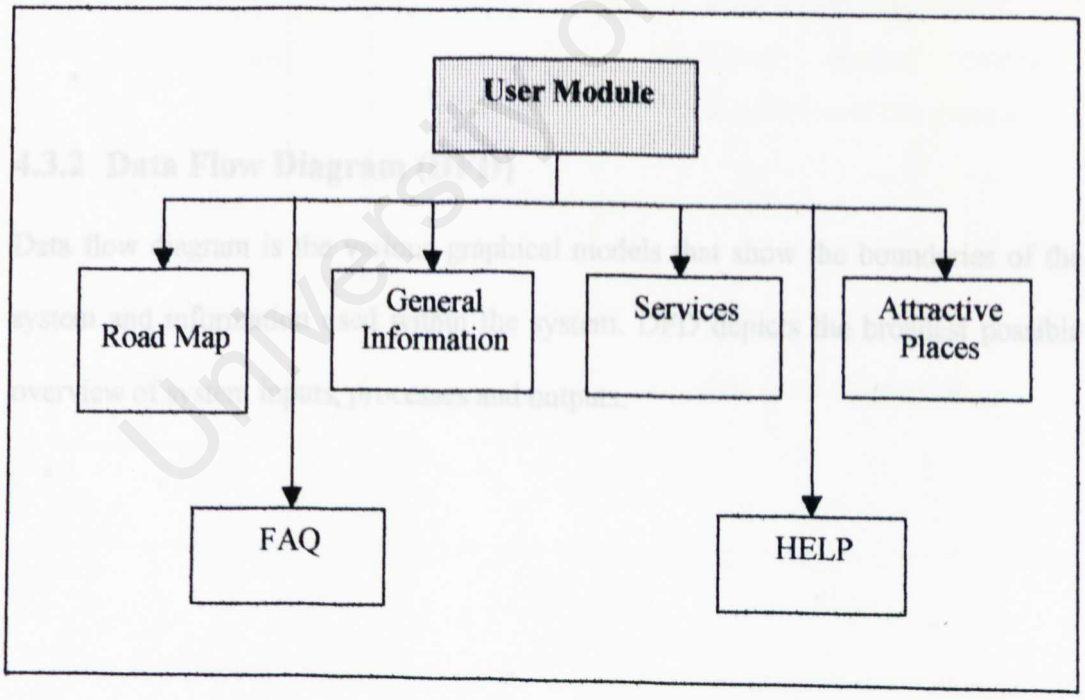


Figure 4.6 Structure chart for user module

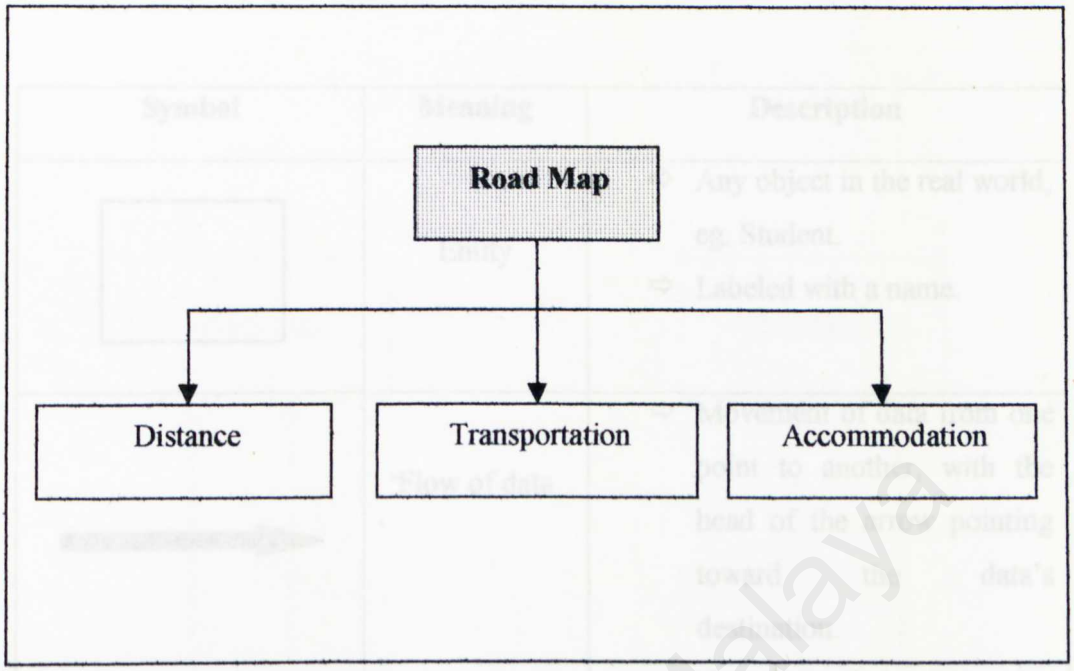


Figure 4.7 Structure chart for road map

4.3.2 Data Flow Diagram (DFD)

Data flow diagram is the various graphical models that show the boundaries of the system and information used within the system. DFD depicts the broadest possible overview of system inputs, processes and outputs.

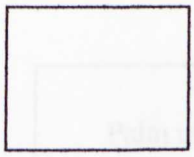
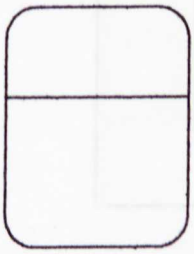
Symbol	Meaning	Description
	Entity	⇨ Any object in the real world, eg. Student. ⇨ Labeled with a name.
	Flow of data	⇨ Movement of data from one point to another, with the head of the arrow pointing toward the data's destination.
	Process	⇨ Top section is labeled with a unique number indicating its level within the diagram. ⇨ Lower section contains description of the process.
	Data store	⇨ Labeled with identifier and data store description.

Table 4.1 Four basic symbols in DFD

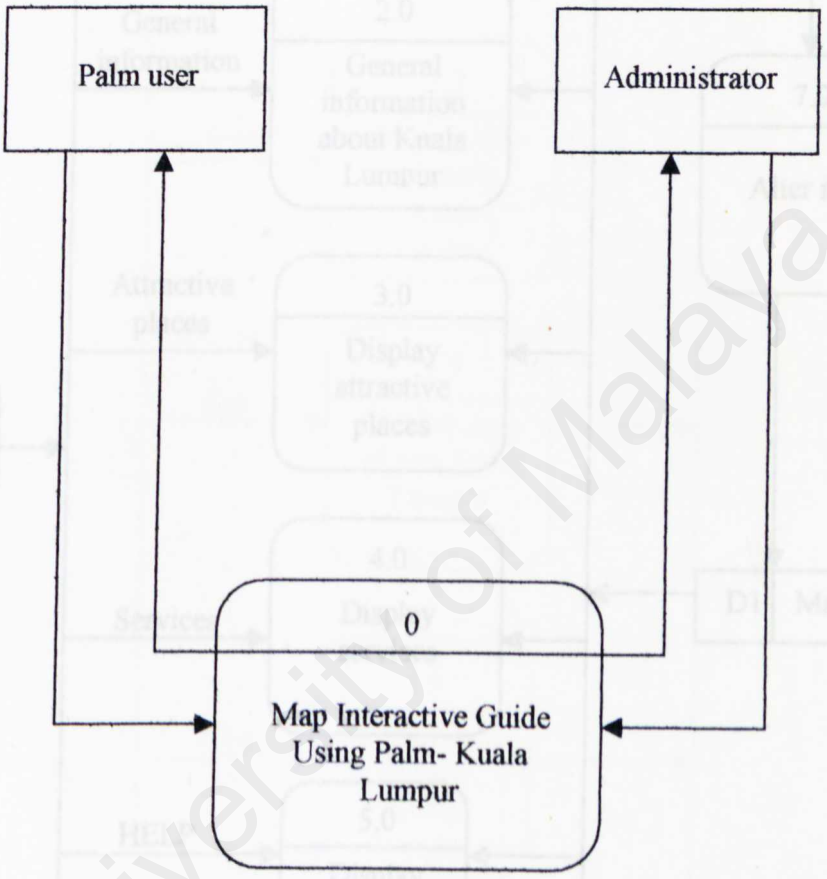


Figure 4.8 Context level diagram for MIGuP

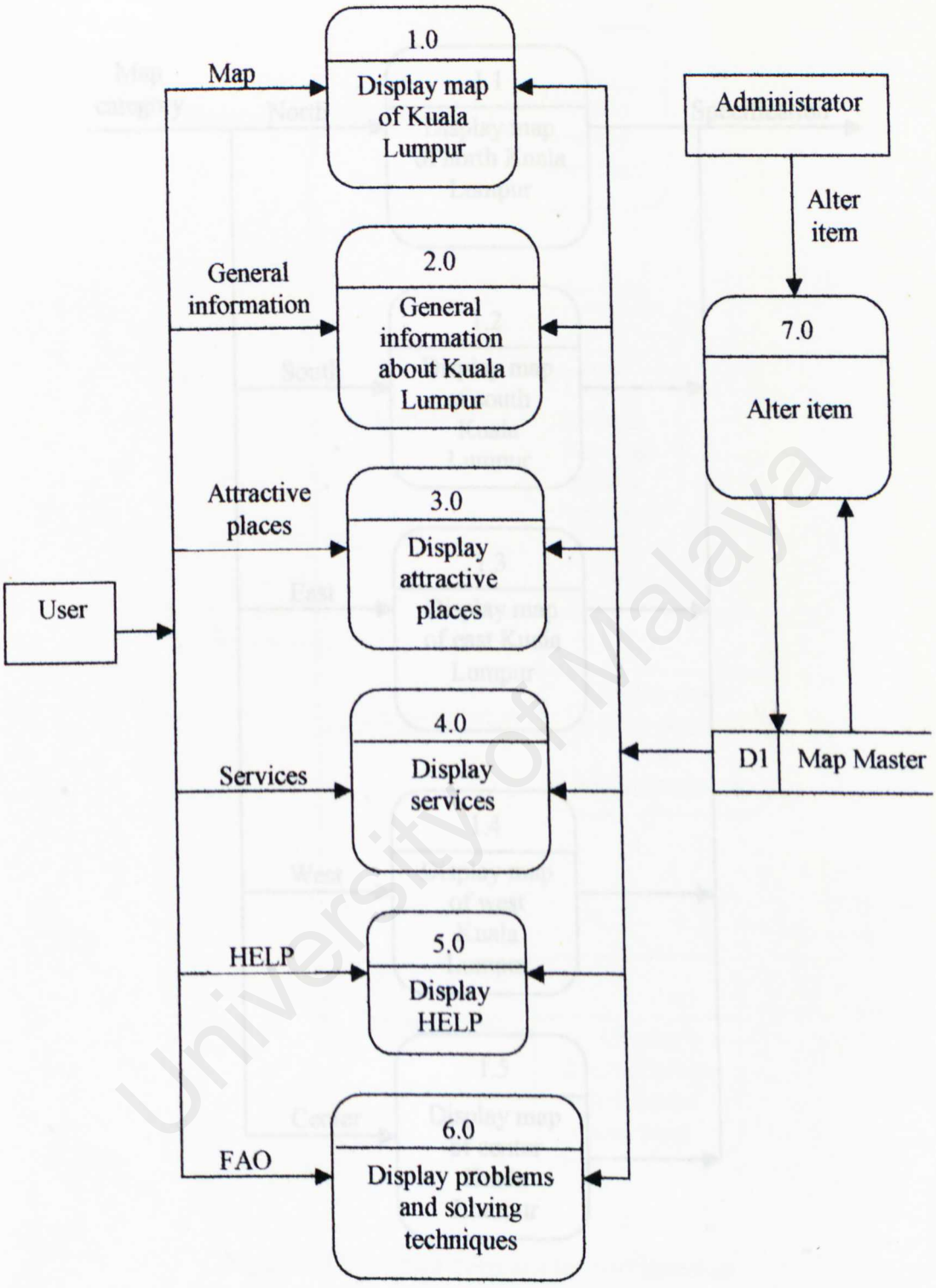


Figure 4.9 Diagram 0 for MIGuP

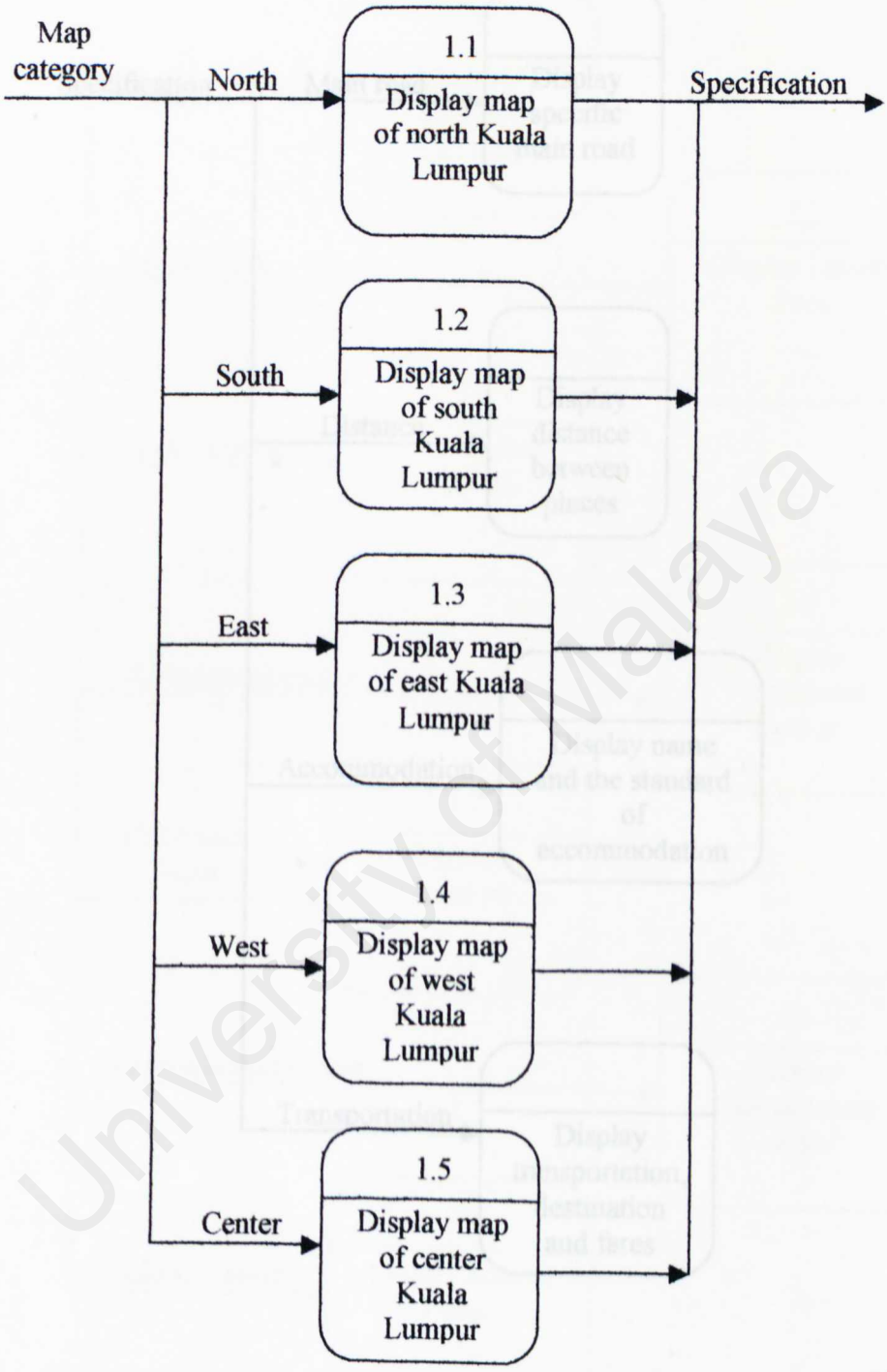


Figure 4.10 Child diagram for process 1.0

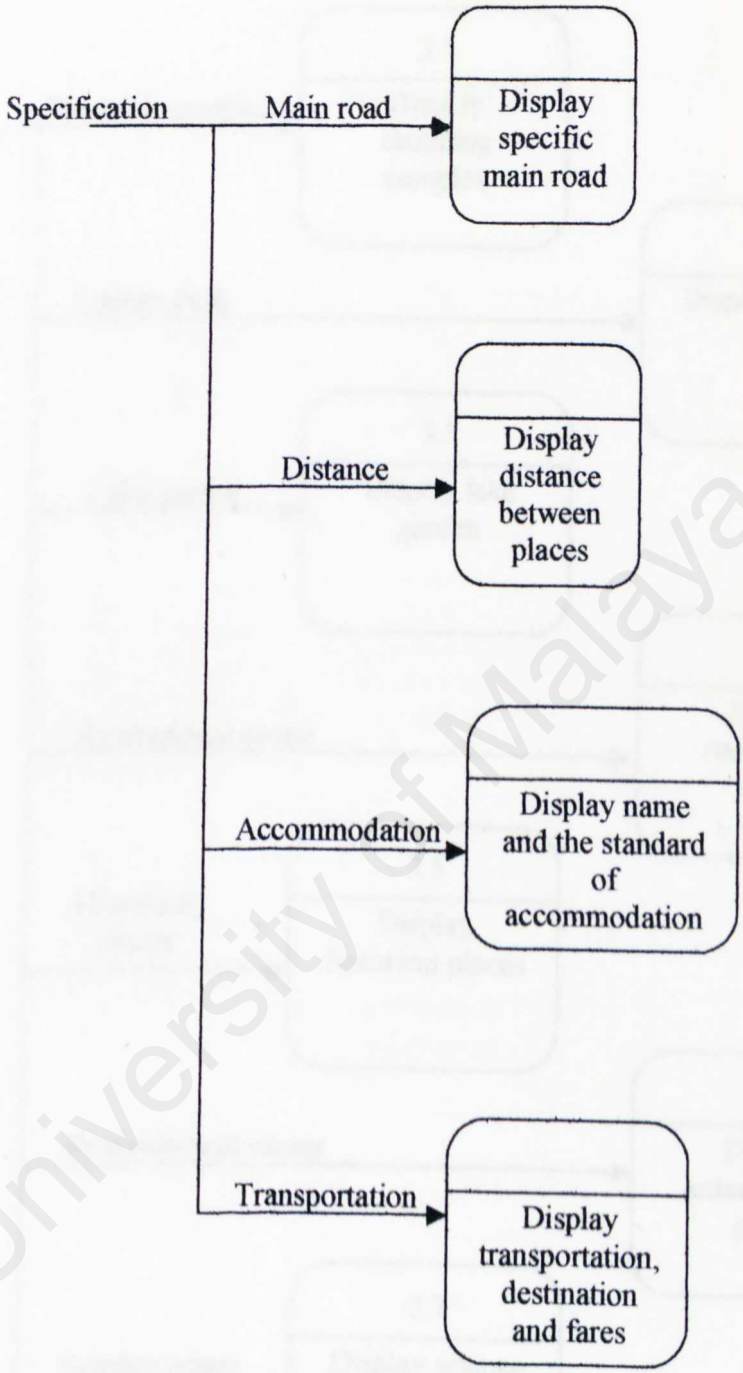


Figure 4.11 Child diagram for specification

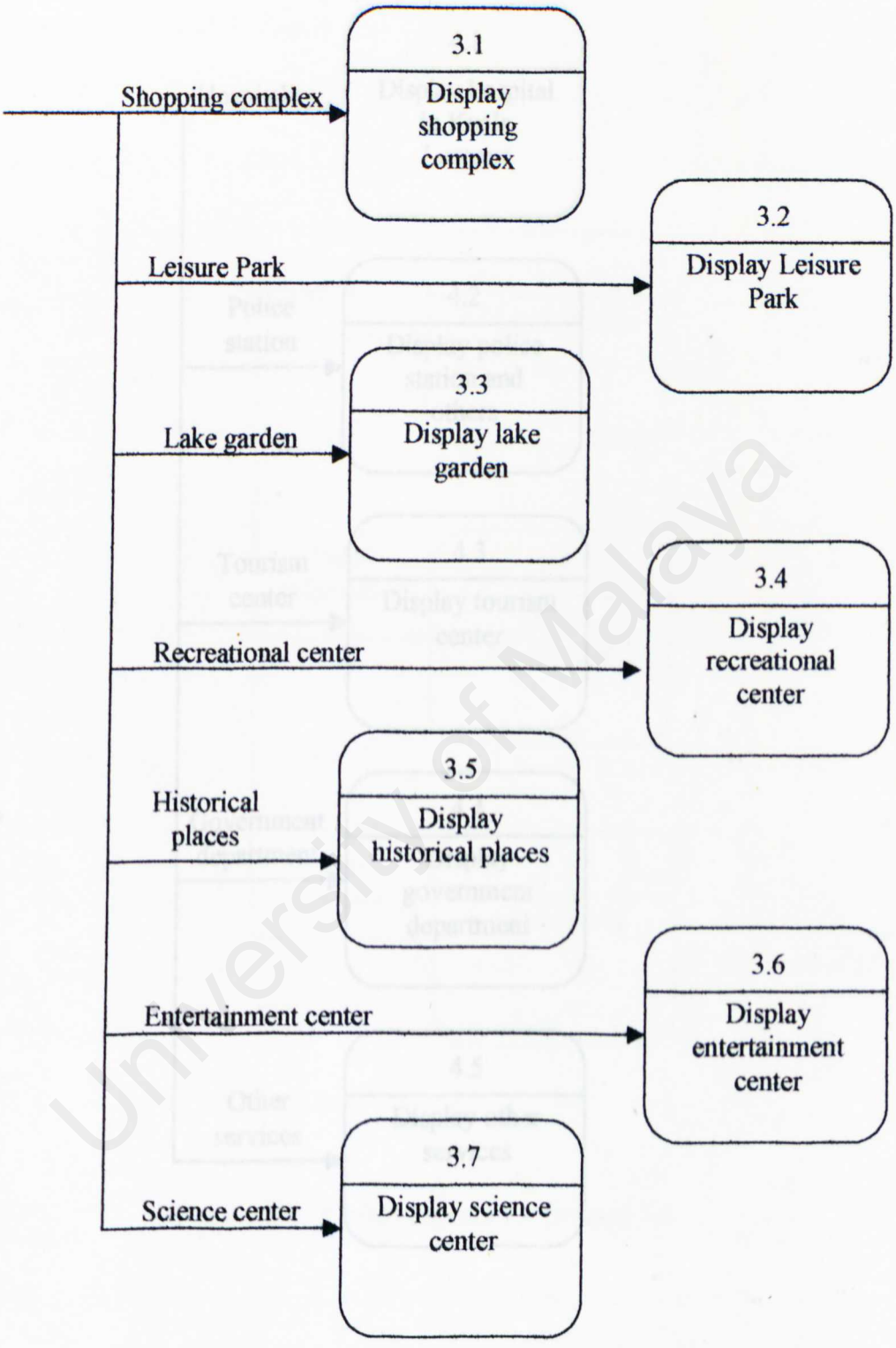


Figure 4.12 Child diagram for process 3.0

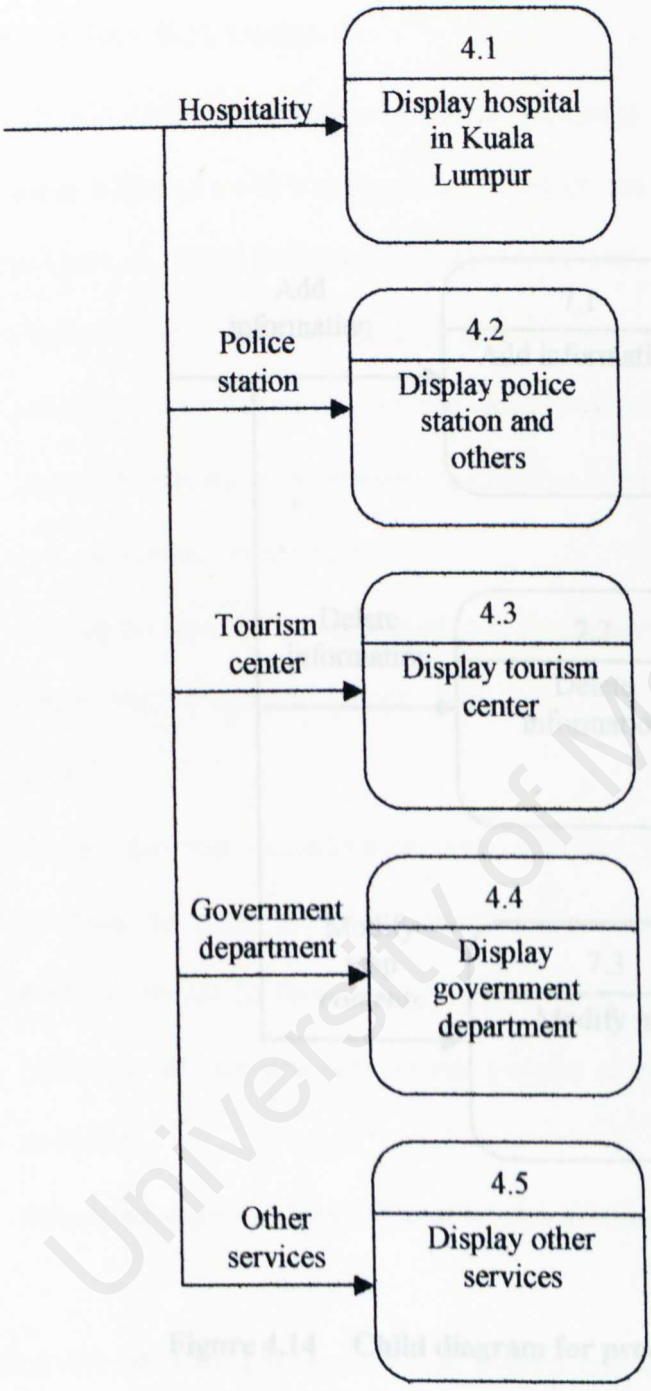


Figure 4.13 Child diagram for process 4.0

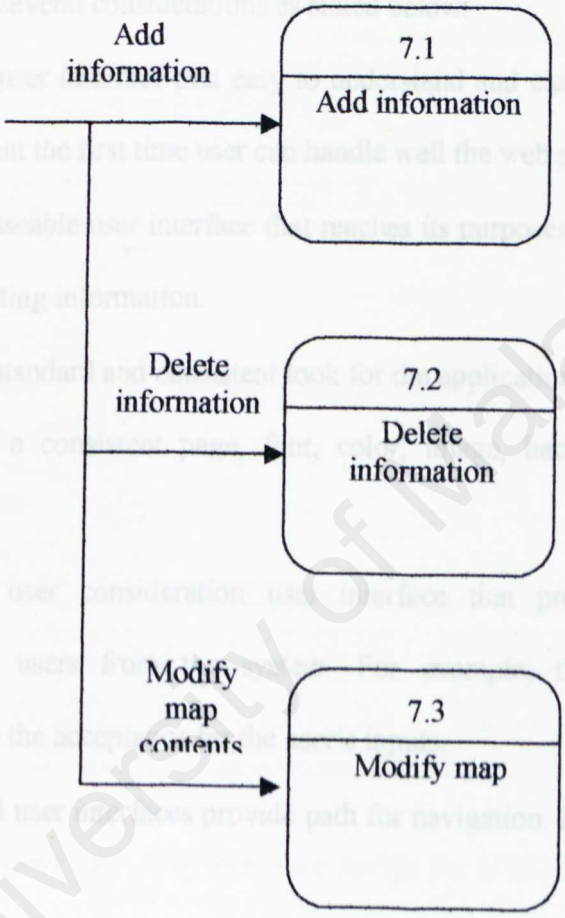


Figure 4.14 Child diagram for process 7.0

4.4 User Interface Design

User interface is an important component for a web-based system. It is essential for the success or failure of a web-based system. Therefore, the user interfaces of MIGuP are design based on several considerations as stated below:

- Creates the user interface that easy to understand and easy to use. This is to make sure that the first time user can handle well the web pages.
- Design the useable user interface that reaches its purposes either in obtaining or disseminating information.
- Provide the standard and consistent look for the application. The pages should design with a consistent page, font, color, image, background and page layout.
- Design the user consideration user interface that provides appropriate feedback to users from the system. For example, the system should acknowledge the acceptance for the user's inputs.
- Make sure all user interfaces provide path for navigation. Do not create dead-end pages.
- Ensure the pages are compatible with Palm devices.

Designing user interface is not an easy task. Besides gaining the theory of design from the book, the experience in web based user interface design is also essential.

The first step in designing a user interface for MIGuP is to determine the information that will be included in the page. The next step will be arranged and present the

information in the standard and systematic way. Each of the user interface designed will be considered from the aspect of reaching its objectives.

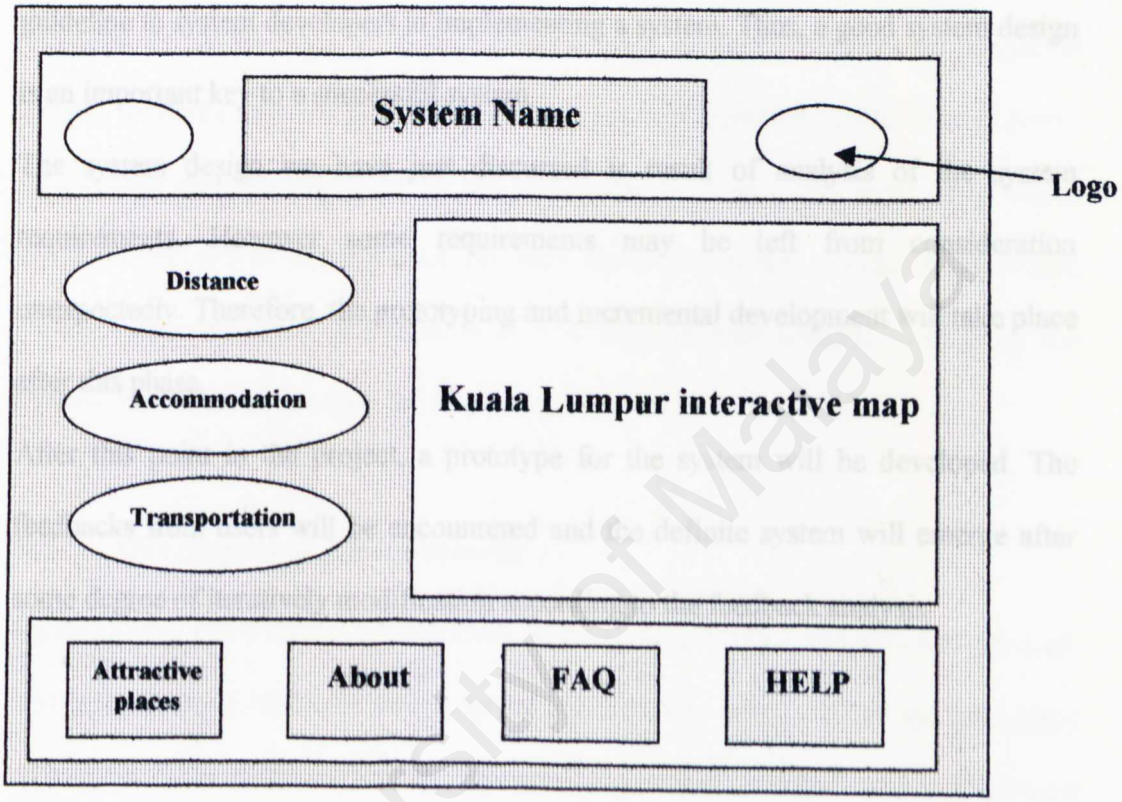


Figure 4.15 User interface design for MIGuP

4.5 Conclusion

This chapter is mainly about the design of the proposed system. Some specific guidelines to design web-based system are discussed. The system design provides a guideline to system developers in implementing a system. Thus, a good system design is an important key to a successful system.

The system design we have just discussed is result of analysis of the system requirements. However some requirements may be left from consideration unexpectedly. Therefore, the prototyping and incremental development will take place after this phase.

After this point in the project, a prototype for the system will be developed. The feedbacks from users will be encountered and the definite system will emerge after some degree of iteratively modification according to the feedback analysis.

Chapter 5: System Implementation

In the system implementation stage, the design model of MIGuP is converted into a workable software product. In the requirements analysis and system design stages, the blueprint of the system is analyzed and developed, however the software product is slightly different from the blueprint and the significant modifications have been done. The system implementation of the MIGuP system is divided into three parts, which are the development environment, platform development and system development. Besides that, the main problems faced and the solutions adopted throughout the system implementation phase are discussed.

5.1 Development Environment

Development environment is important in building a correct and efficient product. Using the suitable hardware and software will not only help to speed up the system development but also determine the success of the project. The hardware and software tools to develop the entire system are stated below.

5.1.1 Hardware Used

The hardware to develop the system are as listed below:

- Pentium II 266 MHz processor
- 7.13 GB hard disk
- 128 MB memory
- Other standard desktop PC component

5.1.2 Software Tools Used

5.1.2.1 Software Tools for Design and Report Writing

There are a lot of software tools available in the market that can be used to do the designing tasks and report writing. The designing tasks included drawing the structure chart and data flow diagram. For these purposes, Microsoft Word 2000 is used.

5.1.2.2 Software Tools for Development

During the MIGuP development, a vast array of software tolls has been used. The software used to develop the system is depicted as table below:

Software	Purpose	Description
Microsoft Windows 98	System requirement	Operating System
Personal Web Server	System requirement	Web server host
Internet Explorer 5	System development	Browser for viewing web pages developed
Macromedia Dreamweaver 3	System development	Source code editor
Macromedia Flash 5	System development	Movie and map design tool
Adobe Photoshop 7	Edit scanned map	Image design and editing tool
Palm OS Emulator	System development	Test web pages developed

Table 5.1 Summary of software used

5.2 Platform Development

The platform development includes setting up the Personal Web Server and Palm OS Emulator.

5.2.1 Setting up Personal Web Server

The platform for MIGuP is Microsoft Windows 98. Therefore, before the system is being developed, the platform should be setting up first. Before Microsoft Windows 98 and Personal Web Server are installed, the hard disk is formatted using boot disk. After the hard disk has been partitioned and formatted, the following steps are done during the installation process:

- Install Microsoft Windows 98
- Setting up the hardware needed
- Install Personal Web Server
- Setting up Personal Web Server

5.3 System Development

5.3.1 Web Page Coding

The hyper Text markup language, or HTML is the language used to prepare hypertext documents. These are documents to distribute on the World Wide Web and are what human clients actually see. HTML contains commands, called tags, to mark text as headings, paragraphs, lists, quotations, emphasized, and so on. It also has tags for including images within the documents, for including hypertext links connecting the

document being read to other documents or Internet resources, such as WAIS databases and anonymous FTP sites.

In this MIGuP project, I used Macromedia Dreamweaver 3 to develop web pages in HTML format. Some of the coding is stated below:

i. **<HTML>HTML Document</HTML>**

Description: *first and last line in every HTML document.*

Type: *container.*

ii. **<HEAD>Head data</HEAD>**

Description: *provides descriptive information about a document as part of the header.*

Type: *container*

iii. **<TITLE>Descriptive title</TITLE>**

Description: *provides descriptive information about the document for displaying at the top of the screen, not in the body of the document.*

Type: *container*

iv. **<BODY>Majority of document</BODY>**

Description: *identifies the contents of the web page.*

Type: *container*

v. **<TD>table data</TD>**

Description: *defines table data (one cell).*

Type: *container*

5.3.2 Macromedia Flash 5 Coding

In Macromedia Flash 5, coding is not done manually. Coding during system development process is using codes that have been fixed. There are three major parts in developing Kuala Lumpur Interactive Map, which are creating buttons and icons, creating scenes and creating layers.

5.3.2.1 Creating Buttons and Icons

Buttons and icons are used in navigating on moving from one scene to another. Buttons and icons can be created through self-creativity or using button symbols in "Flash Library". Button that had been created initially in "movie-clip" format or it is not click able. It has to be changed to button format by pressing F8 button and a window will appear to make the change.

When creating icons, same steps will be applied to change it from movie-clip to button format. Buttons and icons that have been changed to button format will be placed in internal database called "Library". Coding the button using "action" command has to be done after changing the button format. "Action" command for button allow user to navigate or go to other scene when the button clicked. For instance, if a user at scene1 and want to access scene2, the code are:

```
on(release){
        gotoAndPlay("Scene2",1);
    }
```

To make a button or icon links to a website or home page, a function called "getURL" can be used to make it happen. For example, a button or icon links to FSKTM website:

```
on(release){
        getURL("http://www.fsktm.um.edu.my");
        }
```

5.3.2.2 Creating Scenes

Scenes are used to display the map or information. To create a scene choose insert menu – scene (insert<scene). To add a scene, user have to click '+' symbol at the scene window and a new scene will appear. To modify a scene, user have to choose modify menu – scene (modify<scene).

5.3.2.3 Creating Layers

Layer is used to store every pictures, or buttons in every scene. There can be more than one layer in every scene. To add a layer, just click at '+' symbol in 'Timeline' bar. Anew layer will appear on top of existing layer. Every layer that has been created will appear on top of highlighted layer.

To avoid looping in every scene, layer in every scene must be coded:

```
stop();
```

If there is animation in a scene, code for the layer is:

```
play();
```

If users want to make movement from scene1 to scene2 automatically, the code is:

```
gotoAndPlay("Scene2",1);
```

5.3.3 Implementation on Palm

The MIGuP so called Map Interactive Guide using Palm; therefore, the MIGuP system has to be able to run on the Palm OS device. I used Palm OS Emulator (POSE) to emulate the real Palm OS device and outline the system on Palm. The POSE may be downloaded from http://www.palmos.com/dev/tools/emulator .

The Palm OS Emulator is software that emulates the hardware of the various models of Palm Powered handheld. It is extremely valuable for writing, testing and debugging applications. Create "virtual" handheld by running the Emulator on Windows, Mac OS, or Unix computers.

Emulated devices can be loaded with new ROMs, so I can test my application with virtual devices, including different devices. The Emulator software does not include ROM images. It is like a computer without an operating system.

To emulate any specific device I need to obtain a ROM image that is compatible with that device. Typically, the ROM and device must match in processor type, display color depth. In order to use some device-specific capabilities, specific libraries and/or applications may need to be present. For example, in order to simulate Palm VII with a wireless connection I need the Web Clipping components (usually provided as part of the ROM.

When you pick a ROM image, the Emulator will give you the option to pick the device user want to emulate from the devices that could use that ROM.

5.3.3.1 Installing Palm OS Emulator

1) Prerequisites

This section describes the software you need to use Palm OS Emulator. Palm OS Emulator requires one of the following runtime environments:

- A 32-bit Windows platform: either Windows 95, Windows 98, Windows NT, Windows ME, Windows 2000, or Windows XP. Emulator is a multi-threaded 32-bit program. It does not run on Windows 3.1, even with Win32s installed.
- MacOS 8.6 or later with Carbon 1.2.5 or later
- Unix: some versions, including Linux

2) Using ROM Images

To run Palm OS Emulator, you need to transfer a ROM image to it. The ROM image contains all of the code used for a specific version of the Palm OS. You can obtain ROM images for different Palm OS versions from the Palm Resource Pavilion, or you can tell Palm OS Emulator to download the ROM from a handheld that has been placed in the handheld cradle and connected to the desktop computer. When you download ROM images from the Palm Resource Pavilion, you can also obtain debug ROM images. Debug ROM images contain additional error checking and reporting functions that can help you debug Palm OS applications.

3) Loading ROM Images

Because Palm OS Emulator emulates the Palm Powered hardware, all components of the hardware must be present. This includes a ROM image file, which is not shipped with the Emulator. There are two ways to obtain a ROM image:

- Download a ROM image from the Palm Resource Pavilion
- Transfer a ROM image from a handheld

To download a debug ROM image from Palm, see: http://www.palmos.com/dev

The ROM image files are found in the Resource Pavilion. The Resource Pavilion is an area for developers who have registered as members of the Palm OS Developer Program. You can find instructions for joining the Palm OS Developer Program at the developer site.

To transfer a ROM image from a handheld, follow these steps:

a) Install the Palm OS application named ROM Transfer.prc on your handheld. You can use the Install program in the Palm Desktop organizer software and then synchronize with the handheld to install this program.

b) Place the handheld in the HotSync® cradle that is connected to your desktop computer.

c) Follow the steps in the appropriate section on next page.

Transferring a ROM File in Windows

This section describes how to transfer a ROM image from a handheld on a Windows-based desktop computer. Before proceeding, you must have the ROM Transfer.prc program installed on the handheld, as described in the previous section.

If you are running the program for the first time, Palm OS Emulator presents the startup dialog box shown in Figure 5.1. Click **Download** to begin the transfer of a ROM image from a handheld.

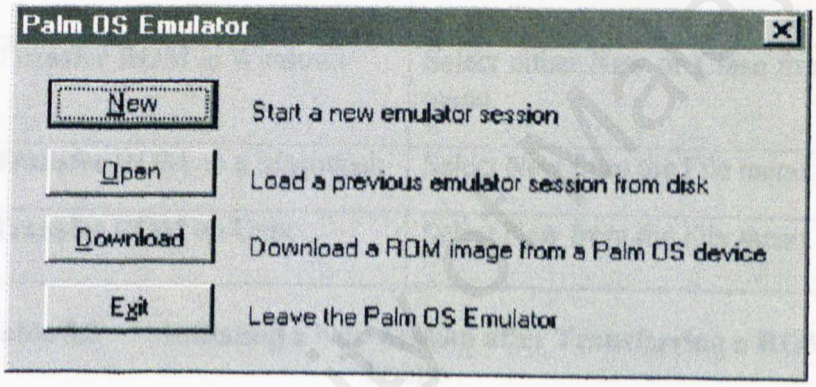


Figure 5.1 Palm OS Emulator Startup Dialog Box

To transfer a new ROM image for Palm OS Emulator to use, you can right-click on the Palm OS Emulator display (the Palm Powered handheld image) and select **Transfer ROM**. Palm OS Emulator opens a Transfer ROM dialog box that will guide you through the process.

4) Using a ROM Image in Palm OS Emulator

Once you have transferred a ROM image to disk, you need to create a new session that is based on the image. To initiate the new session, select **New** from the popup menu. Table 5.2 shows the first step in creating a new session for each transfer method.

Method Used to Initiate ROM Transfer	New Session Method
Clicked **Download** initial dialog box in Windows	Click **New** in the dialog box.
Selected **Transfer ROM** in Windows	Select either **New** or **Close** from the File menu.
Selected **Transfer ROM** on a Macintosh	Select **New** from the File menu.
Selected **Transfer ROM** on Unix	Select **New** from the File menu.

Table 5.2 Initiating a New Session after Transferring a ROM Image

After you initiate the session, Palm OS Emulator presents the new session dialog box. The Windows version of this dialog box is shown in Figure 5.2.

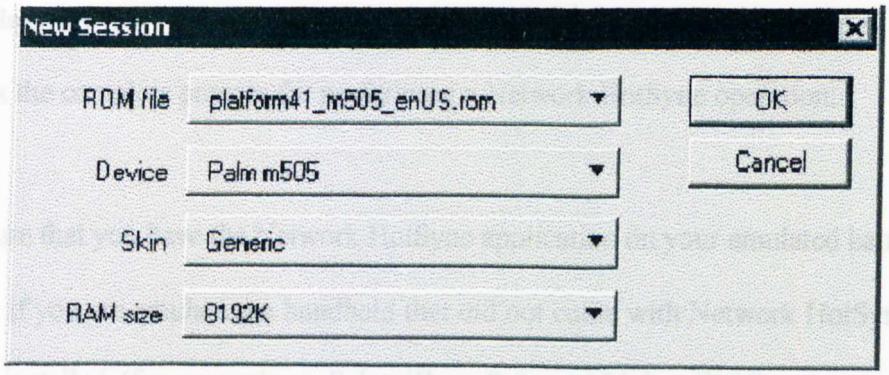


Figure 5.2 New Session Dialog Box

5.3.3.2 Running Palm OS Emulator

Performing a Network Hotsync Operation with Palm OS Emulator on Windows

Users do not need to be connected to a network to perform a Network HotSync operation with Palm OS Emulator. This method can be used with Emulator and a single Windows computer. However, other configurations are possible. In general, user need these two:

- A Windows computer running HotSync Manager
- A computer running Emulator that can access the computer running HotSync Manager.

The computer running Emulator can be the same Windows computer that is running HotSync Manager, or it can be a second computer (either Windows, Macintosh, or Unix). If you are using a single Windows computer, you don't need to be connected to a network. However, if you are using a second computer, you will need the actual

IP address of the Windows computer running HotSync Manager for step 4 below.

Here is the complete process for performing a Network HotSync operation:

1. Ensure that you have the Network HotSync application on your emulated handheld:
   - If you are emulating a handheld that did not come with Network HotSync pre-installed (for example, a Palm III or Palm m100 handheld), you must first download and install the Network HotSync application on the emulated handheld. You can get the Network HotSync files from:

     http://www.palm.com/support/downloads/etsync.html
   - If you are emulating a handheld running Palm OS version 3.1 or later, then you may already have the Network HotSync application installed on the emulated handheld.
2. Configure the HotSync settings on your Windows computer:
   - Right-click (use mouse button two) on the HotSync icon in the system tray.
   - In the pop-up menu, select **Network** to enable Network HotSync. (A checkmark will appear next to the **Network** menu item if it is already enabled.)

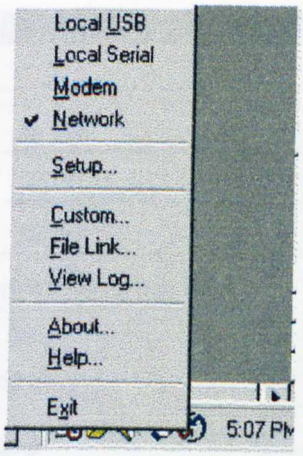


Figure 5.3 Enabling Network HotSync

3. Configure Palm OS Emulator to Redirect NetLib Calls to TCP/IP:

- Right-click (use mouse button two) on Emulator.
- In the pop-up menu, select **Settings>Properties...**
- In the Properties dialog box, click the **Redirect NetLib Calls to TCP/IP** checkbox. Click **OK** to save the changed properties.

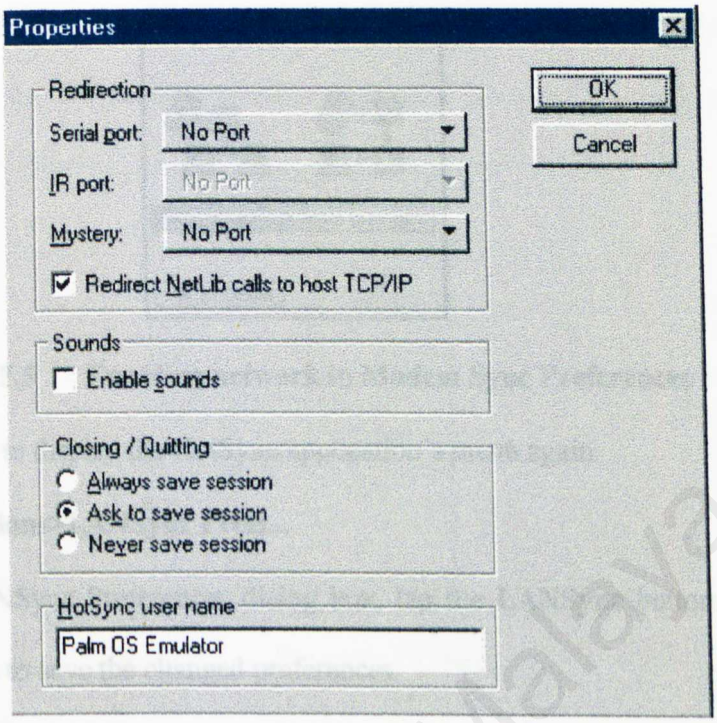


Figure 5.4 Redirect NetLib Calls to TCP/IP

4. Configure the HotSync settings on the emulated handheld:

- From the handheld's application launcher; tap the HotSync application to open it.
- Tap **Menu** to display the HotSync application's menu.
- Select **Options>Modem Sync Prefs...**
- In the Modem Sync Preferences dialog box, tap the **Network** button. Tap the **OK** button to save the changed preferences.

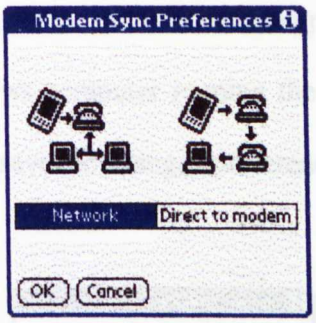


Figure 5.5 Enabling network in Modem Sync Preferences

- Tap **Menu** to display the HotSync application's menu again.
- Select **Options>LANSync Prefs...**
- In the LANSync Preferences dialog box, tap the **LANSync** button. Tap the **OK** button to save the changed preferences.

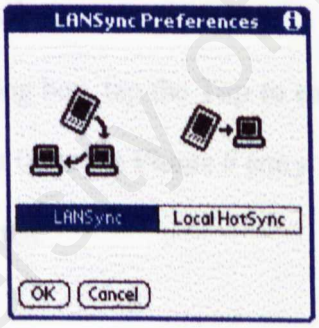


Figure 5.6 Enabling network in LANSync Preferences

- Tap **Menu** to display the HotSync application's menu again.
- Select **Options>Primary PC Setup...**
- In the Primary PC Setup dialog box, enter the **Primary PC Address** (the middle entry field):
- If you are running Emulator and HotSync manager on the same Windows computer, enter 127.0.0.1

- If you are running Emulator on a second computer, then enter the actual IP address of the Windows computer running the Network HotSync operation. Tap the **OK** button to save the changed preferences.

Figure 5.7 Primary PC Setup

- In the HotSync application, tap **Modem**. Next, tap the **Select Service** button under the Modem Sync icon.
- In the Preferences dialog box, tap the **Tap to enter phone** field. In the Phone Setup dialog box, enter 00 in the **Phone #** entry field. Then tap the **OK** button. Then tap the **Done** button.

Figure 5.8 Phone Setup

- To start the HotSync operation, tap the HotSync icon in the center of the HotSync dialog box.

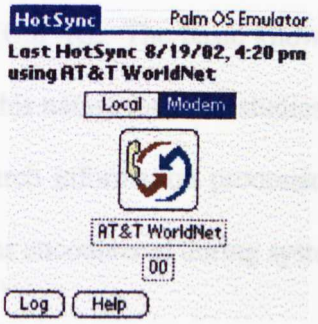


Figure 5.9 HotSync operations

5.4 Problems Encountered and Solutions

A lot of system analyses need to be done on technologies and programming concepts before starting to develop MIGuP-KL. The basic knowledge needed as a foundation in building an application of this nature involves studies in fields such as the Internet, information system and research information processing procedures. The following are some of the major problems encountered during system implementation.

5.4.1 Creating Buttons

The term button is referred to map that are click able. Several steps has to be followed to make this map is click able. Initially, the map divided into several parts and every part has to be highlighted using 'Brush' tool. The highlighting process is a very detail process and I took too many time working on it.

Every part has to be highlighted and MIGuP have over 180 maps. The solution for this problem is performing 'zoom-in' at the map to make it bigger and the highlighting process became easier.

5.4.2 Getting the Right Map

The second problem during MIGuP development process is getting the right map. To get the right map I searched on the Internet and no map is suitable in this project.

This problem solved by buying a book of Kuala Lumpur map from the bookstore nearby.

5.4.3 Using The Palm OS Emulator

This is my major problem encountered during the system development process. Without this emulator I cannot test my map on the Internet. Palm OS Emulator is very complicated software and I have problem in connecting it to the Internet. Reading some books about Palm OS Emulator and some articles on the Internet solves this problem.

5.4.4 Flash Movie did not appear in POSE

After this system has been fully developed, it has been tested over LAN and Internet and this system can be accessed. The problem when it is access through Internet is the interactive map did not appear on the Palm OS Emulator screen.

This is because the size of the movie is too large and Palm OS Emulator did not support animation or movie.

This problem solved by creating a new map (a non-interactive map) to allow Palm OS Emulator access it.

Chapter 6: System Evaluation

6.1 Testing Strategies

Testing is the process of exercising or evaluating a system by manual or automatic means to verify that it satisfied requirement or to identify differences between expected and actual results. Many type of testing have to be done before the system is released to the customer to ensure that the system is developed according to its specification and every function is implemented in a program works correctly.

The strategies used for testing are unit testing, integration testing, system testing and performance testing.

6.1.1 Unit Testing

Unit testing stressed on the components' function that linked the modules in this MIGuP system. Unit testing is done after every module to ensure the correctness and to find any error or problems in the module. Every module needs to be tested in every aspect such as error handling and logic flow interface.

The unit testing in MIGuP is stated below:

- Testing program codes.
- Comparing codes with specifications and design to ensure every relevant case considered.

6.1.2 Integration Testing

When collections of components have been unit tested, the next step is ensuring that the interface among the components are defined and handled properly. The integration testing is the process that verifying the system components works together as described in the system and program design specifications.

The bottom-up integration is adopted in this system. The testing begins with construction and testing with atomic modules, which have tested in the unit testing. For instance, in the map interactive contains atomic modules such as north, south, east, west and center. After the unit testing, this part of map is grouped together in a cluster and testing performs on the integration of these components. The similar testing is done in every part of map interactive of Kuala Lumpur.

Figure 6.1 illustrates the integration of the components in MIGuP system. The cluster will be integrated into a big module after integration testing has performed on the cluster. The testing continues performs among the clusters to ensure each component integrate properly in the module. Finally, each integrated modules will be merged and tested as a whole integrated system.

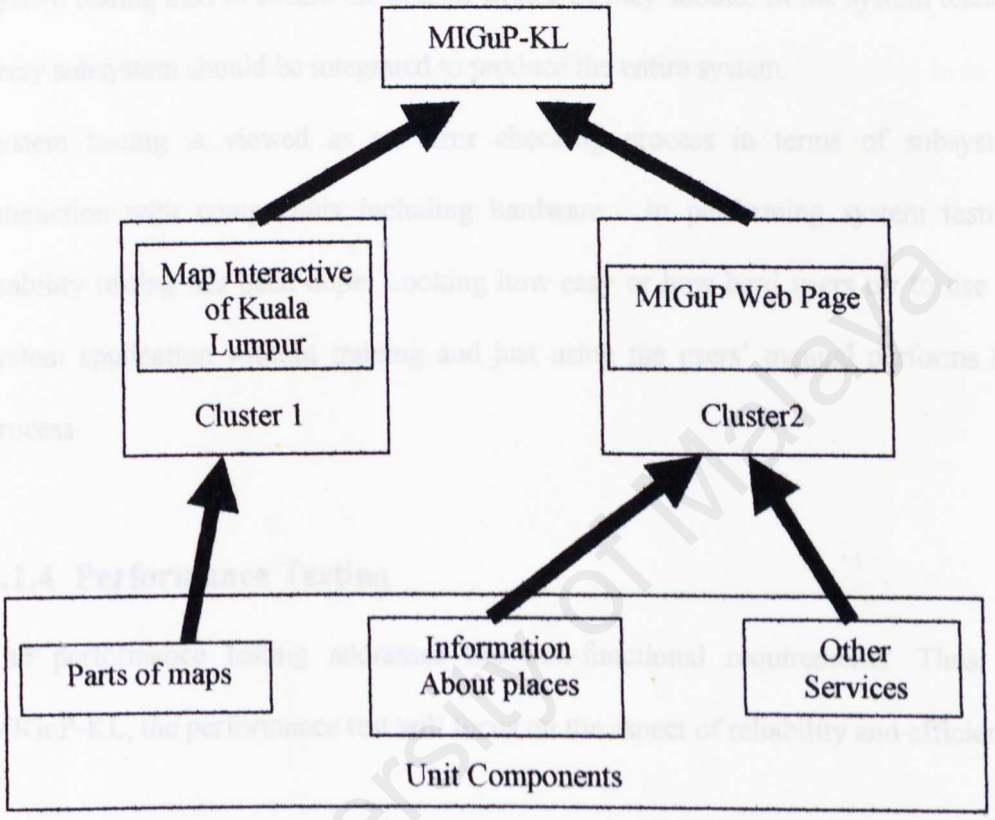


Figure 6.1 Integration testing in MIGuP-KL

6.1.3 System Testing

System testing is different from unit and integration testing. The objective of system testing is to ensure the implementation of codes with system design works correctly. System testing also to ensure the system works, as they should. In the system testing, every subsystem should be integrated to produce the entire system.

System testing is viewed as an error checking process in terms of subsystem interaction with components including hardware. In performing system testing, usability testing has been done. Looking how easy or how hard users try to use the system application without training and just using the users' manual performs this process.

6.1.4 Performance Testing

The performance testing addresses the non-functional requirements. Thus, for MIGuP-KL, the performance test will focus on the aspect of reliability and efficiency.

6.1.4.1 Reliability Testing

The reliability testing done by testing the system on both desktop and Palm OS Emulator to ensure the system can function well at both devices. A same function for example, information about places will run or appear on both desktop and Palm OS Emulator and the result is to expect both send the same information to the server.

6.1.4.2 Efficiency Testing

The result from the efficiency to the system might not be significantly reliable due to its was tested in a LAN for the response time of the server. Although the web clipping application was tested over the Internet, but it is not the real environment it should be. The testing should be done in a wireless network because data transmission over the wireless network compare to wired network has a significant different response time.

Chapter 7: Conclusions and Recommendations

MIGuP has achieved the aims and objectives stated in introduction of the report. However due to the project boundaries, there are some limitations in MIGuP and future enhancement can be made to produce a perfect version of MIGuP.

7.1 Objectives Achieved

This MIGuP project achieved its objectives after it has been developed. They are:

- Developed a dynamic and interactive system successfully.
- A professional interface and meets users' requirements.
- Replaced manual map with interactive map.
- Developed a complete information platform to be used by tourists. Information such as map interactive, interesting places and other services displayed to the users.
- Developed a virtual guidance to the tourist in searching places and roads in Kuala Lumpur.
- Developed a system that can be access by Palm device using wireless technology.

7.2 System Strength

7.2.1 User-friendly Interface

User interface in this system is user friendly and easy to understand and easy to use by a first-time user. User does not have to insert any input and every button in this system is user friendly and unique.

7.2.2 System Reliability

MIGuP system not allows any modification by user. This means user cannot change information in this system. Therefore, this system is secure enough and every data are accurate by the time it is developed.

7.2.3 Ease in Navigation

This system appears to the users as a compact and simple system. This is important in maintaining the consistency of the system. Buttons in interactive map make it easier to navigate from one scene to another

7.2.4 Wireless Access

As named, MIGuP-KL allows the user to access its information anywhere with Palm OS device provided there is a wireless access point. The user just need to download the palm query application from Palm OS site before access MIGuP services on the move.

7.2.5 Mouse/Stylus Driven

For the user's sake, the MIGuP is design in such a way to minimize the keyboard input. Most of the operations are carried out through mouse clicks or tap. The user just has to move the screen pointer to the targeted feature and click the mouse or use the stylus to tap on the targeted feature on Palm device. The system would response accordingly. This will ease the user's task and save a lot of time, especially for the Palm user. Nevertheless, some of the input still required a manually input either from keyboard or using graffiti writing.

7.3 System Limitations

Limitations in this system are the factor that affect the success of MIGuP development, some of them are:

- No real environment testing.

  The testing of the system performance was just tested on the Internet and never been tested over the air due to there is no wireless network for testing. It might be causing the actual response time is slower than the tested time when come to the wireless environment. The intention of data losing might be increase if the amount of data is too large when transfer on the wireless network which rely on the connectionless protocol, UDP yet the testing is in a more reliable connection protocol, TCP. It will reduce the system reliability and availability.

- Limited support on Web Browser.

  The system testing is based on Internet Explorer 5.0. The performances of the system in other browsers such as Netscape Navigator have not been tested. Therefore, the user is recommended to use Internet Explorer 5.0.

- This system cannot give the complete road map and information of Kuala Lumpur. There may be some places that are not stated in the map.
- This system cannot be tested on the real Palm device to ensure it is working properly. The system just be tested on Palm OS Emulator and the feedback are not as accurate as the real Palm device.
- This system is limited by time. For instance, a new tourism center or attractive place build in Kuala Lumpur, this will limit the system reliability.

7.4 Recommendations and Future Enhancements

7.4.1 Enhance Function and Scope

As stated before, MIGuP only focused on area Kuala Lumpur. This scope would be enhanced to greater area including Klang Valley or Selangor in future or next version of MIGuP. The function also can be added such as a search engine to find any roads in MIGuP.

7.4.2 More Attractive User Interface

MIGuP can be upgraded by designing a more attractive user interface and ad some multimedia effect in the interactive map. Changing the map with more attractive and complete map also can be done in later version of MIGuP.

7.4.3 Increase Compatibility on Other Web Browser

To increase the number of user, the web page can be design to suit in other browsers such as Netscape Navigators.

7.5 Experience and Knowledge Gained

Throughout the duration of system development, a lot of invaluable experiences have been obtained. The most important is the experience of developing a system. The systematic approach has been used and practically applied in developing the Web-based MIGuP-KL. The systematic approach is embodied in System Development Life Cycle (SDLC) as what I have learned theoretically in my course.

Developing an interactive map of Kuala Lumpur is indeed challenging and exciting experience. I have personally experienced the power of using Macromedia Dreamweaver 3 software that enables incorporation of advanced features and its built-in features into MIGuP-KL.

During the system implementation phase, I have gained some useful knowledge in hardware networking. For example, I have learnt the way to do master/slave on the

hard disk. For the networking part, I have learnt how to set up and configure Personal Web Server and Palm OS Emulator.

Apart from that, I found my programming skills have advanced a big step forward after I completed the project. Although I have experience in developing such system in HTML, I have learnt the way of writing source code in a better way. Besides that, I have explored the advanced feature such as building an interactive map using Macromedia Flash 5.

7.6 Summary

All in all, this project has achieved and fulfilled the objectives and requirements as an interactive Web page as determined during the system analysis. MIGuP-KL is not only an interactive system to disseminate useful information for the Internet user but also provided information about Kuala Lumpur.

The MIGuP-KL can be claimed as a pioneer to promote Kuala Lumpur tourism industry via the wireless operation on Palm OS device. This system will act as portable guidance for tourist to gain information in fast and reliable manner of network.

The map interactive of Kuala Lumpur as the sub component of the MIGuP is to top up the value of the system by providing transferring data over the air on Palm OS device. Although there are a lot of similar system in North America (where palm.net services coverage), but it still can be considered as a contemporary effort to achieve the goals in the context of Kuala Lumpur.

Overall the MIGuP-KL has achieved and fulfilled the objectives and requirements as determined during the analysis phase.

USER MANUAL

Chapter1: A Brief Overview

MIGuP-KL is developed tom handle process in searching places in Kuala Lumpur. This system will appear to user as a fully interactive web-base application such as map interactive of Kuala Lumpur and some information about its attractive places.

1.1 About the Manual

This manual is divided into four main headings, which are:

- A Brief Overview
- Hardware and Software Requirements
- Manual for Personal Computer User
- Manual for Palm Device User

1.2 Conventions

A consistent typographic is used in this user manual for the better understanding purposes.

Convention	Description
[button]	Indicates the button name
Menu|Option	Indicates the menu in the system

Chapter 2: Hardware and Software Requirements

2.1 Hardware Requirements

Below are the hardware requirements to run this system:

- Minimum 486 MHz processor (Pentium processor or above is recommended)
- Minimum 16 MB RAM (32 MB RAM or above is recommended)
- A SVGA Graphic Adapter.
- Keyboard and mouse as input devices.
- Modem/Network Interface Card to connect to Internet/Web server
- Minimum 16 bit color monitor
- 800 x 600 pixels screen monitor (for optimum screen layout)
- A Palm OS device

2.2 Software Requirements

Below are software requirements needed to run this system:

- Windows 95/98 or Windows NT 4.0 Workstation.
- Microsoft Internet Explorer 4.0 or above
- Palm OS Emulator software (optional)

Chapter 3: Manual for Personal Computer User

Getting started

In order to use MIGuP-KL, firstly you need to open your Web browser. Then, type the Web site address of MIGuP-KL into the address bar and press Enter. The URL is http://migup.web_MIGuP/main/main_page1.htm and the page below will appear.

Figure 3.1 MIGuP-KL main page 1

Below is main page 2 for MIGuP system. This page gives general information about Kuala Lumpur.

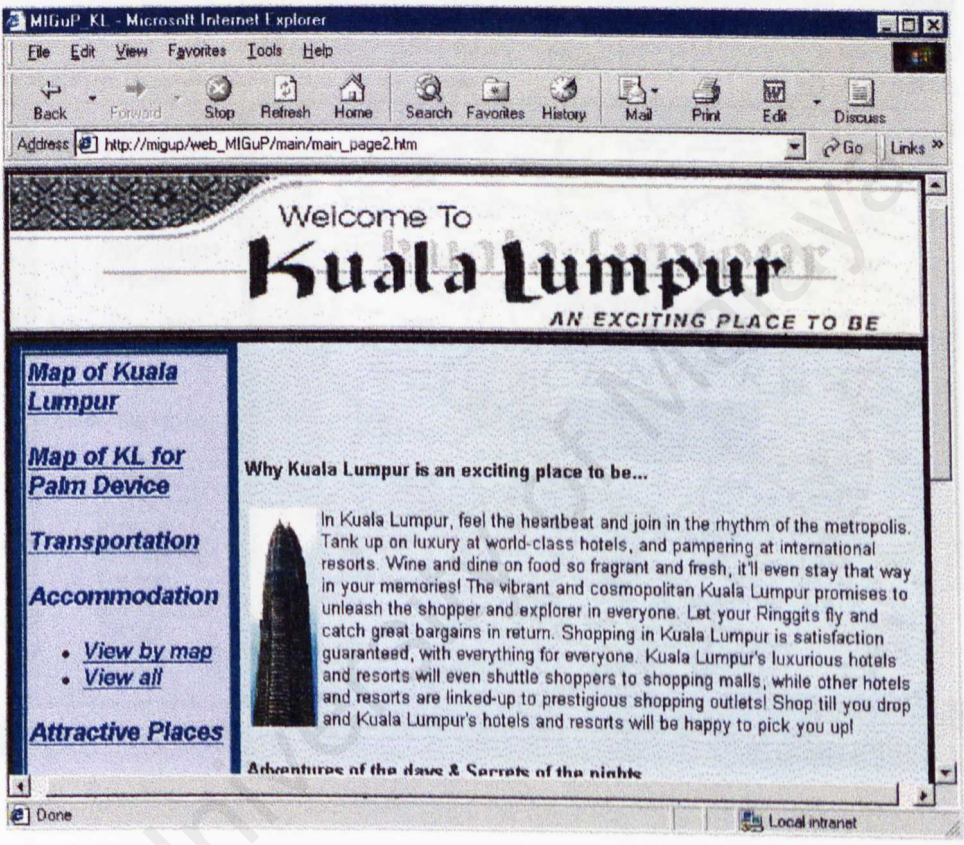


Figure 3.2 MIGuP main page 2

There are several menus on the left side of this page. The menus are linked to a particular page such as interactive map of Kuala Lumpur, transportation, accommodation, attractive places, frequently asked question and help page.

Interactive Map of Kuala Lumpur

If you click on Map Of Kuala Lumpur menu, the page with interactive map of Kuala Lumpur will appear.

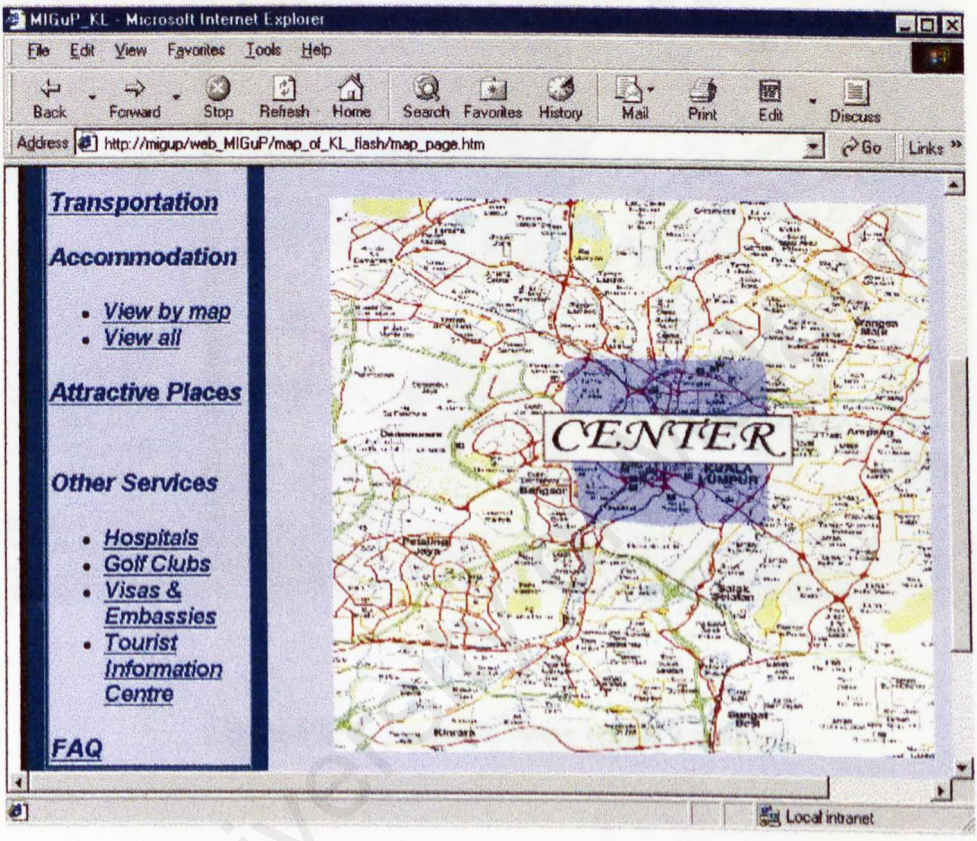


Figure 3.3 Interactive Map of Kuala Lumpur

There are button on the map, which it will be highlighted when user point on to the map. For example in figure 3.3, center of Kuala Lumpur is highlighted when user point on to it and it will link to map center of Kuala Lumpur. There are four layers of map in MIGuP that will provide detail information about Kuala Lumpur map.

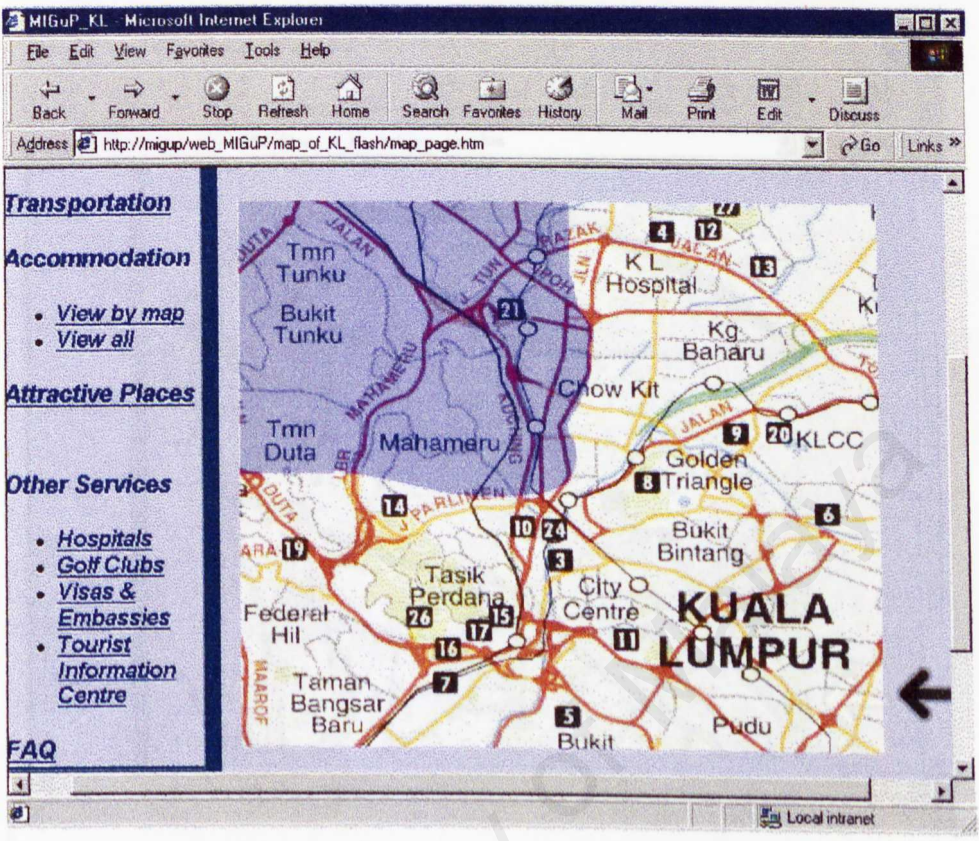


Figure 3.4 Map of Center Kuala Lumpur

The map of center Kuala Lumpur is divided into four parts to make it more detail. Every part will link to another map as seen on figure 3.5.

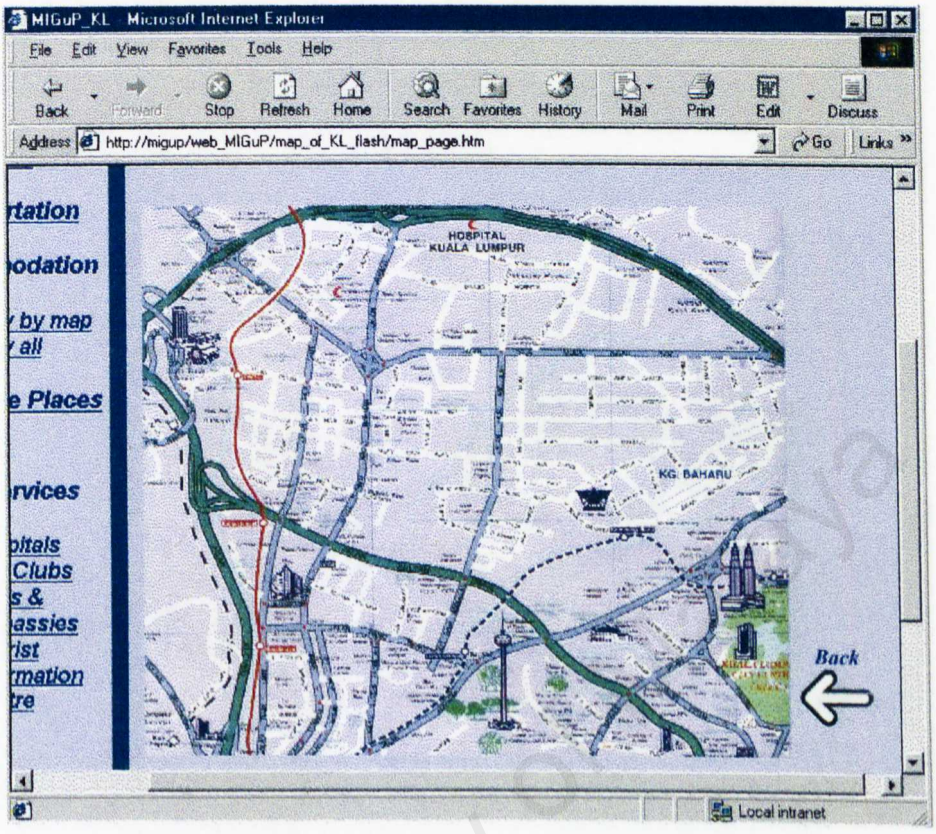


Figure 3.5 Part of center KL map

There is an arrow button [Back] in the interactive map to allow user to go to previous page or map. After user clicked on the map, it will go to the last layer of Kuala Lumpur map interactive (layer 4). This final layer provided information for attractive places or hotels in Kuala Lumpur.

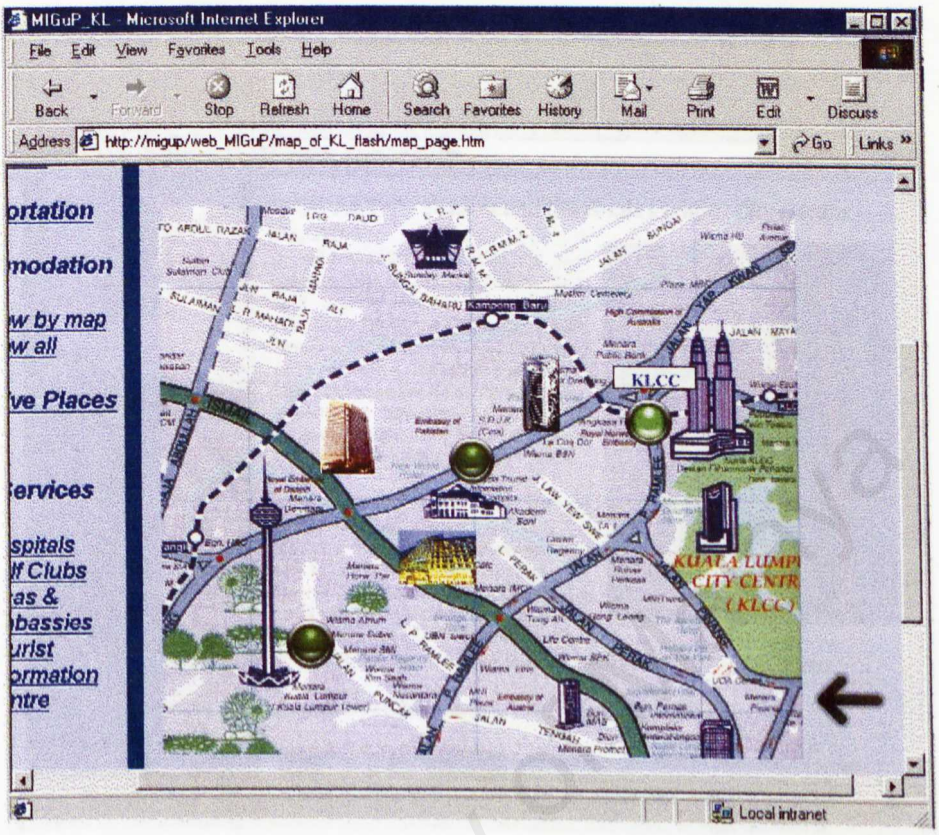


Figure 3.6 Final layer of map interactive

The buttons in this map will linked to a particular page to view its information. For instance, if user clicks on button KLCC, it will go to KLCC information page. The information about places not only can be access from this layer but it can be access from menu column on the left side of the page.

Information about places

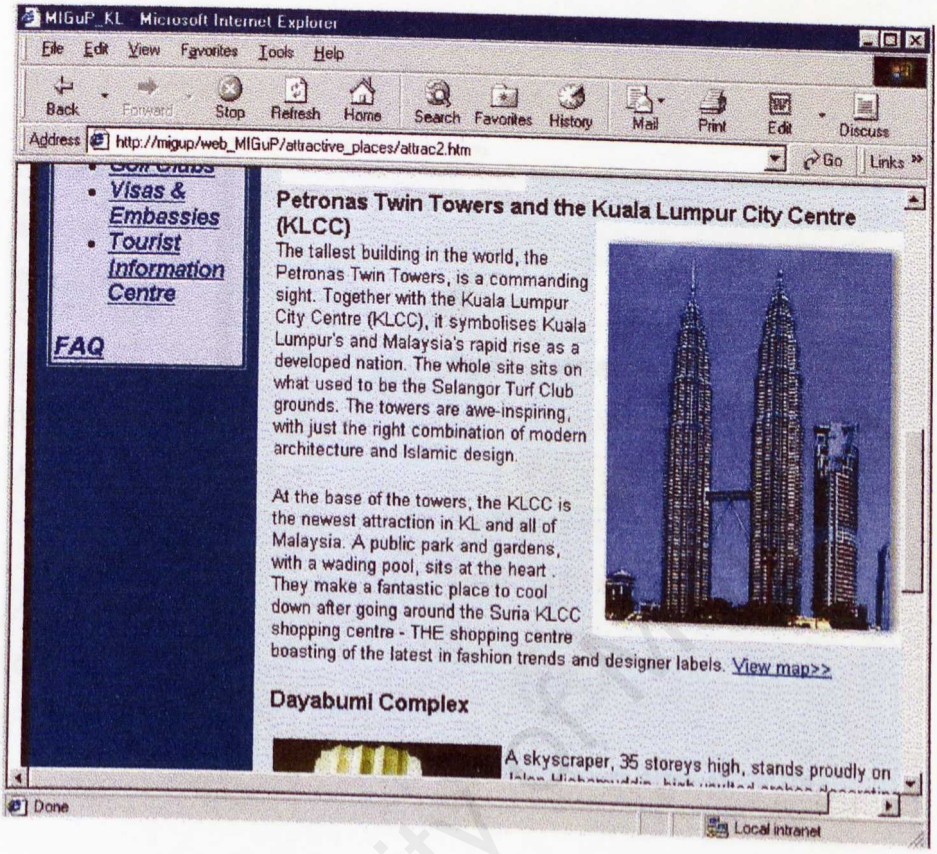


Figure 3.7 KLCC information

Transportation in Kuala Lumpur

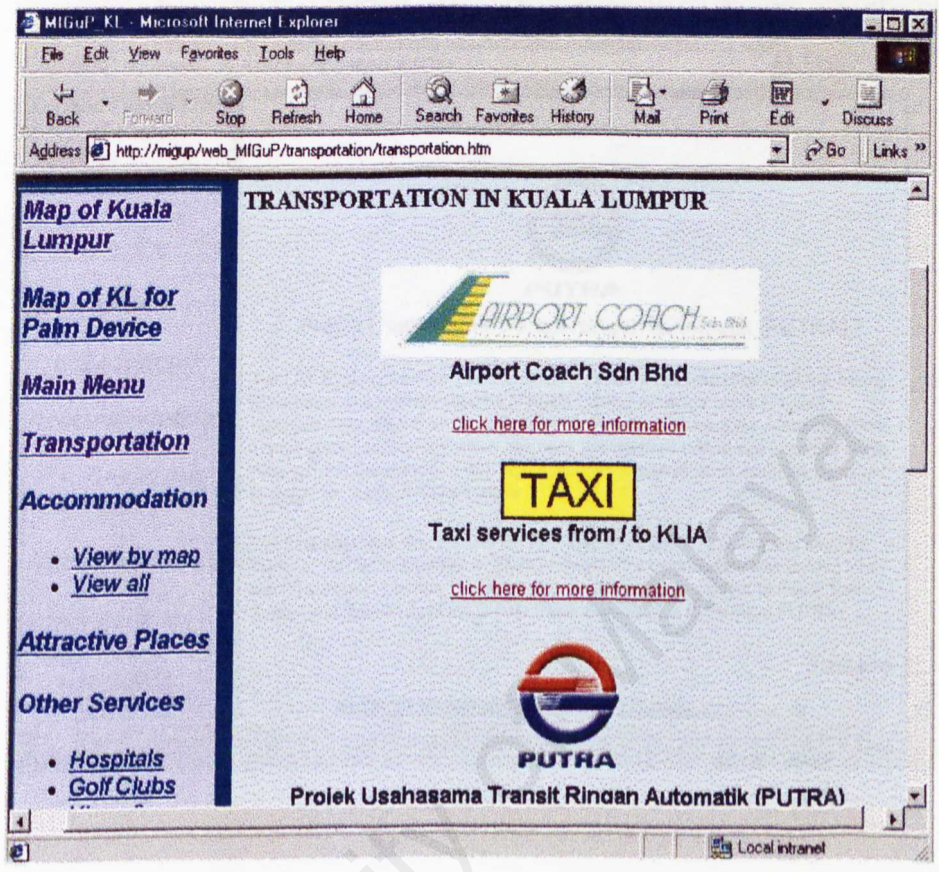


Figure 3.8 Transportation in Kuala Lumpur

This page will display the transportation available in Kuala Lumpur such as taxi, bus, Putra-LRT, STAR-LRT, Commuter and train.

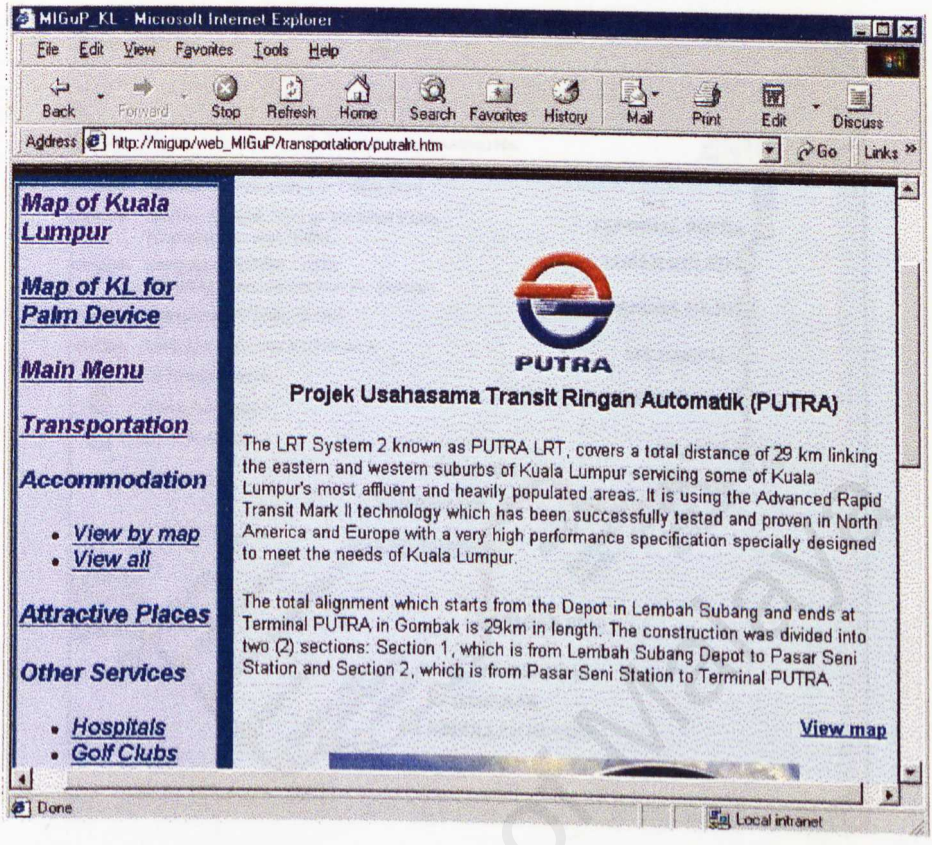


Figure 3.9 Putra-LRT information

If user clicks on the button [View map], the page will display the route map of Putra-LRT.

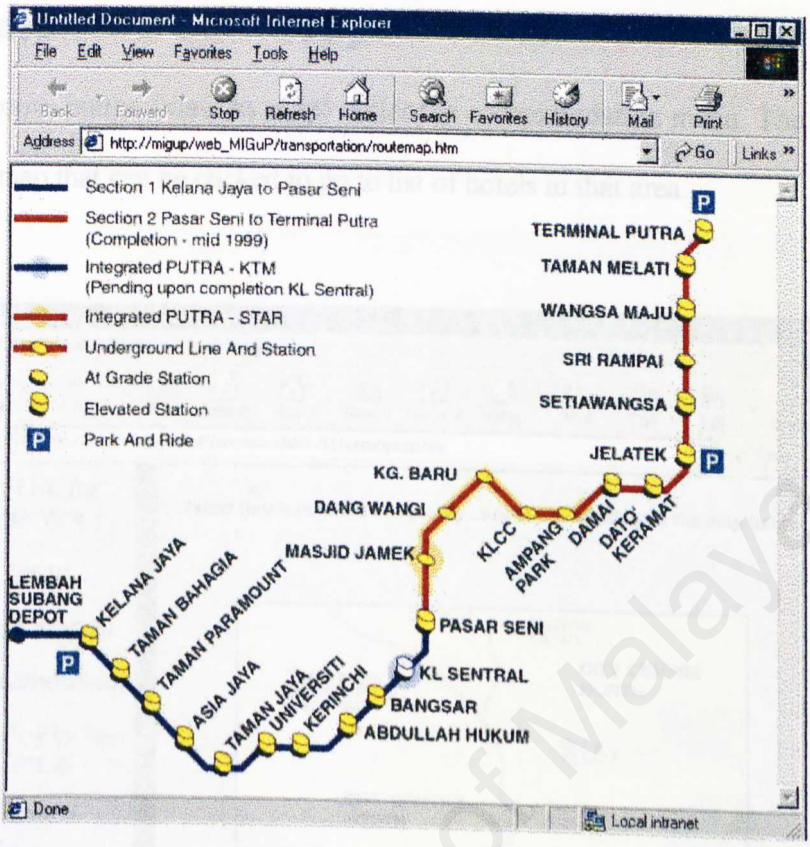


Figure 3.10 Route map of Putra-LRT

Accommodation in Kuala Lumpur

If user choose button [view by map] under the accommodation menu. The page will display a map that can be clicked to go to list of hotels in that area.

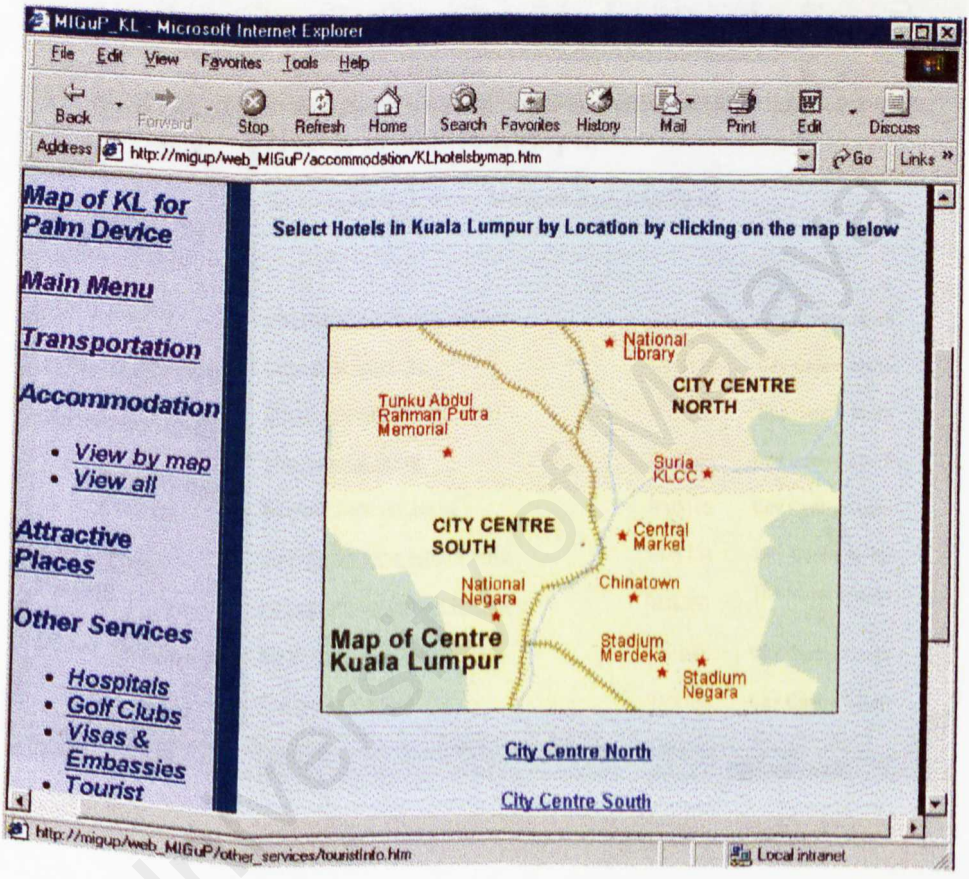


Figure 3.11 View hotels by map page

I user clicks on button [view all], the page will display all selected hotels in Kuala Lumpur.

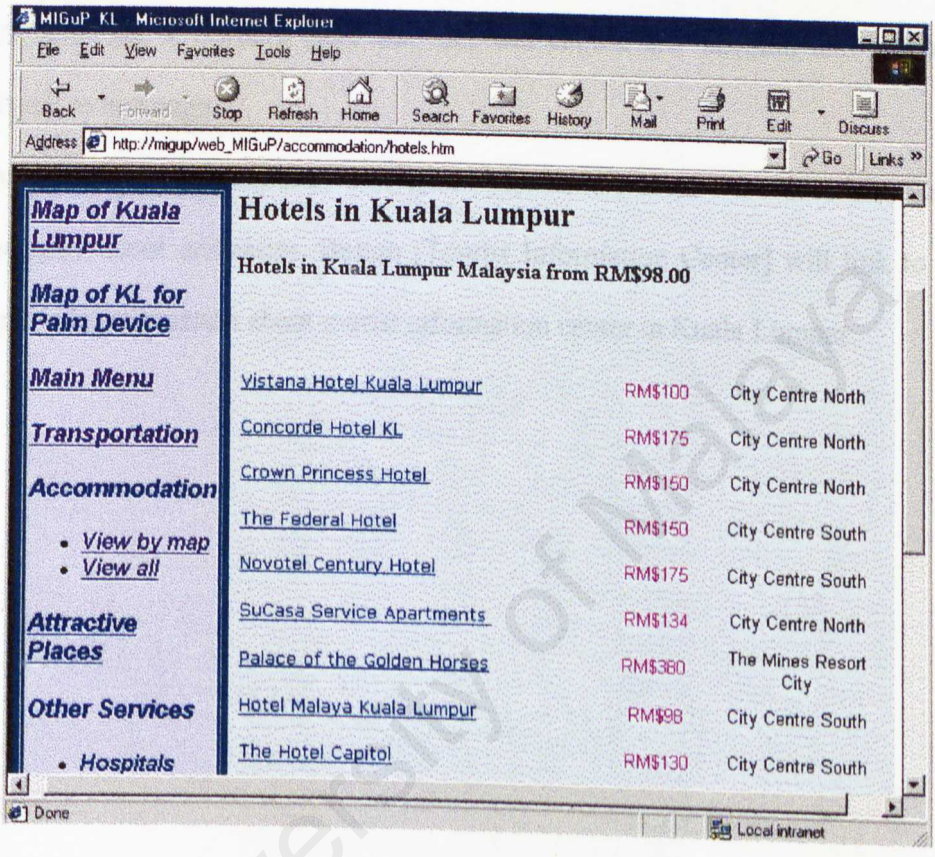


Figure 3.12 View all hotels page

All selected hotels can be clicked and the page of the hotel will be displayed.

Other Services

There are four buttons under other services menu, they are Hospitals, Golf Clubs, Visas and Embassies and Tourist Information Center. Button [Hospitals] and [Golf Clubs] will link to hospital page and user can choose any hospital and golf clubs displayed in that page.

Button [Visas and Embassies] will give information about visa in Malaysia and information about embassies. Button [Tourist Information Center] will link to page that provide information about tourist information center in Kuala Lumpur.

Chapter 4: Manual for Palm Device User

In order to use MIGuP-KL on a Palm device, firstly you need to tap on your browser. Then, tap on the open page icon and type the Web site address of MIGuP-KL into the address bar and press Enter. The URL is

http://migup.web_MIGuP/main/main_page1.htm

Figure 4.1 Palm m505 interface

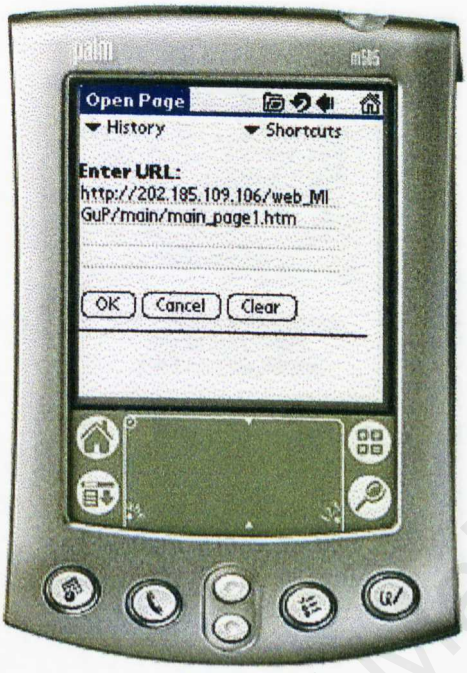


Figure 4.2 Opening MIGuP page

This manual is very similar to manual for personal computer but it has a major difference. The difference is the interactive map cannot be displayed in Palm device. Palm device user must choose the [Map of KL for Palm User] button. Tap on this button and the page will be displayed.

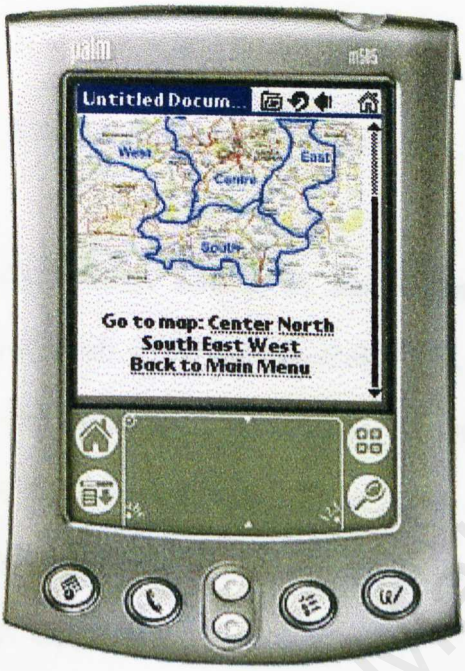


Figure 4.3 Map of Kuala Lumpur

User cannot click on the map because there is no button on it. User must use the button below the map to navigate from one page to another. The information displayed in Palm device is the same as in personal computer.

References

1. **Roster, Lonnon R**. *Palm OS Programming Bible*.U.S.A.:IDG Books Worldwide, Inc., 2000.
2. **Whitten, Jeffrey L., Bentley, Lonnie D. and Dittman, Kevin C**. *System Analysis and Design Methods*. Irwin/McGraw-Hill, 5th Ed., 2000.
3. **Pressman, Roger S**. *Software Engineering: A practitioner's Approach*. Singapore: McGraw-Hill Higher Education, 5th Ed., 2001.
4. **Pfleeger, Shari Lawrence**. *Software Engineering: Theory and Practice*. U.S.A.: Prentice-Hall, Inc., 2nd Ed., 2001.
5. **Maas, Brian and Hillerson, Gary**. *Palm OS Emulator: Excerpt from Palm OS Programming Development Tools Guide*. U.S.A.: Palm, Inc., 2001.
6. Department of Statistic's Homepage

   www.statistics.gov
7. Internet and Messaging Applications

   http://www.palm.com/
8. Malaysia Tourist Arrivals 2000

   http://tourism.gov.my
9. Hotels and resorts in Kuala Lumpur, Malaysia

   http://www.marimari.com
10. Palm OS website

    http://www.palmos.com