Interactive Virtual Directory for Shopping Mall (Suria KLCC)

by

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Dissertation submitted in partial fulfillment of
the requirements for the
Bachelor of Technology (Hons)
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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
Information Technology Programme,
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in partial fulfillment of the requirement for the
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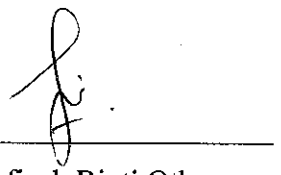
CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the reference and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or person



Norhafizah Binti Othman

ABSTRACT

As Internet-related technology advances rapidly, the number of system presenting information using VR techniques are also increasing to promote better understanding of information. The use of static directory nowadays is still very much lacking and not encouraging as an information provider. This is due its inability provide user adequate quality information in an interesting and interactive manner. The objective of this system is to help shopping mall visitors to know the direction of where they are and where they are going by using simple, intuitive, observable and interactive directory system. With the combination of VR technology and Interactive Directory, an Interactive Virtual Directory for Shopping Mall that provided with adequate information been developed. To form the basis of the system development, a pre-survey questionnaire was conducted to find out customers opinion on static directories. The result of the survey showed that 70% or 35 out of 50 respondents know and understand the VR technology.The results of the analysis provide motivations for the development of the interactive virtual directory system The development of the system is based on the approach proposed by Kulwinder Kaur's design framework which will analyze the requirement and project scope, task and domain of the project, the designation of the environment, designation of user support and navigational tools and also evaluation by determine the prototype and iterative process. The results of an evaluation on the system shows that by having experience on both static and virtual map help user precisely understand the system. However if the mouse click application could be replaced with the touch screen application, it help user to navigate easily. In conclusion, a directory with additional functionalities could be an informative and more usable directory

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ABBREVIATIONS AND NOMENCLATURES

1)	VR	Virtual Reality
2)	EBA	Embodied Conversation Agent
3)	3D	Three Dimension
4)	2D	Two Dimension
5)	PC	Personal Computer
6)	LEO	Low Earth Orbit
7)	PET	Positron Emission Tomography
8)	FMRI	Functional Magnetic Resonance Imaging
9)	RAM	Random Access Memory

CHAPTER 1:
INTRODUCTION

For this chapter, it will consist of background of the project, the problem relate to this project and the objective in developing this project. The Interactive Virtual Directory is developed to replace the traditional directory that locate in Shopping Mall which only provide customers with static information and also limit of information. The detail of this study will explained in background of study. The problem that causes by traditional or static directory nowadays also has described in the problem statement part. Based on both background of study and the problem statement it illustrates the purposes or objectives of the project done. For the project, all the design of the mall been modeled as a prototype where the design could be applied to a larger shopping mall. Limit of time that is not feasible to develop a larger model is one of the points that been discussed in the scope of study.

1.1 Background of study

A directory, catalog, or folder, is an entity in a file system that contains a group of files and other directories. A typical file system contains thousands of files, and directories help organize them by keeping related files together. A directory contained inside another directory called a subdirectory of that directory. Together, the directories form a hierarchy, or tree structure. The directory that relate with this project is about a hierarchical structure of list of shop stores include in a shopping mall. By categorizing the shop into it, preferences such as Fashion Wear group been listed down all the shop that relate on selling attire that is fashionable for all ages.

Nowadays directory design can cause navigation problems in unfamiliar environments. Some sign lack "conspicuity", or visibility, because lettering lacks legibility when viewed from a distance. Others contain inaccurate, ambiguous or unfamiliar messages; many obstructions obscured by or contain reflective surfaces that hinder comprehension. Consequently, many people do not read signs often, which it is easier for them to ask for directions. Static signs might not been observed particularly if they are placed in a visually cluttered environment. In addition, these signs do not have the ability to provide real-time information.

Customers expected to have a directory that could have all broad selection, extensive hours, convenient location and fast, easy and pleasant shopping. Moreover, when it is time to buy, they want purchases to be fast and flawless every time. Today's retailers are looking for solutions to be a vital part of their gaining competitive advantage. In addition to affordability, reliability, speed, security and scalability, today's solutions must provide the functionality and flexibility to change the customer experience as market conditions change. The technology of virtual directories could obviate or at least lessen the need for structuring roles. Not that the concept of roles is bad, but with virtual directory, it is easier way to accomplish the goal by group file into appropriate classes

By locating virtual directory, systems in Information kiosks application will help consumers find products on their shopping list more quickly. There is a certain flexibility offered by a virtual directory that a static data store cannot offer. On the other hand, there is certain stability to a data store constructed on a robust relational database. With the new system user could browse through the mall's complete directory and get all the pertinent information on the store in question. The combination of virtual directory and information kiosk application provide feasibility to public user which allow them to choose the method of viewing the directory in most convenient way.

1.2 Problem Statement.

There are several drawbacks of static directory that been discovered in this study. Current static directory provides user with information statically with symbols, signs or texts. The traditional or static directory only provide customers with basic static data to the customer such as the list of location, location of customers and location of desired shop and compact it in a map. Nevertheless, with the information given statically it does not inform general customers or even regular customers about the location of each shop in the store. With limited of information, customers might get confused on the map designed on static directory because customers do not perceive enough information from the directory. Mostly they prefer to ask for directions that could help them better in understanding the location desired rather then getting puzzled with symbols and text.

Most customers want to know what type of stores existed in the shopping mall and the latest promotions for each stores in the shopping mall. In adequate information on the stores locate in the mall does not help customers to trigger changes in purchase behavior unless the directory itself provides customers with the latest advertisement of the stores. If the information regarding the shop desired provided does not improve understanding, it might lessen the opportunity for the customer to shop in the mall again. If surroundings video of stores provided it could help customers with unlimited information of selected shops on what they sell and provide. This could increase the depth of understanding for all level of customers; youngster, middle ages, elderly and disabled peoples.

Another problem encountered with static directory is the way it presented to the end users. Mostly customers are not interested to have the static directory as their references because of its static and monotony appearances. Lack of interactivity presents the most dramatic drawback for almost all other forms of directory. Directory could provide interactivity if it gives the chance for customers to experienced a walkthrough of the map to guide user to the desired shop might leaves a lasting impression, can be thought provoking, and impacts purchase behavior. If the directory could provide user with full

information, interactivity and able to educate customers, there is no need for the mall to have information counter as directory references.

1.3 Objective

Most shopping mall customers comprises of youngsters, family group members, senior citizen, and disabled people and foreign tourist. Several factors need to taken into consideration in defining the objectives of this project such as ability to perceive information from the end product, the level of understanding when dealing with the product and the level of interest to trigger the product.

The objectives of this project are:

1. To develop an Interactive Virtual Directory Shopping Mall System that could provide end user with simple, intuitive, observable and predictable directory that could help customers to know where they are and where they are going.

2. To integrate the HCI design guideline with the interface design of the system that could improve high level of understanding and depth of information perceived that meet all level of citizen including youngsters, middle ages, elderly and also disabled people by increase sense of presence using virtual environment.

3. To include adequate information and other features that could help to educate end user with the system and give them the ability to interact and experience to traverse the map virtually.

1.4 Scope of Study

In developing the project, there are several limitations has been observed. Generally the target users for the system are public customers which usually the shopping mall visitors. Most of shopping mall visitors consist of youngsters, middle ages, elderly and disabled people and tourist. In order to develop the system it needs features and functions that could be understood and observable by these types of users.
The scope of the system been divided into two main points describe as below:

1. Virtual Environment of the system

The system structure has been designed same structure as the actual shopping mall. For this system, Suria KLCC had taken as an example to develop the directory. Most of the structure will consist of the Stores Environment, which has various type of block that locates the listing shops in the mall. In the system also will provide one section, which provide with 3D animation of building structure. With those features could help user to view the overall location of the user and the desired stores. The system also provide user with route of location that show the path of the tour.

2. Navigational from user

The Interactive Virtual Directory Shopping Mall System provides end users to communicate with the product. By having selection of the stores listing, give users opportunity to explore and navigate with the systems button and text links. The system also allocates a section that allow user to view the environment or surroundings of particular stores in order to understand what type product they sells. User are able to move the view left, right, forward and backward by clicking on the appropriate button. The system also allow user to select the type of map to view either the 2D-animation map or virtual map.

1.4.1 The Advantages of the system

The system developed has several advantages that could solve the problems of nowadays directory. 2D-animation map and Virtual map could help to increase the level of presence, which could increase the depth of information perceived when the customers experienced the route themselves.

The information about the stores gathered were managed and classified in several classes, which it help user to explore and navigate with the system. By having proper and manageable system and information, it could help in increase level of understanding of end user.

The system that provides user the ability to communicate with the system could increase the level of interactivity between the customers. With this functionality, the directory system is able to provide customers with better information regarding the places they desired to go.

1.4.2 The Limitation of the system

The focus of this project is to have the simplest, intuitive, observable and predictable directory system that could help all level of shopping mall's customers to navigate. Due to time constraint, the following are the system limitations:

1. The design of the system is just a prototype that it can be applied to a larger mall. The reason having it as a prototype because the limit of time given which is not feasible to develop a full system for a mall.

2. The Virtual map only allow user to view the path or route to the location they desired. User is unable to navigate with the map or move the view, as they desired.

3. The system planned to be applied with touch screen application but meanwhile in getting the sources the system usage is limited to the use of a mouse as the navigational tool. It also will be run as a desktop application.

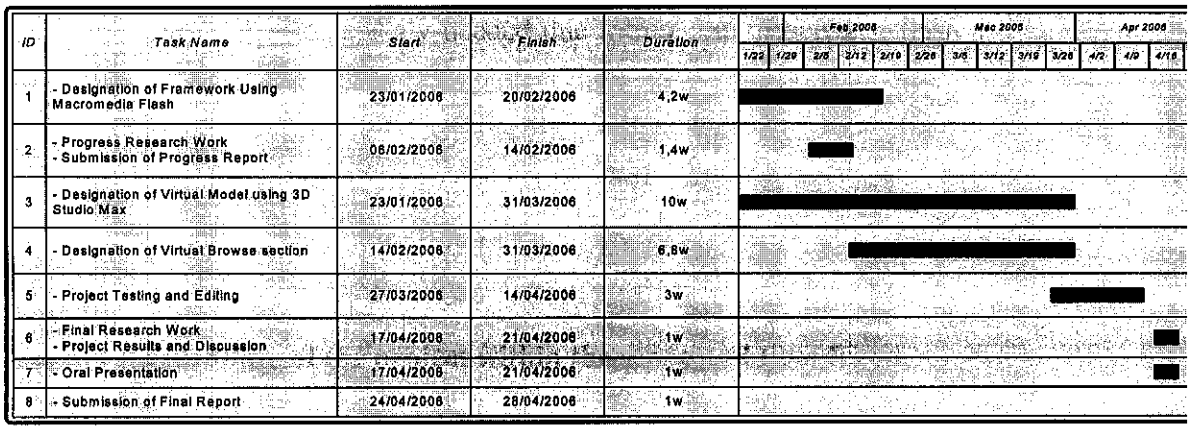
4. Currently it is difficult for the system to restructure when there are any changes of stores locations in the system. The system need to update the changes of the latest information on the mall.

5. The system compatibility only suitable to applications that have higher RAM capacity. Large capacity needed due to integration between flash animation and virtual walkthrough, which consume large amount of memory.

6. Inability to perform Virtual Browse due to incompatibility of 3D Engine application to combine with Macromedia Flash.

1.4.3 Feasibility of the project within the scope and time frame

For this project, the time given is around 6 months. Figure 1 show the entire workflow for the project development. Activities involved research of writing paperwork, three phases of system development multimedia phase, virtual phase and integration of both phase and system testing and editing. (A detail Gantt Chart is attached in APPENDIX I):



ID	Task Name	Start	Finish	Duration
1	- Designation of Framework Using Macromedia Flash	23/01/2006	20/02/2006	4.2w
2	- Progress Research Work - Submission of Progress Report	06/02/2006	14/02/2006	1.4w
3	- Designation of Virtual Model using 3D Studio Max	23/01/2006	31/03/2006	10w
4	- Designation of Virtual Browse section	14/02/2006	31/03/2006	6.8w
5	- Project Testing and Editing	27/03/2006	14/04/2006	3w
6	- Final Research Work - Project Results and Discussion	17/04/2006	21/04/2006	1w
7	- Oral Presentation	17/04/2006	21/04/2006	1w
8	- Submission of Final Report	24/04/2006	28/04/2006	1w

Figure 1: Project Workflow – Gantt Chart

CHAPTER 2:
LITERATURE REVIEW AND THEORY

In this chapter discussed on the detailed of information kiosk and its model and differentiated it with information booth and its structure. Next study discussed in identifying an intuitive interface that suitable for public customers. In this study, it focused on the theory of Embodied Conversation Agent (EBA) and MACK System, which it helps in 3D customers interface. The third study was discussed on the Shopping Mall Kiosk Information and how it could enhanced for future used. After focused the study on the product, next continue with human factor issue that could relate to the development of this product. At first, it discussed on how human mind can perceived better with experience. Next it focus on how interactivity could enhanced human performance on a navigational

2.1 Information Kiosk

In order to bring information within the reach of more customers, the "information kiosk" model is a useful alternative to the telecenter model: information kiosks are shops where people request information and have a professional complete that request. These professionals henceforth referred to as "information specialists" are experts at finding and retrieving information principally online. Through the medium of the information specialist, people are therefore able to access the information they need even though they are unable or unwilling to develop the capacity to access the information themselves. This information could be on any number of topics and all segments of the public would be able to use the kiosk's services [5].

The basic information kiosk could be further strengthened the research such as figure below.

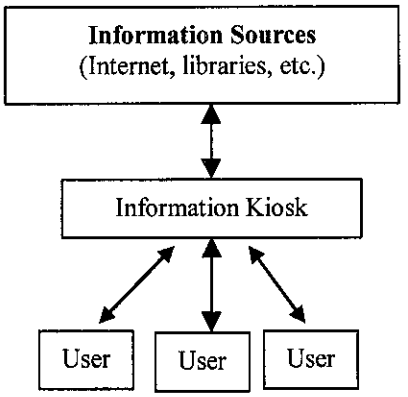


Figure 2: Information Kiosk Model

Instead of the local information kiosk processing the information request, the request is emailed to a central location where more experienced staff with access to greater resources in processes the request. A number of field information kiosks could be supported by a single research center. In situations where connectivity or capable information specialists are unavailable at the local level, this model may be more appropriate

This assisted-access concept is relatively new and the references to it in the literature are limited. However, a number of village knowledge centers have been established in India on June 1999. Furthermore, there are a number of companies who are providing similar information provision services to people in developed countries via the Internet. There is even a title of "cybrarian" for those who specialize in finding information online professionally.

2.1.1 Information Booth Structure

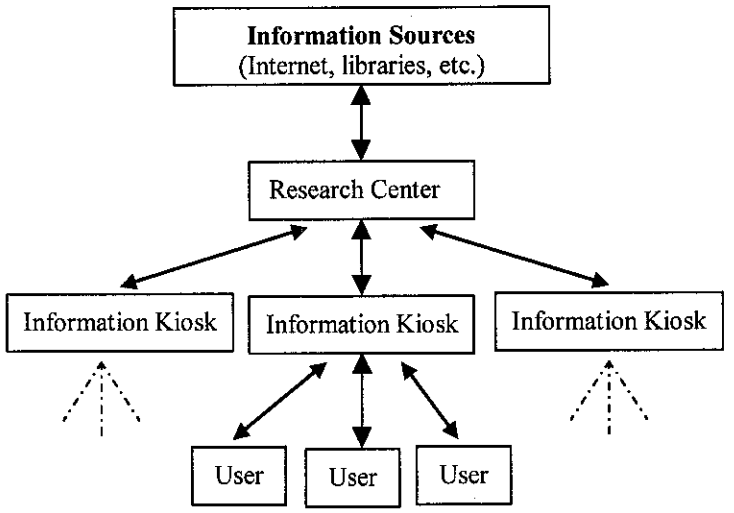


Figure 3: Information Kiosk with Research Center Model

These booths could be staffed by a single individual with a PC, printer, and some form of Internet connection. The local information specialist could send information requests via email across existing information infrastructure or download them to a low earth orbit (LEO) satellite on a daily basis and receive completed requests on a similar time scale, thereby allowing this person to meet the information needs of the local community and surround areas. Training would be limited since the staff member is merely encoding the local customers' requests and transmitting that request to another information kiosk that would serve as a research center.

In general, telecenters focus on providing computer access and training opportunities whereas information kiosks are designed to meet the information needs of the individual through an assisted-access framework. However, the similarities between the two models allow us to learn from the telecenter example to improve and develop the information kiosk concept.

2.1.2 Advantage of Information Kiosk

1) Saving on Training Costs and Time

Accessing information online is not trivial and a number of skills need to be developed and honed before it can be accomplished with any degree of accuracy: Each of these steps requires time, money, and qualified teachers, and all of these are in short supply in developing countries. In contrast, the information kiosk model is based on the theory that training a single individual to the expert level and retaining this person to staff an information kiosk would provide much greater information access and be efficient than attempting to train a number of individuals to proficiency.

2) Minimizing Connectivity and Hardware Costs

The information kiosks model would lower the costs of obtaining information since the information specialist would be able to find high quality information substantially faster and thus more cheaply, than the average customers. Information specialists would also be able to use the hardware and connectivity more effectively than periodic customers. It is conceivable that two or three shifts of these information specialists could work on the same computer, thus increasing the investment return on the hardware and connection. Furthermore, information specialists could better use the hardware time more efficiently than proficient or incompetent customers.

2.2 Intuitive Customers Interface for Public Customers

The old-fashioned information booths in railway stations, department stores and museums had one significant advantage over today's information kiosk: staff members could rely on the physical space shared with a visitor in order to give directions, describe travel and spatialize relationships among places and things. Railway personnel pointed out the proper train platform; department store greeters unfolded store maps to give directions to shoppers; and museum staff illustrated the size of the dinosaurs in the great hall. An intelligent kiosk that integrates the face-to-face strengths of information booths with the self-sufficiency and accuracy of information access stations by incorporating an Embodied Conversational Agent (ECA) into an information kiosk.

2.2.1 Embodied Conversational Agent (ECA)

ECAs have served as animated pedagogical agents that taught students procedural tasks in simulated environments [8]. Research indicates that such animated agents provide key benefits that enhance learning environments. One such benefit is that embodied agents serve as valuable navigational guides that can direct students and show them how to get around. Virtual 3D learning environments represent a further advance in navigational guidance by helping students develop spatial models of the subject matter [6]. ECA Kiosks were conceived with this in mind, as a logical extension of ECAs as navigational guides in virtual worlds. However, instead of immersing the ECA in a 3D virtual world, ECA Kiosks immerse both system and customers in the actual physical space, allowing them to interact within the shared physical and informational reality they are referencing.

2.2.2 MACK System

In designing and creating MACK, an ECA Kiosk, we had three primary requirements:

1) Real-time multimodal input as a basis for natural face to-face interaction.
2) Coordinated natural language and gesture generation.
3) The ability to reference physical reality. Hence, the system must be aware of its location and orientation, as well as the layout of the physical building.

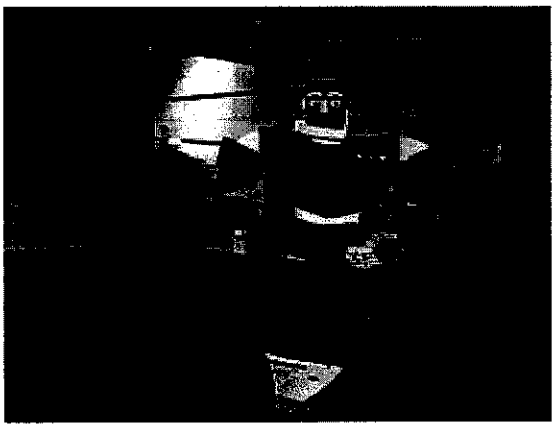


Figure 4: Customers interacting with MACK.

2.2.3 Advantages of ECA as 3D customers interfaces

Provide a system that is more flexible, allowing for a wider diversity in customers. ECAs allow for hands-free multimodal input and output (speech and gesture), which produces a more natural, more intuitive interaction [9]. These communication protocols come without need for customers training, as all customers have these skills and use them daily [10]. Natural language and gesture take full advantage of the shared environment, which creates a spatial bridge between the customers and the agent.

2.3 Shopping Mall Kiosk Information

Refer to the NTG Clarity Networks Inc; In Mall Kiosk Information has been invented during the year 1998 and 1999. The main function of the application is a central server and information that selectively download to the kiosk in the malls. The kiosk itself is a standalone structure containing of computer which provide alternative way for customer to become aware of news, information and services in the mall. The components that consist in Kiosk application are as below:

i) Front-end mall kiosk

For front-end mall kiosk is a customer interface that might used multimedia approach or touch screen application. The subsystem of this application is as below:

a) Advertisement Engine

The system displays advertisements when the kiosk is idle or when customers goes to one screen to another. This generates an interaction between customers and the system even though the system is idle; it might attract the customer nearby to use the application.

b) Search Engine

Necessary interface to allow patrons to search for information about the tenants or shop and their products

c) Information Engine

Provide requested information dynamically with multimedia capabilities.

d) Contact Facilitator

Facility to contact via hands free phone a shop's manager as well as the attendant of the customer information service booth.

ii) Back-end information maintenance

A Back-en Information Maintenance is the services that might get affected to the customers when they use the applications. Several advantages that they might gathers during the exploration on Kiosk Information are such as:

a. Customers are able to update tenant's information
b. Customers are able to update product information
c. Customers are also able to update the advertisements
d. A replication subsystem provides the mechanism too synchronize the mall's information stores with that of the central server

The ability to get the updated information from the kiosk is the most wanted services by customers. Customers does not have to go for tour the whole mall to gather the updated information such as sales on certain stores or the new opening of stores.

2.3.1 Enhancement for Shopping Mall Kiosk Information

According to the NTG Clarity Network Research, an innovative enhancement of the development of this kiosk is by including the application that enables the kiosk to find a particular store within the mall. Software on the kiosk's computer displayed a map of the mall on the screen. Map traversal algorithms were provided to show the customers most convenient route to the desired location even the routes involved more than one floor.

2.4 What is Virtual Reality?

2.4.1 Virtual Directory (Virtual Tour)

Virtual Reality is a computer simulation of a real 3-dimensional world, often supplemented by sound effects. These computerized images can be simulated in any environment made an existence of sense of presence in an environment. This definition was taken from the Web Definition where it illustrate the ability of the VR to making user feel like their really in the situations. Virtual Reality will likely be defined as a 3D engaging, engaged, and intelligent computer-simulated ecology. Surrounding engages human senses with enough breadth and volume to give the participating human a subjective sense of being encompassed by the simulated ecology instead of viewing the simulated elements as incidental parts of the dominant real-world environment. This does not require that the human believes that the virtual environment is a real one, but does demand that the human behaves in enormous measure as if the virtual ecology were real.

Virtual reality can additionally be a colossal aid for invention in the fields of engineering and manufacturing, architecture and construction, biotechnology and nano-pharmacology, chemistry and molecular modeling, medical care and bionics, the garments industry, and the fine arts. Three-dimensional models of molecules and biologic patterns may be assembled and manipulated virtually. Electronics will likely be assembled and tested without creation of a physical prototype. Virtual modeling clay will likely be shaped into various forms for either aesthetic or functional purposes

When you are planning a vacation or business trip, a simulated tour can give you a much better sense of what you will experience at a destination than the information provided by a web page with a couple two-dimensional, non-interactive pictures. Like artificial home tours, the majority of virtually reality vacation tours are yet not completely three-dimensional or immersive, but they are increasingly two-way and progressing in the direction of more being surrounded. Virtual vacation tours

incorporate tours of cruise ships, resort hotels, cities and towns, parks and scenery and different tourist attractions.

2.4.2 How Human Perceived Information From Virtual Reality?

Humans communicate with data processors in a lot of unique ways. Each time one looks at a digital watch or listens to a CD, one is interacting with a machine. In order for the boundary of this interaction to cross over into synthetic reality, the computer-simulated elements must become perceptually dominant over the real-world elements. For example, when a human views a standard-size project screen within the real world, the machine screen vision is only an incidental feature of the dominant real-world ecology. However, if the screen is sufficiently large and curved to improve upon a high percentage of the total human subject of vision and the image that it projects responds naturally to human motion, then the data processor vision becomes perceptually dominant. If various senses are also engaged, then the latter moves into the realm of artificial reality

In order to successfully perform sensory envelopment of a human within a synthetic reality environment, the virtual reality system must attract key human senses in a realistic and synchronous fashion. The most important senses by which humans receive material related to their surroundings are sight, hearing, and feel. Thus, these are the main parts of current VR systems. If sensory input from these sources is not orchestrated, then envelopment will not be achieved. For example, latency between position determination by the inner ear and place determination by vision will erode the feeling of envelopment in a realistic biosphere. Similarly, lags or disconnects between handle and hearing or between hearing and vision also induce problems. Such lags induce disorientation and nausea.

2.4.2.1 Two-Dimension image (2D) vs. Three-Dimension image (3D)

Large hypermedia information systems that do not provide users with appropriate guidelines or "big picture" make comprehension of the information difficult because the user will have fewer mental resources directed toward the interpretation task since they need to focus on re-orienting themselves within the surplus links of information [24]. In many cases with large hypermedia systems, users must adapt to the information system to get around or have enough previous browsing experience to retrieve information they need.

There is an analysis done by Paul Kim from University of Southern California which it purpose to discover the effects of routing variation during experiencing two distinctive navigation system which are the 2D link based navigation and 3D spatial navigation. There are several characteristics focuses in this analysis which include of the ability to perceive different degrees on disorientation, cognitive capacity, navigational difficulty and conception and preservation of Information perceived.

Based on the analysis it divided into two group of control design which is the 2D navigation system by using Conventional link-based hypermedia and 3D spatial navigation system by using VRML-based spatial navigation system.

The analysis indicates that there two factors occurs significant differences which are the perception of navigation difficulty where VRML 3D pages scored higher with ($F(1, 32) = 5.625$, $p = .024$) while performing retrieval task. However 3D pages have high preservation information where in the retention test 3D group scored higher than 2D group. This shows that the ability of VR or 3D images to have high perceiveness in human memory. While for others factors it does not shows any significant difference in the perception of disorientation and cognitive load while performing information retrieval tasks and comprehension after performing the information retrieval tasks[24].

Below are the results of the analysis taken from the literature research:

		Sum of Squares	Df	Mean Square	F	Sig.
Perceived Disorientation	Between Groups	8.015	1	8.015	2.132	**.149**
	Within Groups	[illegible]	[illegible]	[illegible]		
	Total	233.548	61			
Perceived Cognitive Load	Between Groups	6.470E-02	1	6.470E-02	.059	**.810**
	Within Groups	[illegible]	[illegible]	[illegible]		
	Total	36.286	34			
Perceived Navigation Difficulty	Between Groups	35.038	1	35.038	5.625	**.024**
	Within Groups	[illegible]	[illegible]	[illegible]		
	Total	234.382	33			
Comprehension	Between Groups	2.931	1	2.931	.635	**.429**
	Within Groups	[illegible]	[illegible]	[illegible]		
	Total	279.742	61			
Retention	Between Groups	392.259	1	392.259	8.186	**.006**
	Within Groups	[illegible]	[illegible]	[illegible]		
	Total	3267.500	61			

(Effects of 3D spatial navigation on perception and performance by Paul Kim, Ph.D. University of Southern California)

Figure 5: **Conventional link-based hypermedia vs. VRML-based spatial**

In the survey the use of mouse during the navigation found it difficult to navigate the 3D web site because of the limitation of conventional mouse. The attractiveness level between 2D navigation and 3D navigation are revealed when most of the subject more interested in routing or touring the VRML 3D system rather then the 2D system, it shows in the analysis of the comprehensive and retention test done. As a conclusion it shows that 2D navigations is suitable during a high task of cognitive load but without any comprehensive and retentions in the navigation, it could not help user to understand more on the information retrieve. In the future, with the combination of 2D advantage with 3D help in order to unravel drawback from both navigation, development of a productive system could be done.

2.5 Human perception – How Human Perceived Information?

Human perception greatly affects human cognition of the world. In everyday lives, the world is not even as important as human perception because it does not only what human see exactly but what is actually out there. What human perceive based on their past experience. Human image of themselves is not the absolute truth; it too is perception based on past experience. Different people, on the other hand, perceive the world in very different ways.

Human understanding, at least of the human world, stems by a large part from human perception, more specifically their mind. How truthful, how close, that perception is to what we are really like determines how much we understand about ourselves and other people. If, from day to day, we see ourselves in a false and usually negative way; if we tell ourselves we are stupid, lazy, etc. we will look at other people in the world and have only confusion. If we are positive and true when we think about ourselves, we will understand ourselves and others much more clearly and understand why we and they do the things we do.

2.5.1 Human perception in scientific point of view

Advances in neuroscience are confirming theoretical positions advanced by developmental psychology for a number of years, such as the importance of early experience in development [22]. What is new, and therefore important for this volume, is the convergence of evidence from a number of scientific fields. As the sciences of developmental psychology, cognitive psychologies, and neuroscience have contributed vast numbers of research studies, details about learning and development have converged to form a more complete picture of how intellectual development occurs.

Clarification of some of the mechanisms of learning by neuroscience has been advanced, in part, by the advent of non-invasive imaging technologies, such as

positron emission tomography (PET) and functional magnetic resonance imaging (FMRI)[21]. These technologies have allowed researchers to observe human learning processes directly.

Overall, it depicts an orchestrated pattern of increased capacity in the brain that depends on experience. This external information is even more important for later cognitive development. The more a person interacts with the world, the more a person needs information from the world incorporated into the brain structures.

2.5.2 Memory and brain process

Memory help scientists understand learning come from two major groups of studies; (1)studies that show that memory are not a unitary construct and (2)studies that relate features of learning to later effectiveness in recall.

Memory is neither a single entity nor a phenomenon that occurs in a single area of the brain. There are two basic memory processes: declarative memory, or memory for facts and events which occurs primarily in brain systems involving the hippocampus; and procedural or non-declarative memory, which are memory for skills and other cognitive operations, or memory that cannot be represented in declarative sentences, which occurs principally in the brain systems involving the neostriatum[21].

Different features of learning contribute to the durability or fragility of memory. For example, comparisons of people's memories for words with their memories for pictures of the same objects show a superiority effect for pictures. The superiority effect of pictures is also true if words and pictures are combined during learning. Obviously, this finding has direct relevance for improving the long-term learning of certain kinds of information.

Research has also indicated that the mind is not just a passive recorder of events; rather, it is actively at work both in storing and in recalling information. There is research demonstrating that when a series of events are presented in a random sequence, people reorder them into sequences that make sense when they try to recall them. The phenomenon of the active brain is dramatically illustrated by the fact that the mind can "remember" things that actually did not happen [20].

2.5.2.1 Memory and experience impact

In view of the fact that experience alters brain structures and that specific experiences have specific effects on the brain, the nature of "experience" becomes an interesting question in relation to memory processes. These points about memory are important for understanding learning and can explain a good deal about why experiences are remembered well or poorly. Particularly important is the finding that the mind imposes structure on the information available from experience.

This parallels descriptions of the organization of information in skilled performance discussed as one of the primary differences between the novice and the expert is the manner in which information is organized and utilized. From the perspective of teaching, it again suggests the importance of an appropriate overall framework within which learning occurs most efficiently and effectively.

Acts of memory involves different ways of remembering, and each of them has a different significance and meaning. Human memory also looks different when viewed from various human perspectives. Much of modern neuroscience has attempted to integrate the study of the mind and the brain; and at least one prominent neuroscientist sees the study of memory as the "Rosetta Stone" that is, as a way to translate between the biological workings of the brain itself and the subjective experiences of those whose brain is at work or malfunctioning[19].

2.6 Interactivity enhanced Human Performance

Interactivity in learning is "a necessary and fundamental mechanism for knowledge acquisition and the development of both cognitive and physical skills" [17]. Interaction is intrinsic to successful, effective instructional practice as well as individual discovery. The implementation of interactivity can be perceived as an art because it requires a comprehensive range of skills, including an understanding of the learner, an appreciation of software engineering capabilities, the importance of rigorous instructional design and the application of appropriate graphical interfaces.

Dynamic interactive maps with powerful interface capabilities are beginning to emerge for a variety of geographical information systems, including ones situated on portables for travelers, students, business people, and others working in field settings. In part through the design of more expressive and flexible input capabilities, these map systems can provide new capabilities not supported by conventional interfaces of the past.

In this research, interfaces supporting spoken and multimodal input were analyzed for their effectiveness in interacting with map systems. Input modality and map display format were varied as people completed realistic tasks with a simulated map system. The results identified a constellation of performance difficulties with speech-only map interactions, including elevated performance errors, lengthier task completion time and more complex and disfluent input problems that declined substantially when people could interact multimodally.

These difficulties also mirrored a strong customer preference to interact multimodally. The error-proneness and unacceptability of speech-only input to maps was traced to people's difficulty articulating spatially oriented descriptions. Analyses also indicated that map displays can be structured to minimize performance errors and disfluencies effectively. Implications of this research are discussed for the design of high-performance multimodal interfaces for future map systems.

2.6.1 Is it Multimedia interactive?

Multimedia is communication that uses any combination of different media; it may or may not involve computers. Multimedia may include text, spoken audio, music, images, animation, and video. The essential implication which can be drawn from this description is that multimedia itself is not inherently interactive. In fact, multimedia represents no significant challenge to developers who understand that quality in an instructional resource is a function of the design effort, not the technology. It is the use of the products which integrate multimedia elements where interactivity becomes important.

Interactivity is generally at a basic "point and click" level for kiosks and information applications, whereas games and educational products require a higher degree of interactivity. This is not to say that basic interactivity is inappropriate, but rather that the level of interaction may not be adequate or relevant to facilitate the acquisition of knowledge or the development of new skills and understanding.

2.6.2 Increase perception on interactivity

The process of examined a range of options for interactivity, based on the desire to continue to develop better understanding of implementing effective instructional technology applications. By focusing on instructional design, graphic design and communication design to implement interactions which will motivate and engage the learner, the on-going success of functional and effective interactive instructional applications is assured.

Interactivity enhances human performance on a navigational training task under normal workload condition. When the workload increased and mental rotation demands were recruited, individual trained in the interactive condition performed less effectively than those who studied a map. This suggest that interactivity is beneficial to the extent that it is maintained within human processing limitation.

Thus the benefit should not be assumed. Designers should recognize that interactivity brings with it increased workload demands that could negate its ability to enhance human performance.

Based on Spector reminds us that "making automated learning environments highly interactive is a multi-disciplinary art ... however, the level of interactivity as measured on anyone's scale does not approach the level of interactivity in a human tutoring situation." [18]. Challenge is to make best use of the technology, not to replicate human behavior and communication, but to enhance human-computer communications and this is what interactivity is all about.

CHAPTER 3:
METHODOLOGY

This section describes detail of method that will be used for the entire development project. This section consists of four subtopics known as pre-survey data analysis procedure identification, tools used and design concept. To identify the rationalization of the system, a pre-survey has been done to gather data from random respondent. From the analysis proves that most of shopping mall visitors would like to have enhancement on the current directory. For procedure identification based on the Kulwinder's Kaur theory of method, which consist of five stages known as System requirement and scoping, Task and domain analysis, Designation of Virtual Environment, interaction and customers presence analysis, Designations of customers supports and navigational tool and evaluation. The other subtopic which is tool used define the software and hardware that will be used for the development of this product. In this chapter also included design concept consist of combination of system interface resulted into a storyboard.

3.1 Pre-survey Data Analysis

Based the literature review, a pre-survey was conducted to identify the interest of user in having virtual reality as directory device. In order to do this task, a pre-survey has been done on January 2006, where it takes places in the Suria KLCC Shopping Mall. The target subject for this survey was the public customers in that mall. Each subject was given pre-survey questions regarding experience in exploring a mall, experience with directory navigations and knowledge on Virtual Reality technology. The pre-survey indicated that the subjects were randomly selected from any level of ages which evaluate in terms of directory navigation and experience.

From the pre-survey done, an analysis has been performed on the data taken randomly which consist of 20 person ages between 17 to 25 years old, 15 person ages between 26 to 35 years old, 10 person ages between 36 to 45 years old and 5 person ages between 46 years old and above (*see Figure 6*).

Figure 6: Findings – Pie Chart of Total Respondent

The analysis indicates that subject mostly know the static directory well and have experience in navigating with it. This proven through the pre-survey where 99% of the respondent show they are familiar with the directory system. The survey also collected customer opinion on the attractiveness of the directory system. Results shows that 68% voted as less attractive, 20% as moderate and 12% as very attractive (*see Figure 7*). This indicates that the static directory might not attract customers in gathering information as they rather go to the information counter to ask for information.

Q7: How do you find the service attractiveness?

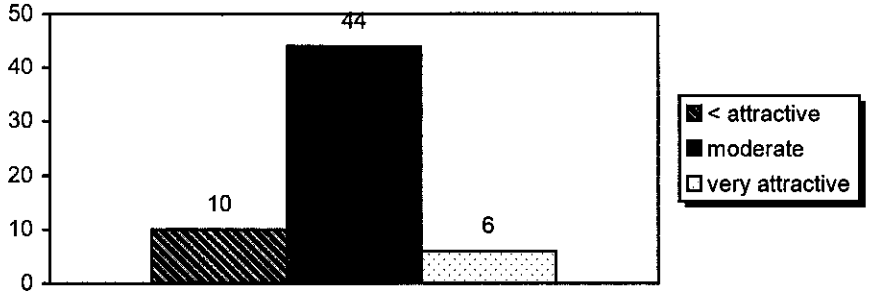


Figure 7: Findings – Bar Graph of Attractiveness Level of Static Directory System

Other reasons why customers might not choose directory as their references because they felt that the system does not provide them with much information that they needed. However the survey result indicates customers are split in regarding the information content of directory system. This means 50% support for less information provided and the other half for lot of information provided.

Figure 8 show that only a few customers find the static directory attractive. Analysis and results shows that most customers are not willing to choose static directory because it consist of complicated symbols or signs which hard to be understand. Customer's opinion also shows that static directory has no proper arrangement which make it difficult for customers to navigate easily. This is proven in the statistical analysis when the respondent voted 68% as moderate, 28% as hard to understand and 4% as easy to understand.

Q6: How do you find the service, is it understandable?

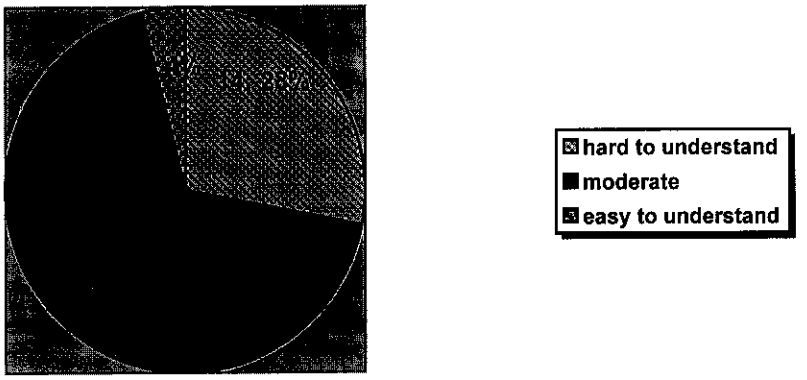


Figure 8: Findings – Pie Chart Level of Comprehensiveness

In the end of the pre-survey, there is question about respondent knowledge and experience on Virtual Reality Technology. With the development of technology nowadays, most of citizen distinguished with the existence of Virtual reality Technology but less of them do not know the actual function that could provide using that technology. As in the analysis it indicates that 70% of the respondent know and understand the technology but only 30% of them are not. The minor percentage is mostly gathered from the respondent in the ages 36 and above. (*see figure 9*)

Q12: Have you heard about Virtual Reality?

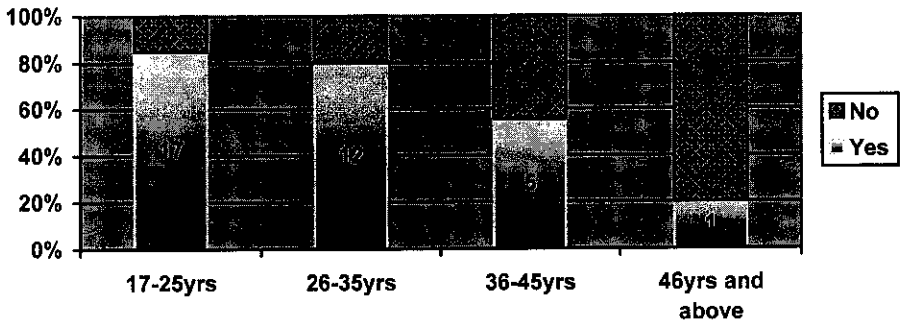


Figure 9: Findings – Stacked Graf Level of Experience in VR Technology

From this survey the respondents agree on any revolutionary in the current directory system into a better technology. This is because of the growth of technology in Malaysia and most of the citizens are aware and eager to explore new technology challenges. This is shown in the analysis where respondent were 100% voted to have changes in current directory system. (see *figure 10*)

Q:15 Do you think that nowadays directory need to be enhance?

Figure 10: Findings – Pie Chart of Willing to Improve

Based on the pre-survey and analysis that has been done shows that static directory needs some changes in order to meet the needs and desires from the expected customers. Without any changes, the existence of directory will be visible to the customers where they might not recognize its functionality. With the combination of Virtual Reality and Interactive Directory could helps in solving those problems that encountered from Static Directory.

3.2 Project Development

3.2.1Procedure Identification

The design of the system is based on the approached proposed by Kulwinder Kaur's design frameworks which are System Requirement and Scoping, Task and Domain Analysis, Designation of Virtual Environment, Interaction and Customer Presence Analysis, Designation of Customer Support and Navigational Tool and Evaluation. The framework consist of five stages in determining the method of designing interactive, immersive and imaginations of system based on the integration of interactive multimedia of 2D applications and virtual Reality of 3D applications.

3.2.1.1 Stage 1 – System requirement and scoping

To start the project, first the requirements for the project need to be identified. As the objective of this project, it should meet the acceptance level by provide end customer with interactive end product which are understandable and observable. The product also must show its functionality to provide customer with enough knowledge on how to get into one location. By having the ability to provide enough knowledge to end customer it give the system to gain advantages to achieve high level of understanding and depth of perceived for all level of citizen by increase sense of presence using virtual environment.

In order those objectives stated, end product should have ability of the system to search the required link in second. This is one action of interactivity between customer and the end product which give ability for customer to interact which could increase level of attractiveness and also understanding. The project should meet the scopes which are simple and intuitive interaction where all types of citizen could easily used the application. By include a level of customer's presence in the application using Virtual Environment applications and also 3D images also could improve level of perception by customer.

3.2.1.2 Stage 2 – Task and Domain Analysis

3.2.1.2a Task Analysis

In task analysis section discussed on collection of service and action which it locate several activity in particular parts of the environment, define its artifact and also the tools involved for each services and action. For this system it divide into several stages such as the menu selection page, controllable virtual shopping environment view, interactive 3D images of traditional map and the Virtual experience map.

First stage for this system is the menu selection page give opportunity for end customer to choose and select the link of shop they required. Customers has ability to select the desired location through link locate in the left frames of the applications. For this action, the base tools used is the Macromedia Flash MX which able to give interactivity and attractiveness for the product.

Next in controllable virtual shopping environment view give customer the ability to view and control the movement of the shops environment they desired. This process occurred before the customer has ability to view the maps of the locations. By having view on the situation of the shop desired increased perceptions to customer to easy searching for the shop location. In this stage customer could move the view right, left or forward to view the condition of the shop.

For others stage which are the interactive 3D images of traditional map and the Virtual experience map, able for customer to view the image and movement. For the 3D images AutoCAD will be used to design three dimensional image of the map. While for the virtual map games engine used to develop the task. End customer also has ability to choose to view one of these maps rather than wait to

view both map. The interactions application will be used is Macromedia Flash MX which provide interactivity by locate buttons on the selection pages.

3.2.1.2b Domain Analysis

In this project will integrate between two applications which are Interactive Multimedia and Virtual Reality part. Customers will experience both integration in 2-dimensions and 3-dimensions of applications.

i) Interactive Multimedia part

Interactive Multimedia involves in this system is when it need interaction between customer and end product such as selection or manipulation or movement of project. As the based software, Macromedia Flash MX will be used to prove the interactivity of the project.

At first the menu selection page should have list of button link to the desired shop. Next, video clip of real environment of the shop which controllable by customers needed and it develop using QuickTime VR software application. The next stage is the designation of 3D map that show the location of the customers and the desired location in static view. The last behavior for the system is the view of route or landmark of the locations in virtual reality applications

ii) Virtual Reality section

The virtual environment for this project consists in the Virtual environment map. In this activity provide with movement of surroundings such as in shopping mall which full of people walking. It also should provide with route of desired locations and also the shop located along the route

3.2.1.3 Stage 3 – Designation of Virtual Environment, interaction and customer's presence analysis

In this stage discussed on the background design of the environment, the object involves in this system and also the modalities of interaction for the system. By identifying those objects, agents and movement helps in developing better environment for the virtual view. It also helps customer to experience as they in the real world which it could increase the sense of presence of customers.

3.2.1.3a Background of the environment

The environment of this system is based on the real environment of shopping complex which it must includes of divisions of shop blocks, lots of people as customers walking through each route, some small booths locate in the middle of the route and also some attractive decoration and design of the malls. For the background illustrations, the designation process will be using games engine which this will be include in Virtual Map stage.

3.2.1.3b Interactive object and agents

In identifying the object and agent involve in this project, at first the situation of the environment need to be initializing. When discussed on shopping complex, the things that can be thought are where it full with humans, lots of block of shops, attractive design and decorations and also several signage. In order to implement the real world action and movement into the movement in Virtual Map the object involves must include of:

- people moving around (active object)
- interactive design of the mall
- division block of shop
- small booth and signage of the shops

3.2.1.3c Land mark and pathways

Landmark that could help customers remembers certain locations are by highlight certain shops locate along the route from the directory to the desired shop. For an example during the Virtual Map route, there will be a shop the will segmented from the background where by doing this it could alert customers that in actual route they will find the same places shown in the virtual map

3.2.1.3d Modalities of interactions

For the interactions it will be applicable if the customers could apply and used it in the fastest way. Moreover, it should be considered that all level of citizen will used this system which it was developed for public. Touch Screen application is the most appropriate way to apply this system. Customers only need to use touch technique on the provided button. While this project is more suitable as a touch screen application and as initially it is planned for, for development purposes, where click techniques is being used. The system will be displayed as a desktop application for the same purpose too.

3.2.1.4 Stage 4 – Designations of customer's supports and navigational tool

In this system, Virtual Reality tools will not be used to interact with the system. Because of the objectives of the system is to be the simplest, intuitive and easy to understand by public customers, we only will be using Touch Screen application as tool to interact with the system.

Touch screens are becoming increasingly used on information kiosk, especially where the terminal has so many functions and services that it is not feasible to have them provided by discrete buttons. Touch screens are very difficult or impossible to use by visually impaired persons. This technique allows visually disabled people to use touch-screens where the number and arrangements of keys on the screen changes.

The customer slides a finger about on the screen. When the finger touches the edge of a button, a click sound is heard, and when an object is entered, the verbal name of the object is presented. The button is then activated with a separate dedicated button. To allow individuals who have artificial hands or arms or prosthetic hooks to use the screen it is important that the touch screen do not require that it is touched by a human body.

3.2.1.5 Stage 5 – Evaluation

To evaluate the system at first a prototype of the system need to be developed to make sure that the integration and interaction of the system could be done. By using Macromedia Flash MX as base application for this system, at first the structures of the system need to be develop. Next the video using games engine for virtual application and also the 3D images using AutoCAD will be attach in Macromedia Flash. In Flash all the applications will shows its functionality and also interactivity will be applied. By provide the structure of the system on Flash, it could be as prototype and could evaluate its usability whether it meets the requirement functionality and also end customers expectations.

In order to develop this prototype or the system itself, the first things need to be developed is the storyboard of the system. This storyboard will be used as guideline during the development process. Evaluation also can be done in this story board by identify whether it is simple, easy to understand and observe and also intuitive. By evaluate the storyboard, it is simple and easy to rework if there is any changes need to be made rather than evaluate end product. Further information on storyboard will be discussed in the design concept below.

3.3 Tools

As discussed in the procedure identification above, the tools are identified. Based on several stages which include of interactive multimedia application, virtual environment application and also 3D image application, the tools need for each stages are different but at the end of each stages each of them will be combined into one main based application which is the Flash applications.

3.3.1 Software

i. Macromedia Flash MX
ii. Games Engine
iii. Macromedia Fireworks
iv. Adobe Photoshop
v. AutoCAD

3.3.2 Hardware

i. Desktop computer (PC)
ii. 1GB of RAM
iii. Higher capacity of Virtual Memory

3.4 Design Concept

The concept of this system is to provide the simplest, intuitive, observable and understandable process between end customer and end product. For the design concept, it provide with four different stages in order to educate customer in requested knowledge. At first there is an overview of the full transaction in the storyboard which gives a full view on how the connection and transaction would occur. Next it also discussed on each pages of the storyboard, its functionality and activities occurred during the interaction within each pages. By doing this better view on the system is gathered and understandable which easy to developed and evaluate the system in the future.

3.4.1 Overall view of the storyboard

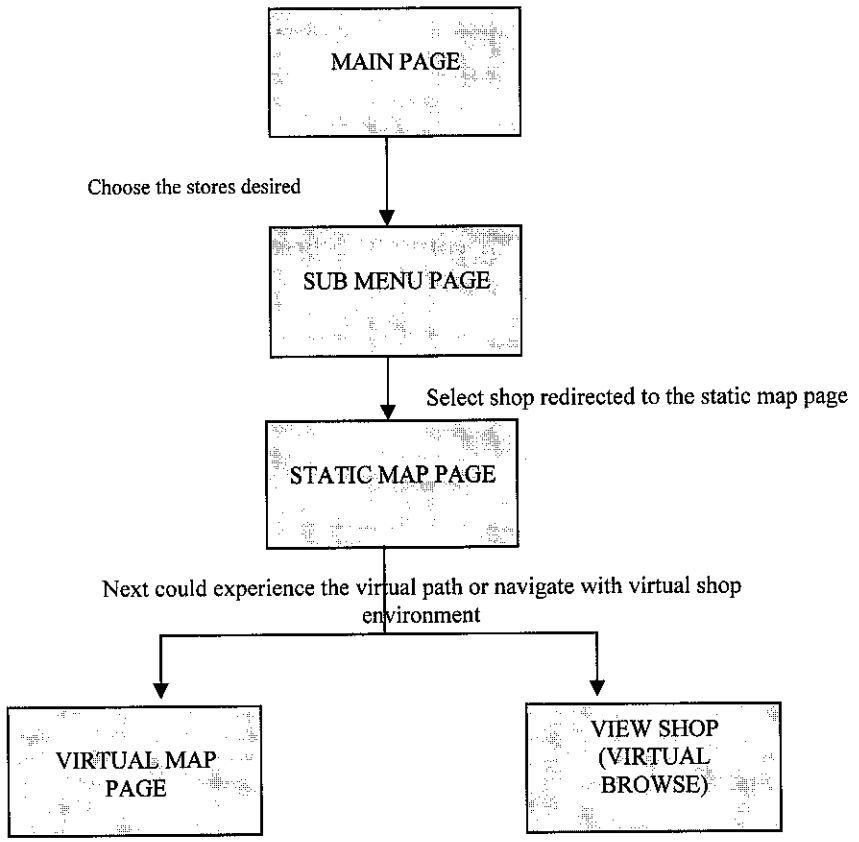


Figure 11: Storyboard Structure

Based on the structure above consist of stages of each transition, the pages involve and the step of each pages on how and what customer need to do on the page. In this structure shows three level needs to be access by end customer which consist of main page, sub menu page and also map page which consist of static map and virtual map. In sub menu page, there allocate the Virtual Browse of real environment which developed using Quick Time VR. After that the customer can choose either to view the static map page which consist of interactive 3D image movement or the virtual map page which allow customer to experience themselves into the virtual environment of the path they gone through. The detail information on functionality for each page will be discussed on the section below.

3.4.2 Detail information for each page

3.4.2.1 Main page

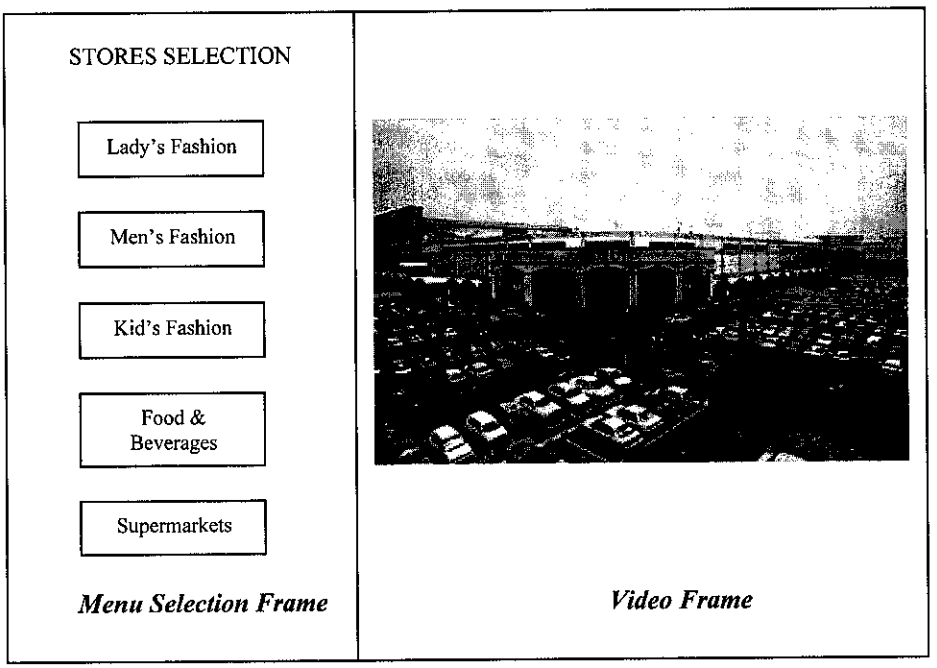


Figure 12: Storyboard- Main Page

The first place they will go is the main page which consists of two frames; the stores selection list in menu selection frame and also the video frame which view of interactive multimedia object. In this stage, user is able to select the stores they desire by click on the button provided in the left frame.

3.4.2.2 Sub menu page

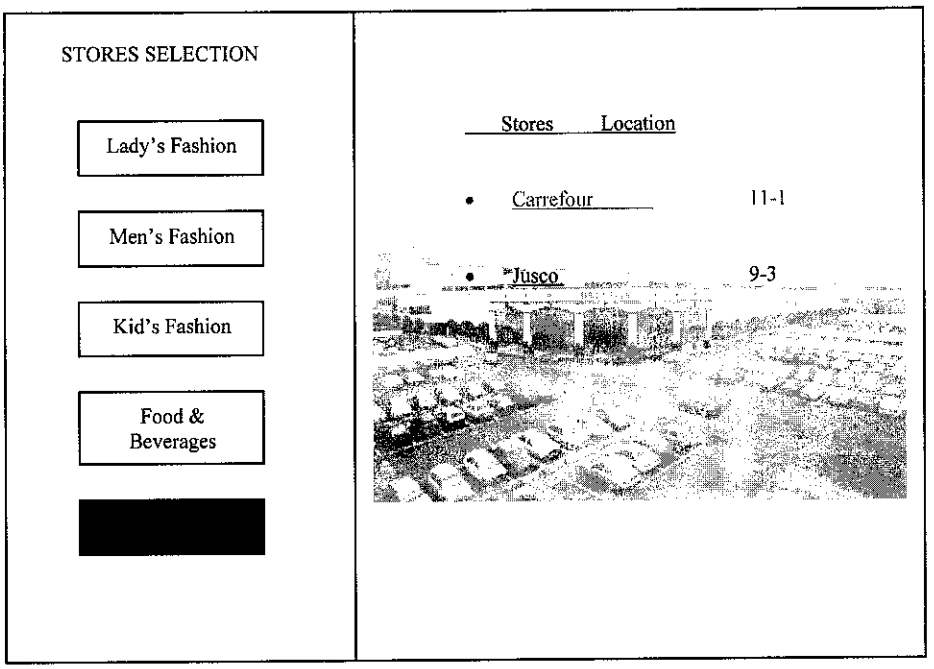


Figure 13: Storyboard – Sub Menu Page

Sub Menu page is the link from the menu page once the customers click the shop selection button from the main page. In this page consist of list of stores from the selection department choose during the first process. By divide the stores into several department, it provide simplicity and easiness for customers to search the stores they requested without need to search entire directory list. For example from Figure 6, shows the list of stores in supermarket department such as Carrefour and Jusco.

In this page user's action is to select the name of the location they desired to go. By doing this, they will be redirected to the map of the location.

3.4.2.3 Static Map Page

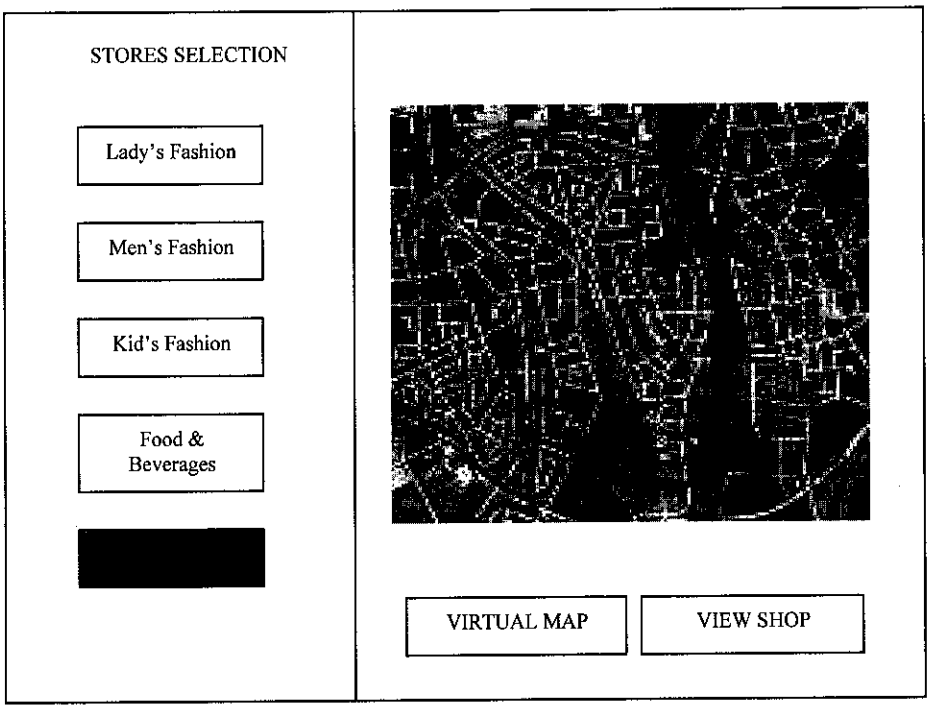


Figure 14: Storyboard – Static Map Page

In this page, consist of 3D object that view from the vertical and horizontal side of the building. By having the view from vertical side of the building give ability for customer to perceived the distance downwards of location from user standpoint. For example vertical view provide information if the location is one level below the user standpoint. While for horizontal side of the building give ability for customer to perceive the distance of location from user standpoint. For example horizontal view provide information whether user need to move forward or backward of direction.

In this page also provide user with two button; Virtual Map and View Shop, which link them to the related pages. In Virtual Map button, user will be redirected to experience a virtual environment of the path to the location desired. While in View Shop button, user will be redirected to a virtual browse of the actual environment of the store. From this page user are able to explore the entire shop by navigating using forward, backward, left and right button.

3.4.2.4 Virtual Map Page

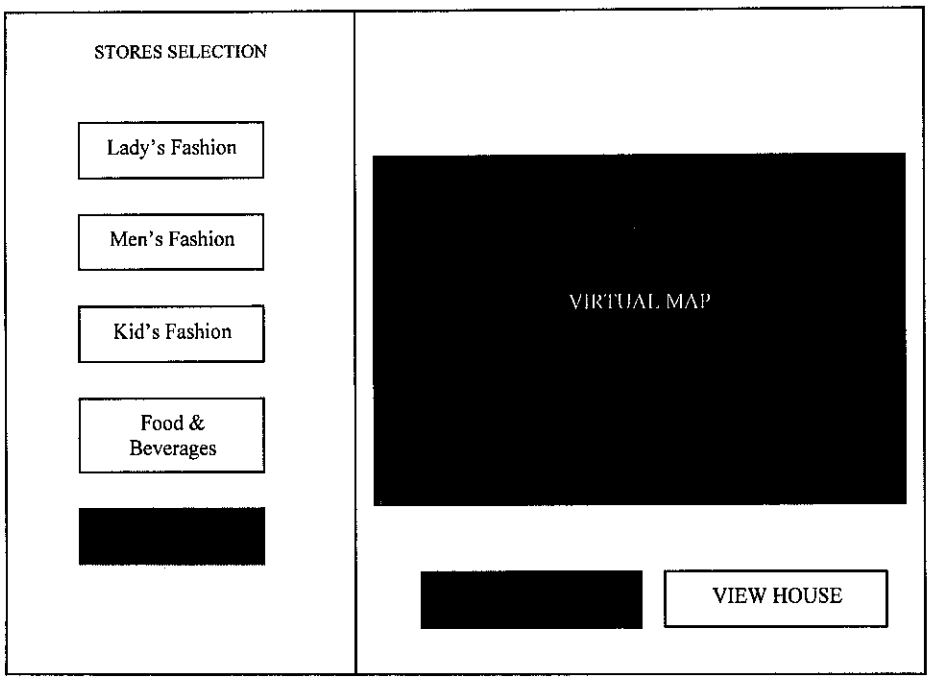


Figure 15: Storyboard – Virtual Map Page

Virtual map page provide customer to experience the environment virtually as they really get into the route destination. The objective of having this page is because some of the customer has better level of mind perceived by experience it virtually. There is also possibility that customer still can not perceived the information from the static map page, they are able to click on the virtual map button that link to virtual map page

In this page consist of the virtual environment of the real route in shopping complex. It also provide with movement object such as human movement, static object such as block of stores, and also the shopping complex background decoration. By mixing each of the object and background provide the user with virtual environment that exact with real shopping complex. It also provide customer with the route to the desired locations and user could experienced the situation and environment locate among the route process.

3.4.2.5 View Shop Page (Virtual Browse)

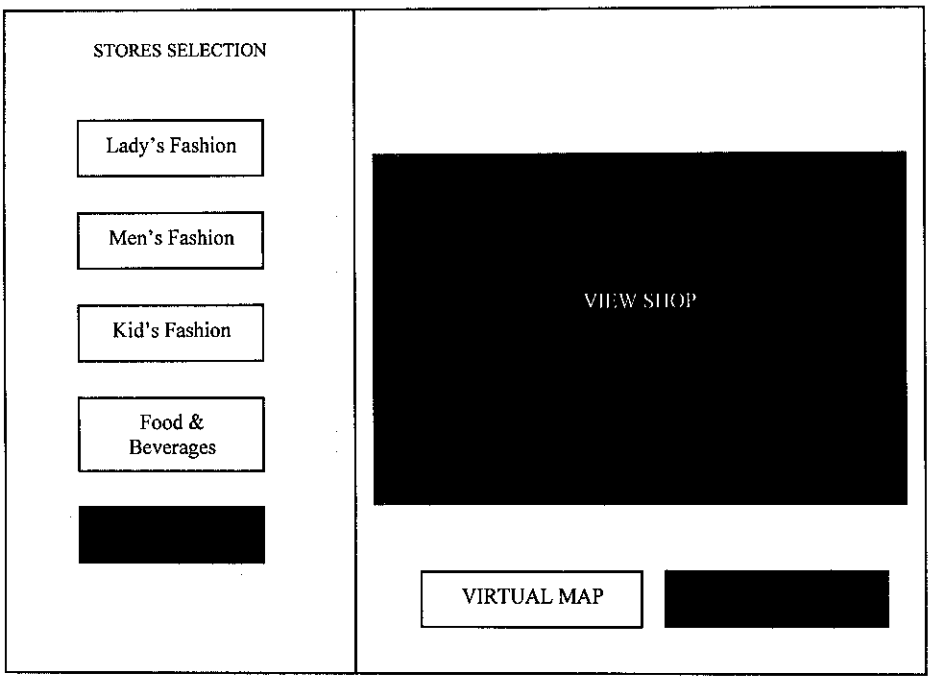


Figure 16: Storyboard – View Shop Page

View Shop page is a virtual browse of design of actual environment of the store. In this application, customer has ability to control the movement of the environment view of the stores such as right, and forward. The objective of this virtual browse is to increase the level of perception which it increase the understanding level of customer. It ease user to search the stores when they have a view of what is provided in the stores and its capacity.

CHAPTER 4:
RESULTS AND DISCUSSION

This section of the report contains findings related to the subject matter through out the product development process until its completion. By identify the rationalization of the findings based on final product and system implementation that has been done for the project. The system consist of four (4) level of phases which include of the main page, the sub menu page, the static map page and the link to virtual map page and view shop (virtual browse) page. Each of the pages was successfully developed accept for the Virtual Browse page, because of incompatibility of software used which can not be integrated with the system.

During the system evaluation, the design of the screen must be able to communicate to its user effectively on what information it wants the user to see, as well as the necessary actions execution for viewers to obtain it. Through a proper implementation of system design which will observe and discuss more in this chapter, users are able to retrieve what are expected quickly and efficiently. In order to authenticate the competence of the implementation, the system has been tested by five (5) random users to identify any error might occur during the navigation and also their references for the enhancement of the project.

Finally in the end of the chapter, based on both information gathered; pre-survey and system testing, some discussion based on the final result has done in order to identify the effectiveness and usability of the project, either it could meet the requirement of the expected users. Awareness on the impact of certain environment design and inclusion of particular toolkit could avoid confusion and unnecessary cognitive load.

4.1 Final Product Description

The final product of this project consists of four (4) level phases which include:

1. Main page
2. Sub-Menu Page
3. Static Map Page
    a. Virtual Map Page
    b. View Store (Virtual Browse)

Each of pages has purposes that described as below.

4.1.1 The main Page

The first page of the system is the main page which consists of the montage and shopping mall advertisement. The left side of the page provides the list of button that the pages with the list of the stores in the shopping mall. The stores are divided into classes which represented using stores department. Once users click the button, it linked the page to the sub menu page which provided the list of the stores in the department selected. The purpose of the page is to advertise the news of the shopping mall in the montage, and also provide link to the list of stores.

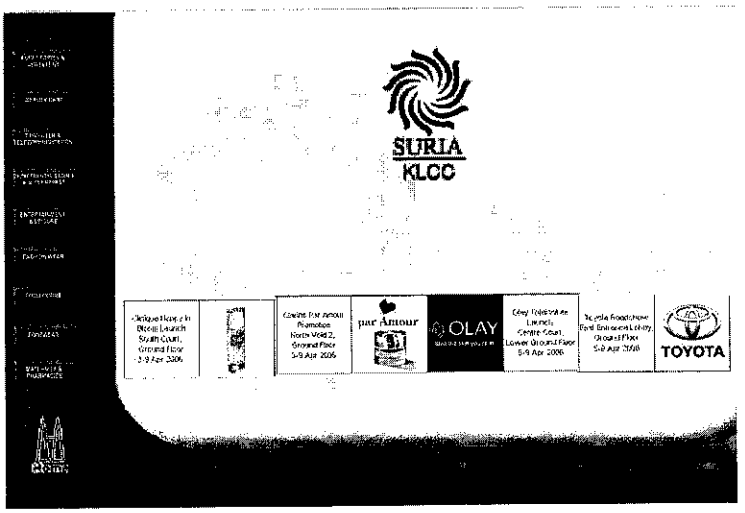


Figure 17: Screen Shot - Main Page

4.1.2 The Sub Menu Page

The submenu page is providing the list of the stores based according to its department. The page is the continuous of the main page once user clicked on the button link in the main page. The list provided the name of the stores and its location address according to the location in shopping mall.

The stores name linked the page to the appropriate static map of the location stores selected. The system also provided with the home button to connect user back to the main page.

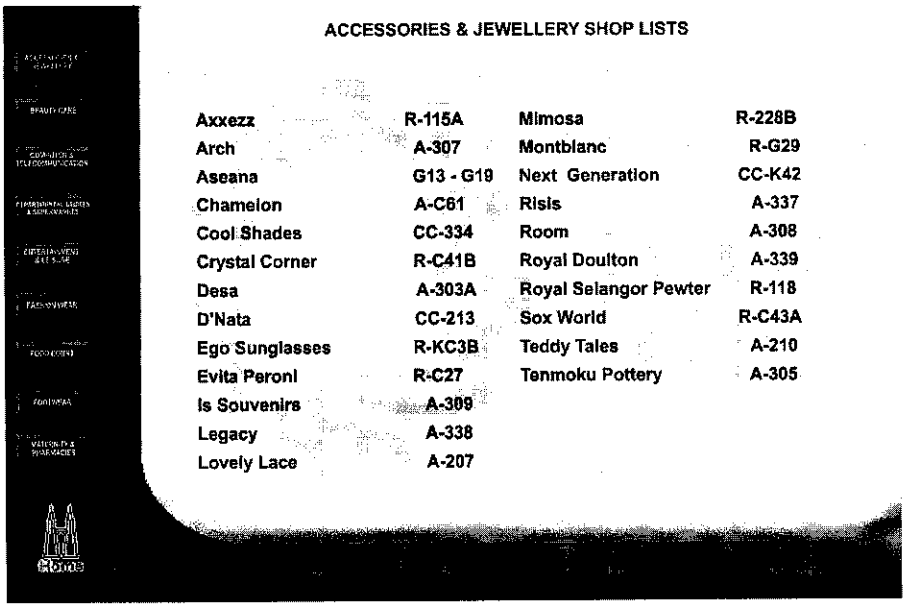


Figure 18: Screen Shot – Sub-Menu Page

4.1.3 Static Map Page

The static map page objective is to give user view on the location using 3D animated image. The map consists of the 3D building preview in two different view; horizontal view and vertical view. The vertical view shows the depth of the stores location from user standpoint. While the horizontal view show the distance of the user standpoint and the location desired.

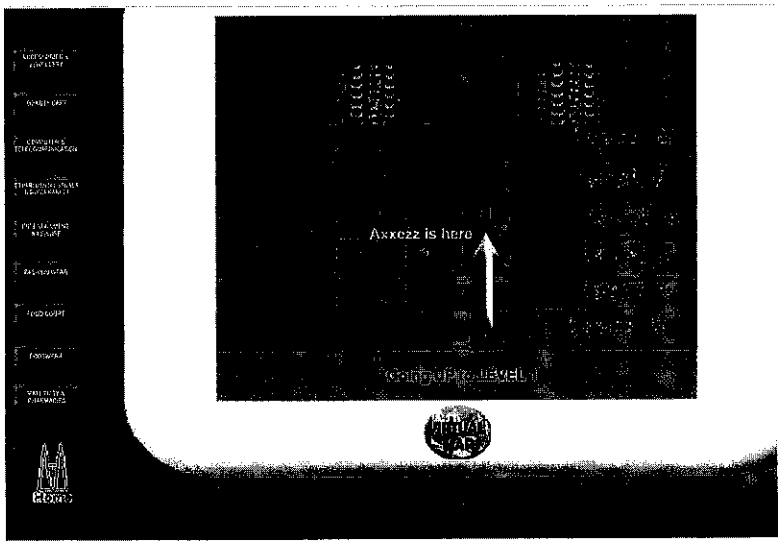


Figure 19: Screen Shot – Static Map (vertical view)

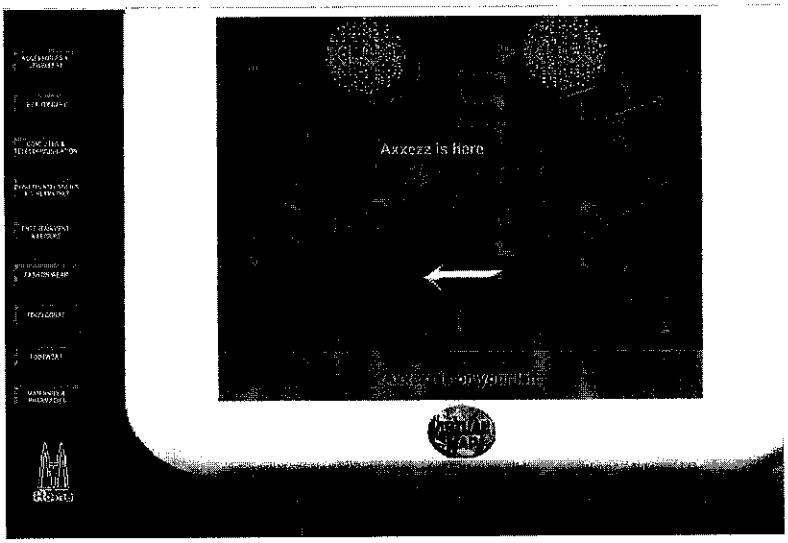


Figure 20: Screen Shot – Static Map (horizontal view)

In this phase also located the button that link the page with two sub-page; Virtual Map Page and View Shop (Virtual Browse) Page:

4.1.3(a) Virtual Map Page

The objective of Virtual Map Page is to experience the user presence into the virtual environment of the Shopping Mall. It previewed the environment of the Shopping Mall using Virtual Technology and provides walkthrough to the location desired. The environment provided landmark and unique sign for user memories the path they going.

Figure 21: Screen Shot – Virtual Map

4.1.3(b) View Shop – Virtual Browse

The View Shop objective is to give opportunity for user to explore the environment of the desired shop. It preview the environment of the stores selected and provided with navigation with the environment of the stores. However in this project this function could not be included due to incompatibility between 3d Engine applications with Macromedia Flash application.

The end system is provided functionality according to the objectives planned. However there are several features that could not be completed due to the time constraint. For example the movement of object (e.g.: people), did not been developed.

4.2 System Evaluation

To design the system several items need to be taken into consideration. Based on the checklist by the research Freksa (1999), it illustrates the specification that could identify the process of pathway developed. In this project, the flow of navigation will at least have one search object, one starting point for search process, one search instant, one possible route, a user and zero or more external support. It is useful to ensure the situation and importance of the design by verifying those factors above.

As has been said earlier in Chapter 1, the objective of the system is to meet the expectation of user to get into desired location. This shows that each navigation does have the search object which is the location of the shop. Each process of pathway, it will start in the point where the directory locates in the mall. As for the directory that specifically done for Suria KLCC, it will be locate at the center court of the building. Each process of pathway will be ended at the location the user expected to go. The system will provide with the shortest path from the starting point to the location.

The expected users for the project are the public customer. The design was planned to meet simplicity and informative directory which able to educate and communicate with user. The view of the system consists of the list of linkage button and the video. Each click on the button will be view on the video section. This show the simplicity of the design where users only navigate with normal button and the button has been group into one side.

Based on the discussion of the system design above, it shows that user requirement to have the simple and observable directory. In addition, those requirements have been included in the system based on the specification stated by Freksa research (1999). Below section will elaborate more on the principle and implementation of the system environment.

4.2.1 Implementation of the System Environment

The system objective is to be simple, intuitive, observable and predictable for the user to navigate. In order to implement the system and meet the objective, there are several factors need to taken into consideration:

- Identify unique identification of location or landmark

Based on Arthur and Passini research (1992), every location in navigable space has unique identifier that can associate the immediate surrounding with other location in the environment. The unique identifier in the system provides support with distinctive object for ease of recalling particular location. For example the system will highlight specific landmark such as shop on the side of the pathway. Identifier or landmark will be as point of reference for self orientation inside the environment. By having this landmark, it provide flexibility to the usage of environment and also increase the understandability of user when navigate with it.

- Clear identifiable data

In the system, the design of the environment is clearly identifiable where each side of the environment path is clearly identifiable. By having the design with proper information, it allows user to acknowledge its existence and include it in decision making process. For example, the system that provide user with horizontal and vertical view of the map give user clear information on where they are and where the location they desired to go.

- Sign as indicator

There are two types of sign which are the informational sign and directional sign. The informational sign will provide user with identifier such as landmark. For example the highlighted shop at the side of pathway or structure locates through the

pathway. The directional sign is the arrow signal which shows the direction of the pathway. For example the system will provide the arrow directional which direction user will go.

- Textual description for clarification

Textual description is another type of informative sign. The textual sign will clarify the path user will take in order to reach the location.

Based on the observation above, it show that the system design of screen and its element has been found to be contributing factor in helping user to provide clear and concise idea in performing in the task during the experiment. Next session will discuss on the result of the experiment that has been done to five (5) selected subject.

4.3 Experiment Result

For discussion, the result from the three treatments exposed to the five (5) selected subjects will be presented according to the phases it occurred for clarity findings. The findings in each treatment will be using the 'think aloud' feedback technique.

Static Map Treatment

Under the treatment, respondent were not provided with any guidance to facilitate the navigation. From this point, users are able to navigate the system until the static map page. Through observation, the respondent found it informative and able to know which direction they will be going. However they still did not have the overall view of the building which they did not specifically know how to get to the location.

- Feedbacks for 'think aloud' technique:

In understanding in achieving the goal, most of the subject decided to remember the information sign given in the map which unswerving them to the direction of the location. They have decided that it was the best approach since the typical structure are designed with two point, start and end point and some textual information without proper information of the shopping mall environment. It only gives the static block of map not the environment of the mall.

Another attempted strategy was through exhaustive search. A few of the respondents have decided to embark in the type of search to gain more knowledge of the environment. The respondents would like to view the map several type in order to understand the map. They could not navigate or control the map to stop or rewind, what they have to do is to have back button to review the map.

Through either one of the ways, all of the respondents are able to perform in understanding task successfully. The success through understanding the map may be due

to the availability of sign, both textual and directional sign, which are directed to the destination.

Virtual Environment Treatment

For this treatment, respondent were exposed to another stage of the system which is the Virtual Map environment. By having this environment, respondent are able to experience the real environment situation and virtual pathway to the destination. In this task, respondent are able to know what landmark they could use to remember the path through the way of destination.

- Feedback for 'think aloud' technique:

In achieving the task goal, the respondent use the landmark and highlighted object when they get through the pathway. Through the strategy, participants unable to view the static map but only the virtual map. By having virtual map as the only information for the pathway, most of the respondents are struggling to remember the signage and landmark without having the overall overview where they are and where they will go to be.

Through the strategy, most of the respondents were disoriented from their destination and is frustrated by the search. Only three out of five respondents made use of the landmark, in orienting themselves towards the destination. Several respondents are remembered the pathway and able to give directions again to others based on the landmark given.

As for descriptive text, some of user felt it cluttered the map, with the landmark and descriptive information as the sign to the direction. They thought that by having the landmark itself, it very helpful without the descriptive text. However some of them found it informative which alert them where is the way they will be going next rather then configure it themselves. Suggestion has been made in improving the descriptive text by specifying in greater detail of what is available around the environment

(viewable and non-viewable). Through the suggestion it is expected that any missed out visual information will and can be recognized by respondents for inclusion in the route selection.

Static Map and Virtual Environment Treatment

Respondent were further exposed to the next treatment, which is the combination of static map with virtual environment. The static map will provide the general overview of the building on structure of the building and where they will be going next. The virtual map gives user to view the environment of the mall and identify any unique signal to get to the destination.

- Feedback for 'think aloud' technique:

All of the respondent found it very helpful to have the view on both overall structure of the building and actual environment of the mall. At first, respondents will gather the information by identify the whole structure of the building. Respondents might know where they are and where they will be based on the coordinate plot on the 3D image. Next when respondents navigate with virtual map, they could integrate the coordinate from the static map with the environment of the mall.

The task of directory had been completed without any problem. Once participants end the session they are able to explain to other the detail direction to the exact location. By explaining what the person might see throughout the pathway and what landmark on the side of the shop shows that they are really understand the directory and found it very informative.

However some of the participant found the textual description supplemented with the map is not required to be included. The main reason given was that the environment complexity has been eliminated with having unique identifier and landmark. The inclusion of text description might confusion the map design. With too many

information provides, respondents get confuse on which information need to focus. Nevertheless touching on textual description, respondents still found it to be shallow in providing useful information. It inclusion in supporting the map is found to be a very good move and a way of retrace the path that has just been selected. In the end of the experiment, most of the respondents found that by having experience on both static and virtual map help user precisely understand the system.

CHAPTER 5:
CONCLUSION AND RECOMMENDATION

This chapter discuss on the conclusion over the project. It will determine the relevancy of the project completed with the objectives expected to achieve. Whether the final result of the project could meet the objective expected to be achieved in the end of project. There are also several recommendations for enhancement of the project. This project might have several limitations which by having the recommendation, the project could be maintained and improve in the future.

5.1 Relevancy to the objectives

The primary goal of the study was to give information and direction with simplicity in a directory system. The objectives have been produced to provide proper direction, as well as, guidance in ensuring the research maintains its focus. The implication of the environment design was also studied in terms of its affect towards learner's learning progress. The study found that the declining of directory usage over the years. To increase those interests of directory usage is by designing a more interactive and ease to navigate directory features which most of people expected to have.

The study of virtual directory shows that user is able to navigate and experience the presence of the environment without need to be at the location of environment. Since virtual directory, by definition, are intended to be used by the public, they must be easy to use for everyone. The system must be easily accessible to all customers on equal terms. The system must have adaptable to meet a customer's specific requirements and uniform customer's interface.

In order to achieve the project objectives, proper methodological approach has been specified for the purpose. Initial activities identified include information gathering, designing, product implementation and testing, which served as the mean gaining firm understanding in the topic being discussed. Information gathering activities have conducted comprises of informal feedback, as well as, the collection of relevant research paper to subject topic. Following the activity is the sketching and storyboarding development process. The sketches and storyboards were developed in accordance with the research findings gathered in the analysis phase. Finally, the product had been constructed as planned and tested. The testing had been conducted for the purpose of confirming that proper navigational tools and environment design has been applied.

Findings from the experiments conducted, useful in contemplating the affect of static map and virtual map in the system. Exposing respondents with the same environment but in three different treatments, respondent understanding on the pathway under each treatments. Summarizing compares the findings on the treatments conducted, respondents were found confused when they only able to observe only one map in one navigation. The static map does not provide user to visualize the environment of mall. While the virtual map doest not provide user with the exact coordinate of the user starting point and location point.

Both results were gathered during the first and second treatments. However in the third treatment, all of the respondents are able to understand the path they were going and the coordinates of the store location. This shows that by having 3D structure of mall and experience the virtual environment helps user to gather information better and more reliable.

This concludes that interactive directory with virtual application might attract user to use the system. With additional functionalities that require less time to navigate and provide user with comprehensive information could increase the level of understanding. The target is to have a simple, understandable and informative directory that is easily observable.

5.2 Recommendation

For future enhancement of the project, there are several recommendations on the project to improve the usage of the system. As for now, users navigate the system using the mouse click; however by having enhancement on the system application, it could increase the efficiency of understanding.

1. The mouse click application could be switch to the touch screen application. By having touch screen application, it could help user that do not have knowledge in using mouse as navigation tools. It also could ease other user in navigating with the system by touched technique rather than mouse movement.

2. To have detail map in static map page which able to define the location of others shop in the map before it been view in Virtual Map Page. This condition to alert the user about the landmark they will see in the virtual map.

3. Implementing the system as a website directory could give chances for user to explore the system through own PC or mobile devices that have internet connection. Through PC, user able to navigate in their own home before they plan the shopping list. While with mobile device, user able to explore the directory without need to go to the directory itself.

4. In order to develop a completed system, the first enhancement need to be done is to increase the capacity of RAM. By being aware to this, the full system developed could avoid from being crash and occurrence of incompatibility to execute.

5. To have navigation in the system such as Virtual Browse, software needed must be compatible with Macromedia Flash. One example of the software is such as QuickTime VR.

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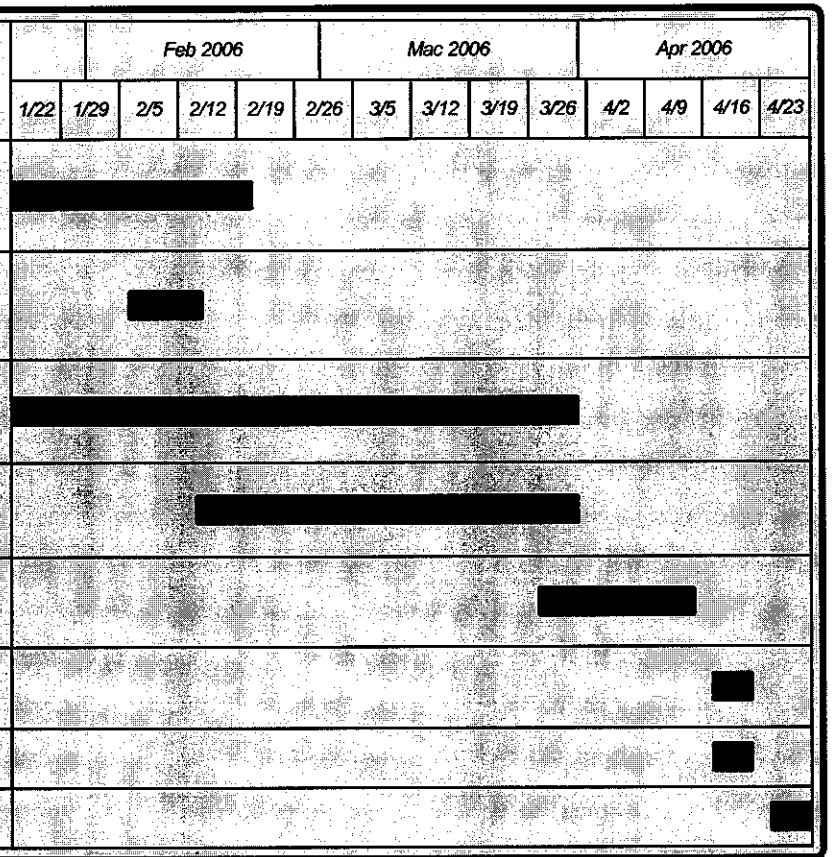
APPENDIX I : PROJECT TIMELINE

– Gantt Chart

ID	Task Name	Start	Finish	Duration
1	- Designation of Framework Using Macromedia Flash	23/01/2006	20/02/2006	4,2w
2	- Progress Research Work - Submission of Progress Report	06/02/2006	14/02/2006	1,4w
3	- Designation of Virtual Model using 3D Studio Max	23/01/2006	31/03/2006	10w
4	- Designation of Virtual Browse section	14/02/2006	31/03/2006	6,8w
5	- Project Testing and Editing	27/03/2006	14/04/2006	3w
6	- Final Research Work - Project Results and Discussion	17/04/2006	21/04/2006	1w
7	- Oral Presentation	17/04/2006	21/04/2006	1w
8	- Submission of Final Report	24/04/2006	28/04/2006	1w



APPENDIX II : RESULTS AND FINDINGS

– Pre-survey Form

Final Year Project Questionnaire:

Survey on Functionality of Shopping Mall Directory and Virtual Reality Knowledge.

I am a final year student from University Technology of PETRONAS. This questionnaire will help me gather feedback from general users about the current Directory system in the Mall. Please take a few moments to complete these questions. Thank you.

Gender: F / M Age :_____

1. How often do you go to Shopping Mall

   ☐ Almost always ☐ Seldom ☐ Very Often ☐ Never

2. What always you done in Shopping Mall

   ☐ Shopping ☐ Windows Shopping ☐ Search& Observe

   ☐ Others

3. Have you ever been lost in a shopping mall?

   ☐ Yes ☐ No

4. Did you know Information Directory Services?

   ☐ Yes ☐ No

5. Have you ever used the service?

   1:Not at all 3: Moderately 5: Frequently

1		2		3		4		5	

6. How do you find the service, is it understandable?

   1:Hard to understand 3: Moderate 5: Easy to understand

1		2		3		4		5	

7. How do you find the service attractiveness?

1:Not attractive 3: Attractive 5:Very Attractive

1		2		3		4		5	

8. How do you find the services could provide you with information?

1:Less Information 3: Moderate 5:Much Information

1		2		3		4		5	

9. How do you find the service interactivity?

1:Less interactive 3: Moderate 5:Very interactive

1		2		3		4		5	

10. Could the directory be observable by all types of citizen?

1: Hard to observe 3: Moderate 5: Easy to observe

1		2		3		4		5	

11. Which one would you prefer, Information Directory or Information Center?

☐ Information Directory ☐ Information Center

12. Have you heard about Virtual Reality?

☐ Yes ☐ No

13. How do you find if Directory developed with Virtual Reality?

☐ Yes ☐ No

14. How do you find if you experience to route of the tour to your desired location?

1:Less attractive 3: Moderate 5:Very Attractive

1		2		3		4		5	

15. Do you think that nowadays directory need to be enhance?

☐ Yes ☐ No