



**Faculty of Cognitive Science and Human Development**

**IMPLEMENTING A USABLE 3D WEB PAGE FOR  
SARAWAK MUSEUM**

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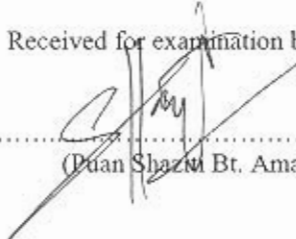
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## ABSTRACT

### IMPLEMENTING A USABLE 3D WEB PAGE FOR SARAWAK MUSEUM

Indra Sumantri B. Eddie Mat Hj. Senal

The project aims to design and implement a usable 3D web page prototype system for the Sarawak Museum in Kuching Sarawak. This prototype system is to ensure that the general public are aware of the capabilities of VR technology. Specifically, this 3D Sarawak Museum web page intends to provide useful information to the users about the Sarawak Museum in particular through non-immersive Virtual Environment approach. In addition, this study is also to assess the importance of the usability design in the development of the 3D Sarawak Museum web page as major contribution to its user-friendly where user can use the system easily. The Star-life Cycle is used in the development process of the 3D Sarawak Museum web page. The VE was modeled using the 3D Webmaster while the web system was designed using Microsoft FrontPage XP and Adobe Photoshop 6.0. The Cooperative Evaluation method was applied to evaluate the prototype system. The evaluation is to make sure that the design of the web fits and meets the users' requirement. A total of 15 respondents consisting of students from the Faculty of Cognitive Science and Human Development (FSCHD) in the University of Malaysia Sarawak (UNIMAS) participated in the evaluation. The results of the Cooperative Evaluation were gathered from observation based on the respondents' performance during evaluation. The comments and suggestions of the respondents were recorded using aid-kit, microphone and tape recorder, which were used to improve the prototype system. In conclusion, majority of the respondents realized the importance of VE and correspond positively to the implementation of integrating VE through the web.

## ABSTRAK

### MENGIMPLIMENTASIKAN HALAMAN 3D YANG MEMPUYAI KEBOLEHGUNAAN BAGI MUZIUM SARAWAK

Indra Sumantri B. Eddie Mat Hj. Senai

*Secara umumnya, projek ini bertujuan untuk membangunkan satu prototaip halaman web tiga dimensi yang mempunyai kebolehgunaan berfokuskan kepada Muzium Sarawak di Kuching Sarawak. Sistem prototaip ini selain itu bertujuan untuk mewujudkan kesedaran masyarakat umum terhadap keupayaan dan penerimaan teknologi Realiti Maya. Khususnya, halaman web tiga dimensi Muzium Sarawak dibangunkan untuk menyampaikan maklumat tentang Muzium Sarawak kepada pengguna dengan lebih berkesan melalui pendedahan persekitaran maya jenis bukan immersive. Tambahan pula, projek ini juga menilai kepentingan rekabentuk kebolehgunaan dalam pembangunan halaman web tiga dimensi yang mesra pengguna supaya pengguna dapat menggunakan sistem dengan mudah. Model Star-life Cycle telah digunakan dalam pembangunan halaman web tiga dimensi Muzium Sarawak. Selain itu, persekitaran maya Muzium Sarawak dibangunkan dengan menggunakan 3D Webmaster sementara halaman web pula direkabentuk dengan menggunakan Microsoft FrontPage XP dan Adobe Photoshop 6.0. Sistem prototaip ini telah dinilai dengan menggunakan kaedah Penilaian Koperatif. Seramai 15 pelajar dari Fakulti Sains Kognitif dan Pembangunan Manusia, (FSKPM) di Universiti Malaysia Sarawak (UNIMAS) telah melibatkan diri sebagai responden dalam kajian tersebut. Kaedah ini melibatkan kerjasama antara pengguna dan perekabentuk sistem bagi memenuhi kehendak pengguna terhadap sistem selain bertujuan untuk menguji keberkesanan sistem tersebut. Keputusan daripada Penilaian Koperatif telah dikumpulkan berdasarkan pemerhatian terhadap pengguna. Segala keputusan dan cadangan pengguna telah direkodkan dan dirakamkan menggunakan alat perakam seperti mikrofon dan pita rakaman suara. Pemerolehan daripada data tersebut kemudiannya telah digunakan untuk memperbaiki sistem prototaip ini. Kesimpulannya, keseluruhan responden telah memberi reaksi yang positif terhadap kepentingan persekitaran maya dan pengintegrasian terhadap laman web.*



## CHAPTER 1 INTRODUCTION

### 1.0 Introduction

Virtual Reality (VR) offers one of the most powerful and natural methods of interacting with computers. According to Roy Kalawsky (1993), VR is the state where the level of interaction, autonomy and feeling of presence is indistinguishable from the real world. He also stresses out that there is a certainty about the extent to which the general-purpose of VR application will be cheap, reliable and effective. VR can offer the user to interact and experience in a particular domain of immersive environment. There have been many areas concerning VR. Some of the areas include training, scientific visualization and interaction, engineering design, aerospace, games, medical and architectural are moving towards its extent.

Nowadays, VR also known as Virtual Environment (VE) is widely used and incorporated with the web. The extent to which the web is incorporated into VE is in areas such as tourism and design. The design mainly focuses on areas such as the museum proper, historical building and many others. Web designer incorporated VE in computer graphic buildings-modeling such as the museum because they believed that VE is interactive enough to attract users and help them to gain experience and learn interactively. VE on the web also provide the cheapest way to perform Three Dimension (3D) if compared to the immersion systems which includes peripherals such as head-mounted display-based and datagloves.

Realizing the necessity of VE, this project is aimed at developing and incorporating 3D in promoting the tourism industry by integrating VE to the web. On the web, VE involves the display of 3-D images that a user can explore and manipulate interactively. It also allows users to walk through and experience in a non-realistic environment by moving the mouse, either forward, backward or any other sides that the user wishes in 0 to 360° degrees angle.

One of the most famous 3D applications is in movies like Toy Story, Bugs Life and Ants. 3D applications were expected to boost up in the areas such as automobile design, tourism, education and entertainment. 3D environment provide a platform for the user to experience in a realistic environment to view virtually the effect of 3D compared to traditional 2D. 3D helps user to visualize the image on the mind better in different angle rather than 2D visualization. This is because 3D objects can be rotated in many different angles from 0-360° degrees. It can also perform almost actual image of an object in the mind.

## 1.1 Virtual Reality

There are many definition of VR. According to MA Gigante (1996), Virtual Reality is the illusion of participation in a synthetic environment rather than external observation of such an environment. VR relies on 3D, stereoscopic, head tracked displays, hand or body tracking and binaural sound.

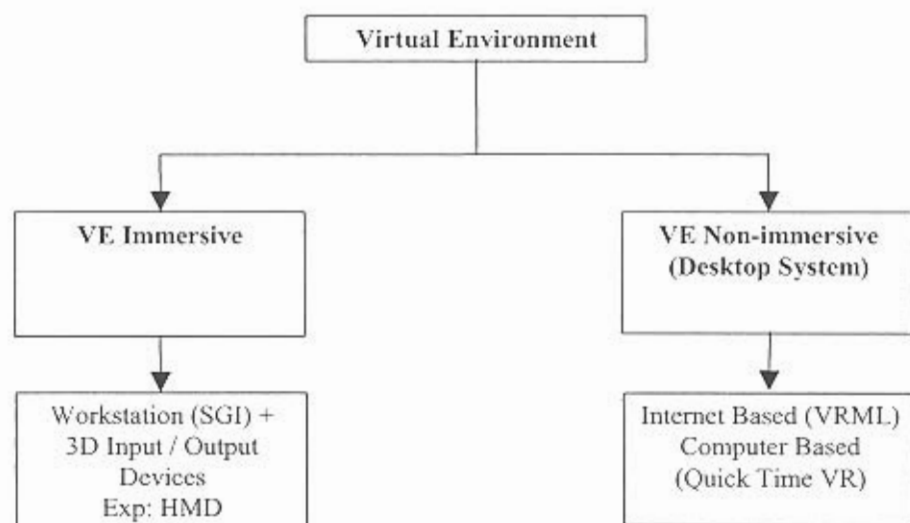
"Virtual Reality refers to a participation of a person in a three dimension, which is immersed and interactive based on computer generation" (Gwen, 1996). VR also provides a way for human to manipulate, interact and experience with or through a computer with complex information. This means that an individual can see, feel, touch and listen in the simulated world of the virtual environment. The greatest impact of VR is the effect and manipulation of the human cognition.

According to Ayman (1997), Virtual Reality can be classified into two categories based on its immersion and interface level in a simulated environment. The first one which he acknowledged is immersive approaches where the relationship between virtual environment and the individual is related and maintain. In particular, Head-Mounted Display (HMD) helps the user to interact with the virtual environment.

The second one is the Virtual Environment Non-immersive which refers to the display of virtual environment on the screen. This type of VR helps the user to interact with the monitor by using the mouse or other computer input devices to feel the surroundings which had been simulated. One of the technologies which have been used until today is the Virtual Reality Markup Language (VRML). VRML is a programming language that helps the user to interact in a three dimensional environment using a World Wide Web (WWW) interfaces.

In this Virtual Environment project, non-immersive technique is applied. The advantages of using non-immersive technique is that the cost is cheap and it is the easiest way to manipulate VR if compared to the immersive approach which is more difficult to built and more expensive in cost.

In this project, VR will be integrated and applied to Sarawak Museum. This system will focus on the human computer interface. Based on McMillan (1994), the advantage of a system does not depend only on the technology but the communication between human and computer must be considered as well.



**Figure 1.0** Types of Virtual Reality System

(Adapted from: Ayman 1997)

## 1.2 Non-immersive VR

Non-immersive VR is also known as Desktop VR. There are many researches concerning non-immersive VR. With Desktop VR, a computer screen is normally used as the display medium. The user views the VE on the computer screen. In order to experience the VE, the user must look at the screen the whole time.

There have been a lot of applied applications based on this approach. Some of the application examples are the Virtual Zoo, Virtual Home, Virtual Tour and etc. The application uses in VE software are VRML and Quick Time VR to integrate VE to the web.

Typically, non-immersive VE is a desktop system that uses single, large, color screen for input and output, a three-dimensional mouse and keyboard. The software and controller involved make the VE possible for example to 'fly' around a model of a house, and inspect and 'turn around' to survey the rooms. In this project, 3D Webmaster software is used, which can perform the drag and drop properties to further enhance the creating and modeling buildings for virtual environment.

## 1.3 Background of the Study

Sarawak Museum is one of the first museums in Malaysia and South East Asia. The first temporary museum built in 1886 was located in one of the buildings in Gambir Road. In 1891, the main building was built and opened to the public. It was later named as Sarawak Museum. After its establishment, it is well known in the world as a cultural museum and became a center for research and tourist attraction in Sarawak.

Currently, Sarawak has eight museums namely Old Building of Sarawak Museum, Tun Abdul Razak Museum, Islamic Museum, Chinese Museum, Cats Museum, Limbang Museum, Baram Museum and Niah Archeology Museum.

The display at the museum (old building) includes preserved animals such as mammals, invertebrate, reptiles, insects, fish, and birds. There are also artifacts that are related with ethnography. Some of the displays in the museum include model-house of the ethnic and indigenous people of Sarawak, musical instrument, weaponry, handicrafts, skeletons and many others.

#### **1.4 Problem Statement**

Currently, there are no web sites that provide detailed information about Sarawak Museum. So this project tends to become the first ever sites that provide information about Sarawak Museum in 3D approach.

More over, Sarawak Tourism Board (STB) is using 2D web-sites to promote Sarawak to the eyes of the world. 2D site refers to a web site which only offers information using only flat graphics and text. Although it can provide the best quality of image and graphics but it could not offer users the tools to communicate interactively with the system. Subsequently, the web that has been developed confuses the users, mostly in the orientation of the graphics provided.

A clear example of 2D tourism site is the Virtual Tour around Sarawak, which has been designed by the STB. These 2D sites only offer users with information but failed to attract users to experience the tour more deeply.

What happened today on most traditional sites is that users are concern whether the information provided on the web reflects what really is. In terms of reliability, the users sometimes might be confused and perceive from what the real world actually looks like differently from the explanation provided. This problem can be overcome if the users can see graphics, movies and pictures and experience for themselves in the VE.

#### **1.5 Objectives**

##### **1.5.1 General Objective**

The objective of this project is to design a usable 3D Web page for the Sarawak Museum. This project is intended to provide useful information to users about the Museum in particular through non-immersive VE approach.

##### **1.5.2 Specific Objectives**

- i. To design and implement a usable 3D Web page prototype for the Old Building of Sarawak Museum;
- ii. To integrate VE prototype system into the web so that users are able to interact on the web interactively;
- iii. To provide useful information about the Sarawak Museum; and
- iv. To perform evaluation to ensure the usability of the system.

## **1.6 Significance of Project**

In Sarawak, tourism has been one of the major incomes of the State. As it is now, STB has tried many alternatives to promote places of interest in Sarawak by using pamphlets, brochures, road shows, magazines, newspapers and even in the radio and television. Sarawak dubbed the "Land of the Hornbills" attracts visitors with its rich rainforests and the diverse lifestyles of its indigenous people. Sarawak has one of Asia's finest museums with an excellent collection of Borneo ethological and archeological exhibits.

There is a need to promote Sarawak using internet technology. Promoting the museum using other media is usually limited, even though it provides the highest quality of photorealism effect. However in certain extend, it fails to attract visitors from other developed countries worldwide. It is because this traditional approach involves high cost and time consuming.

Hence, the introduction of 3D concept is necessary. This is to enhance the tourism industry in Sarawak, by providing useful information about the renowned Sarawak Museum through the web. It is also to help the user to gain experience when they do not have a chance to go to Sarawak by using VR technologies. And foremost, the project is aimed to ensure that the general public is aware of the capabilities of VR technology. In addition, the project is to make sure that the design of the web fits and meets the users' requirement.

## **1.7 Scope of the Study**

This project will focus mainly on the old buildings Sarawak Museum, although there are eight well known museums in Sarawak. This is only a prototype system to evaluate the system usability. In this regard, only a part of the sections in the Museum is modeled in VE. The part of the museum that will be modeled in a VE is the Longhouse (Rumah Panjang) section.

## **1.8 Key Concepts**

The terms below are some concepts that will be used in this project.

### **1.8.1 Human-Computer Interaction (HCI)**

This term is mainly concern with all the aspects that are related to the interaction between the users and computers. According to Baecker and Buxton (1987), HCI refers to the processes, dialogues and actions that a user employs to interact with a computer in a given environment. ACM SIGCHI (1992) defined HCI as 'A discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of a major phenomenon surrounding them'.

### **1.8.2 Usability**

Usability can be defined as a measure of the ease with which a system can be learned or used, its safety, effectiveness and efficiency and the attitude of its users towards it.

Usability which is a key concepts in HCI is concerned with making systems easy to learn and easy to use by the users. According to Benneatt and Shackle (1984), usability refers to a complex design system which uses many functions needs a high time and effort to make sure the users can use the system at an optimum level.

### 1.8.3 Prototype

A prototype is an experimental incomplete design of an application used for testing design ideas. It is also a representation of the user interface that a user can interact with, built to be changed and improved. It might be a short user guide, a paper simulation, a software simulation using a prototyping tool or interface generator, an early version of software and the system that is going to be replaced. It can also being referred as constructing a version of a system that maybe functionally incomplete, does not cover the whole system and lacks the performance of final system. Users can involve in testing design ideas by using prototypes. Developing prototypes is an integral part of iterative user-centered design because it enables designers to try out their ideas with use and to gather feedback.

### 1.8.4 Cooperative Evaluation

According to Monk et al. (1993), "Cooperative Evaluation is a technique to improve a user interface specification by detecting the possible usability problems in an early prototype or partial simulation. It sets down procedures by which a designer can work with the sort of people who will ultimately use the software in their daily work, so that together they can identify potential problems and their solutions". Generally, Cooperative Evaluation is a procedure to identify problems experienced with a prototype design where the user and the designer work together as a team to improve the design of the system or product. It is necessary so that changes can be made to ensure the usability as to fit the needs of the user. Cooperative Evaluation is the most useful way when the designer wants to obtain data about problems and early feedback about redesigning the system in a rapid iterative cycle. Cooperative Evaluation is most useful to work on with an existing product that is to be improved or extended, an early partial prototype or simulation and with a full working prototype.

### 1.8.5 Think Aloud

Think aloud is the term given to a special kind of verbal or oral protocol in which the user says out loud what they are thinking while they are carrying out task or doing some problem solving. This term will be mainly used for evaluating the user in the Cooperative Evaluation session.

## 1.9 Limitation of Studies

Since this project concentrates on the usability of the virtual environment, therefore, it would not focus and concentrate on the effectiveness of the system that would be applied later. This is because of the time limitation, cost limitation, hardware constraint and user constraint.

- a. **Time constraint-** To test the effectiveness of the system requires a year or more to see its impact on the users.
- b. **Cost constraint-** A very high cost is needed to test the effectiveness of the system.
- c. **Hardware constraint-** The graphic card must be powerful enough for VE application. This is because incompatibility will only make the users feel uneasy, awkward and stress in using the VE technology.

- d. **User constraint-** This project also depends on the attitude (preferences/interests) of the users. Ostensibly, some users shun away from browsing the information through the internet and some even prefer getting information from the newspapers or elsewhere. Some users are not even ready to accept VE technology.

This project is to evaluate the usability of the system and does not concentrate on the effectiveness of the system. This is due to the time constraint and the scope of the project itself. It is limited to the longhouse gallery only and not the Museum per se.

#### 1.10 Summary

This chapter is an introductory chapter, which attempts to put the project in perspective. This includes giving the background, scope and importance of the project, objectives of developing this project as well as discussing the key concepts. The next chapter will discuss on the literature review that is related to the project.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter reviews the references and previous research, which is related to the significant process of designing and developing of the 3D Sarawak Museum web system. The references also include some examples on the applications of 3D in various fields that are related to this project. It also covers the development and the various studies that have been done by recent researchers on the system-applications and the evaluation process that is related to this project.

#### **2.1 Web-based Virtual Reality in Tourism**

VR Technology has been introduced in various 3D building modeling, such as museums to boost up the tourism industry. Many countries and cities used VR to attract visitors and tourists alike. This is because VR contributes many attractive and realistic features and environment before the users can actually experience it in reality. The introduction of VR in tourism industry and building modeling has been applied through the internet and e-commerce.

The use of VR Tourism has helped web users to experience the environment interactively without actually going to that particular place. Some of the 3D modeling was applied to help users to visualize historical building that no longer exist for example the city of Athens. In addition, VR has been employed in certain museums in the world such as The Virtual Museum of Colorado, The Japanese Art Museum and the famous Eiffel Tower in Paris. A reconstructed historical setting provides stories of the lives of the people that lived in a time and place that no longer exists. Through interactive Desktop VR the users will have the opportunities to freely navigate, explore and interact with these historical places by using input devices such as a mouse and a joystick.

#### **2.2 Examples of Applied 3D Modeling**

VR has been applied in promoting cities, buildings such as museum. The following are examples of applied Desktop VR in Tourism and other related applications.