Virtual Field Trip via Digital Storytelling

by

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Dissertation submitted in partial fulfilment of
the requirements for the
Bachelor of Technology (Hons)
(Business Information System)

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
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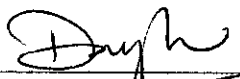
Approved by,



(Dr Dayang Rohaya bt. Awang Ramli)

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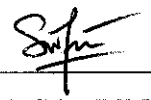
TRONOH, PERAK

July 2007

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 references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



SASHA SABRINA ARNI

ABSTRACT

Digital storytelling is a practice of combining digital content such as 3-dimensional images, text, sound, images, and video to create a short story. It is the intersection between the old art of storytelling and access to powerful technologies. This project will be a step to experiment the development and effectiveness of digital storytelling and hopefully ignite a source of motivation and encourages others to tap into their interests and skills to develop their own digital storytelling and expand ICT usage in this country. School children look forward to traditional field trips. However, such trips are costly. VFT aims to reduce if not eliminate the constraints that traditional field trips face such as money, time, energy, resources, distance and inaccessible area. To fit the time frame, the VFT is created only for small selected areas in the KL Bird Park even though the KL Bird Park is not that big because some of the areas are not suitable to take panoramic pictures. The development of the VFT is adapted from *QTVR Creation Steps* by Kitchens (2006). The procedure consists of defining the problem statements and goals, literature review and research, creating image content through taking photos at the site, transforming the photos to QTVR node through stitching, design and construct prototype, inserting interactivity such as hotspots, delivering the output, and last but not least, evaluation. The final output of the project is the KL Bird Park Virtual Field Trip which consists of a photo based 3D panoramic images for each scene from the site which are linked to one another and also hotspots which are placed on the panoramic images to reveal the birds' information with one click on the hotspots. The informal evaluation of the final output that was conducted shows an overwhelming response and acceptance. All of the respondents would like to see more of this type of VFT in the future.

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CHAPTER 1

INTRODUCTION

Stories have been used throughout history to convey important knowledge by all cultures. If a picture is worth a thousand words - just think how effective your information can be when you can include motion and emotion as well. Certainly it is well known that a well-executed diagram of a complex process is easier to understand than a lengthy description of the process. If you were to add motion to the diagram then that process can become much clearer for some users.

The focus of this project is to demonstrate the effectiveness of using Quicktime movie formatted "stories" and other animation tools such as Shockwave and Flash to illustrate various kinds of information. In addition, the issues involved with creating files of this type will also be addressed.

When asked, "Can there be significant new forms of storytelling in the new digital medium?" Janet Murray (2001) replied, "Yes, because it has its own expressive properties: encyclopedic, spatial, procedural, and participatory".

Sheizaf Rafaeli (1997), who preformed some of the earliest work on interactivity, defined it as, "An expression of the extent that, in a given series of communication exchanges, any third (or later) transmission (or message) is related to the degree to which previous exchanges referred to even earlier transmission".

Digital stories can be used to either weigh the options in a decision to be made, or document the decision-making process. Stories can help us shape our direction or our preferred future.

1.1 Background Study

Due to affordable gadgets such as digital cameras, and digital video camera, and the ease of use and accessibility of software, a broader population can now capture their own stories in a new way. Therefore the outbreak of this technology can change the way of teaching and learning in and out of a classroom. Digital storytelling is also a knowledge management tool and with the right support of compelling content, it can demonstrate a powerful technology.

Digital storytelling facilitates new modes of expression and new reading habits which could even lead to the replacement of written text in favour of a combination of graphical images, photography, audio, video, text and animation. This is because people usually prefer watching and listening instead of reading plain text. Stories show us patterns, and they help us to make connections thus becomes a form of "expert system" for remembering and integrating what we learn. One way to implement digital storytelling is through Virtual Field Trips (VFT).

1.2 Significant differences between the VFT and Traditional Field Trips

1.2.1 Static vs. Action, current Virtual Field Trips available

It is human nature that we are prone to using an interesting system which has movement, audio and visual to explain the information that we require instead of reading long boring static texts describing an object. The VFT that are currently available on the internet only consist of pictures of the site and also long descriptions of the pictures. The user can only click on a button to jump to the next page to interact with the content.

Children especially are not very keen on visiting these VFT because they are more prone to learn new things from watching and listening instead of reading plain textbook and understanding a static texts, plain maps, photos or graphics.

This KL Bird Park Virtual Field Trip will set a new standard to be followed by future field trip designer.

1.2.2 Interactivity level to assist user

Studies have shown that people like to have the freedom to control and manipulate in what order they retrieve the information and which information they want to retrieve. Allowing users to interact with virtual story or experience provides many pedagogic or educational benefits. It allows them to inquire and reflect. It allows those users to manipulate the information in ways that allow them to construct their own knowledge from the materials provided. It keeps the users more engaged with the materials so that they will spend more understanding the material rather than processing the material to understand it. This VFT offers freedom to retrieve the content that they desire in any order. For example, they are able to jump from Waterfall Aviary Scene to World of Parrot Scene in less than 5 seconds just by one click whereas in traditional field trip, it will take them 25 minutes if not more to walk through Ibis Lake, Hornbill House and Emu Land to get to World of Parrot from Waterfall Aviary.

Through the use of multimedia, the complex information and text from textbooks or trivia at the traditional field trip site can be more easily visualized by the participants. Using colours, motion, and sound it is also possible to visualize many dimensions of information. From the survey, 62% respondents do not read the information available because the information does not look appealing and does offer any interactivity, and 17% refuse to read the information that are available because they were too lazy to read the information that was represented by long static text.

1.2.3 Memory Recall Scores

Michelle Nicolosi(2002) conducted a study on the current practices of usage of the Elements of Digital Storytelling in online news content. From their findings, it is safe to say the subjects that viewed the multimedia content had better recall scores regardless of their age group.

The informal usability testing that was conducted supports the aforementioned study. This is due to the fact that all of the subjects ranging from the age of 11 to 58 find that it is easier to recall the birds' fact because the voice over narrations combined with the animated facts. One of the comments from the user was that the factor that made him recall the birds' facts was because of the way that the static text was presented and the combination animated text help as well.

The subjects were quizzed after they were done exploring the VFT prototype. The quiz consists of 10 questions about the birds' fact taken from the VFT.

The traditional field trips offer participants to be able to have non-visual and aural feelings of touch and smell. And this, most often than not, distracts students from remembering facts that are available at the site. From the survey that was conducted, 88% of the respondents agree that the information available at the field trip location are boring, too lengthy and does not attract them at all to read it. 93% of the respondents cannot recall what they have read at the field trip location.

1.2.4 Preview and Review

The traditional field trips can not offer participants the luxury of previewing and reviewing the desired field trips sites. Participants waste most of their time as they spend their time and energy trying to figure out where they are, what and how much they need to know and learn, what they need to do, and how to focus on the experience they need to gain. Those who fail to grasp the objective of a field trip will succumb to all of the excitement and spend the rest of their time on the field trip socializing.

VFTs allow participants the freedom to visit the site at anytime and anywhere. Those taking advantage of the VFT will become acquainted with the field trip. Adding audio to any of these VFT can greatly enhance the participant's experience.

1.3 Problem Statement

Traditional Field Trips have been very commonly used as a method of learning and teaching by both students and teachers all over the world. Students in Malaysia alone get to experience at least one Field Trip throughout their entire schooldays. Studies show that field trips have long accomplished the goal of enriching the learning and teaching experience. Participants look forward to such trips. But nevertheless, such trips are quite costly because they comprised of no less than 15 students, at least 1 chaperone, and transportation, entrance fee, and food. Parents who are overprotective often would not let their child go on such trips for fear of their safety and these children have no other choice but to be left out and lose on precious experience. Children who are physically challenge or are sick and prone to diseases such as asthma will also suffer such loss.

Moreover, when the institution needs to cut budget, extracurricular activities are often the first to go. Field Trips become increasingly rare while student's curiosity is increasing by day.

1.3.1 Significant of the project

There are numerous reasons why digital storytelling approach benefits the user:

- Providing multi-modal learning opportunities by presenting materials in ways that address different learning modalities such as visual learners, auditory learners and kinaesthetic learners. Modality refers to how a person detects, registers and recalls information.

- Providing richer content so that the message can be delivered more quickly, and the user can become more engaged with the information emotionally and intellectually

- Addressing language issues by offering students for who English is a second language a multi-modal approach to understanding the written text.

- Eliminate or reduce constraints such as time, expenses, guardians, energy, and also inaccessible areas.

- Provide abundant materials and information for users that be previewed and reviewed.

- To set the standard and the direction for future VFT that is going to be built.

1.4 Objectives and Scope of Study

1.4.1 Objectives

The development of this system is based on the following objectives:

- To develop a digital storytelling on KL Bird Park Virtual Field Trip in a virtual environment and virtual walkthrough.

- To create a virtual field trip using existing methods such as photo stitching, hotspots, and virtual tour that is not widely used in Malaysia.

1.4.2 Scope of study

Study focuses on constructing a smooth Virtual Field Trip (VFT) for selected areas in KL Bird Park in Kuala Lumpur especially for school students and teachers. It is important to develop a system that has user friendly features and functions that could be easily understood and fun. However, to fit the project time frame, the VFT is created only for small selected areas in the KL Bird Park even though the KL Bird Park is not that big because some of the areas are not suitable to take panoramic pictures.

A virtual 3D panoramic view prototype will be designed and implemented. The prototype will be able to store the captured images, retrieve stored images to construct a VFT. Users will be able to view in 360 degree angle in the developed prototype.

It will first be developed by taking and collecting photos of the KL Bird Park. Then the selected photos will be stored. The pictures will be stitched into 3D cylindrical view.

Then it will be transformed into a digital story by embedding other suitable multimedia elements such as audio and text annotations. It was originally plan to be uploaded and run on the web but due to the time constraint it runs as a stand alone application only.

As far as I am concerned and as far as my research goes, there are no such digital storytellings currently developed or implemented in Malaysia.

1.4.3 The advantages of the system

The system will be able to solve the problems and also limitations that arise in traditional field trips nowadays. The VFT and also panoramic view of the location could help increase the level of presence, thus increase the depth of information perceived when users experience the route themselves.

The information about the site will be gathered and managed into several classes which help users to explore and navigate the system. By having a manageable system and information will help the user to understand the site better.

The system also allows interactivity through 3D panoramic images that can be scrolled up, down, left and right and visualizes and understand a subject through exploration and active learning. With this functionality, users will engage more in the VFT and will retrieve the information better.

Another advantage of the system is that users in Sarawak and Sabah for instance will be able to visit this site as well. Constraints such as distance could be eliminated.

1.4.4 The limitation of the system

The objective of this project is to provide the simplest, observable and understandable VFT that could assist participants retaining the information they need at the site. Nevertheless, due to time constraints, the following will be the limitation of this system:

1. The design of the system will only be a prototype due to the time given to complete this project is limited and not feasible to develop a full system for the VFT.

2. Cannot replace 'real' field trip due to the absence of non-visual and aural feelings of touch, smell, etc.

CHAPTER 2

LITERATURE REVIEW AND THEORY

The fact is "human beings are naturally predisposed to hear, remember, and to tell stories. The problem – for teachers, parents, government leaders, friends and computers is to have more interesting stories to tell", says Roger Schank (1990). Steuer (1992) says that interactivity also has been used to refer to the user's control over the experience by influencing the order in which the information is presented. For example defines interactivity as the "extent to which users can physically modify (or manipulate) the form" and content of a technologically-mediated environment.

Michelle Nicolosi (2002) of the *Online Journalism Review* compiled 39 stories experts have identified as the best examples of online storytelling. A content analysis of these stories found that:

- Forty-seven percent were open, with over 48 percent being nonlinear.
- Fifty-eight percent had dynamic elements and just under half (47%) were active.
- Half of the stories included linked context and half included multimedia presentation.
- Approximately 70 percent utilized only one-way communication.

Nicolosi (2002) have conducted 3 studies on the current practices of usage of the *Elements of Digital Storytelling* in online news content. The purpose of the study is to measure the effects on subjects of different age group when they are given 2 different content to recall back, in which is the Single (HTML) versus the Multimedia (Flash). Initial effects experiment data has been collected in the form of a cross-generational nonlinear access online news storytelling experiment.

From their findings, it is safe to say the subjects that viewed the multimedia content had better recall scores regardless of their age group. And moreover, regardless of age, most of the subjects preferred the multimedia content over the single medium content. And almost all of the subjects across the group liked the fact that they are able to control and manipulate the order in which they can read the stories and being able to choose which stories to read.

Jonathan Dube (2000) also wrote that "In online journalism you have many more elements to choose from — so use them. Combine the best of each world: Use print to explain, use multimedia to show, and use interactive to demonstrate and engage." Nevertheless it is also important to be cautious in using or taking such elements as Faculty and students both need to be aware of intellectual property issues that arise if digital stories include copyrighted images, music, video, or text.

Tim Berners-Lee (1997) said," I want the Web to be much more creative than it is at the moment. I found that people thought that the Web already was 'interactive', because you get to click with a mouse and fill in forms! ". The World Wide Web has opened new ways to present information with its hypertextuality and interactivity, digital storytelling will also facilitate new modes of expression and new reading habits which could even lead to the replacement of written text in favor of a combination of graphical images, photography, audio, video and animation which are usually labeled multimedia. This is because people tend to prefer watching and listening instead of reading plain text. Telling stories to teach beliefs and moral values to others are as old as time could tell. The ancient art of storytelling has gained new life through an unlikely partner: technology.

Most of the virtual field trips available are the ones that are presented as a slide show or a video where they do not have any control and freedom to choose the medium that they prefer to see in any order. Children especially are easily bored with still images and formal interfaces. This is sad because the children loves traditional filed trips and would love to have more and go to other places, places that they could not possibly go-

somewhere far and exciting. Children are at the stage where they are curious about everything. But to hold such filed trips are very costly. Not to mention that it consumes a lot of time and those who have strict parents who worry about their children's safety are left behind.

2.1 Evolution of Technology

Around fifty years ago, in which was the 'beginning', there was a hypercalculator, a computer that computed numbers. It was the very first electronic logic-device to slither out of the ancient ooze that has spawned the entire computing industry. Fast forward to the early 90's when the fickle vacuum tube has vanished, superseded by the transistor and semiconductor. The smaller, more powerful computer has evolved, growing rapidly in each brief generation. In the last twenty years, they have turned the publishing industry on its head; those who do not publish using the computer are now prone to perishing.

Digital image manipulation quickly followed by desktop publishing, with new software species expanding into three dimensions – 3D modelling, rendering and also animation – and the time-based dimension-digital video, music, sound, text annotation, and multimedia. As new breeds of creative disciplines have been emerging and maturing, all these computers that managed to populate the planet are now becoming connected to one another on the Web. The once slow and expensive CD-ROM is now speedy and affordable. The root elements-new creative disciplines on the computer and the emergence of the Web and multimedia-have created very fertile ground for the birth of a new type of computing offspring. The new inheritor in this rich lineage of hardware and software and network is virtual reality, in which gives you the experience of ""being there" without physically being there. The current stage of this technological evolution is heaving with potential- so much new technologies are available to create and experience the Virtual Field Trip.

In the same manner that computers became smaller and more streamlined than their earliest versions, the new immersive virtual field trip or virtual reality for desktop PC dispenses with big bulky equipment of the recent past (goggle, helmet and tethering devices). Now, the desktop PC mouse and keyboard, is the only thing needed to navigate in an immersive environment (Shenchang Eric Chen, 1995).

2.2 Sea of Images

Aliaga, Funkhouser, Yanovsky, and Carlbom stated that the most challenging problem in computer graphic is to create an interactive walkthrough of a complex real world environment (p. 331). Currently there is no interactive system which can regenerate the photorealistic real world environment. According to Aliaga, Funkhouser, Yanovsky, and Carlbom, image-based rendering (IBR) achieve photorealism by using a set of photographs to render novel viewpoints without the need of constructing detail 3D model. However, the current IBR technique is only capable of generating IBR walkthrough for a small scene or environment with low geometric complexity (p. 331). The 'Sea of Images' is a method proposed by Aliaga, Funkhouser, Yanovsky, and Carlbom to create an IBR walkthrough system that supports an interactive experience for large and complex real world scene. In their article, Aliaga, Funkhouser, Yanovsky, and Carlbom explained that the 'Sea of Images stands for a collection of images every couple inches throughout a large environment (p. 331).

To generate the 'Sea of Images', Aliaga, Funkhouser, Yanovsky, and Carlbom captured omnidirectional images on an eye height plane by moving a video camera mounted on a motorize cart back and forth in a zigzag pattern throughout the environment. Aliaga, Funkhouser, Yanovsky, and Carlbom explained that the captured images are then compressed in a multiresolution hierarchy to enable them to be access efficiently. Time critical algorithm is used to prefetch the relevant images and feature based morphing method is used to reconstruct images during the interactive walkthrough.

The difficult computer vision problems such as 3D construction and surface reflectance modelling can now be replaced with easier problem from SOI approach, which are motorized cart navigation, data compression and working set management. There are four advantages provided by the SOI approach. As stated by Aliaga, Funkhouser, Yanovsky, and Carlbom, first, it enables precise image reconstruction for novel views in environments with specular surfaces, a great amount of geometrical detail, and complex visibility changes. Second, it does not require accurate geometric model to produce novel images over a wide range of viewpoints. Third, it provides a method for images-based modelling of a large environment without sophisticated gaze planning. And lastly, it supports of rendering inside looking out images in an IBR interactive walkthrough system (p. 332).

The three main challenges in implementing an IBR interactive system by using the 'Sea of Images' are obtaining a large set of images over a large area in a practical manner, compressing the massive amount of captured images, and accessing a large out of core data set for real time walkthrough. The authors of this paper have proposed and experiment the below solutions for each of the problems mentioned above in their research work. According to Aliaga, Funkhouser, Yanovsky, and Carlbom, an omnidirectional camera on a motorized cart is built from off the shelf components to capture a dense of images on an eye height plane. The motorized cart moved the omnidirectional camera in a zigzag pattern through a large environment.

This system is small enough to move around anywhere a person can walk through and more pictures are captured for areas where viewer may want to study object in detail. Compression is achieved by implementing a multiresolution IBR representation to exploit coherence in nearby images. Predictive fetching and caching algorithm are used to load images from disk as a viewer moves through an environment interactively.

This method is the approach to be taken to create an interactive walkthrough system. Therefore, it is only taken as a supplementary guide to the *QTVR creation steps* method.

This is because the VFT developed in this project only uses panoramic images as an interactive virtual environment instead of a *virtual walkthrough*. Due to the time constraint, developing a virtual walkthrough on top of the interactive panoramic view is not feasible.

2.3 How Human Perceive Information from Virtual Reality

Human communicates with data processors everyday in various ways. Each time when we listen to a CD or look at a digital watch, one is interacting with the machine. In order for the boundary of interaction to cross over into synthetic reality, the computer-simulated elements must become perceptually dominant over the real-world elements. The closer the system is to the real thing, the more likely user will be prone to use it. For an example, when one 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 curve to improve upon a high percentage of the total human subject vision and the images 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 information or material related to their surrounding is through their sights, hearing and feel or touch. Thus, these will need to be included as the main parts of the current directory. If sensory input from these resources is not orchestrated, then the envelopment will not be achieved. For example, the 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 and disconnects between handle and hearing or between hearing and vision also induce problems such as disorientation and nausea.

2.4 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 of information. 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 whereby the purpose is to discover the effects of routing variation during experiencing two distinctive navigation system which are the 2D link based navigation and the 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 is divided into two group of control design which is the 2D navigation system by using the Conventional link-based hypermedia and 3D spatial navigation system using VRML-based spatial navigation system. The analysis indicates that there are two factors that cause two significant differences to emerge which are the perception of navigation difficulty where VRML 3D pages scored higher while performing retrieval task.

However, 3D pages have high preservation information where the retention test 3D group scored higher than 2D group. This shows that the ability of VR or 3D images to instil high retention in human memory.

The attractiveness level between 2D and navigation and 3D navigation are revealed when most of the subjects are more interested in routing or touring the VRML 3D system rather than the 2D system. The 2D navigation is more suitable during a high task of cognitive load but without any comprehensive and retentions in the navigation, which could not help user to understand more on the information retrieve. In the future, the combination of 2D and 3D will unravel both of their drawbacks.

2.5 Virtual Field Trip

It is undeniable that VFT cannot replace traditional field trip in the near future. However, students and teachers will be able to appreciate VFT when it comes to the fact that there are places that are impossible to visit. Some are too dangerous such as volcanoes, floods and landslides while others are inaccessible such as the moon, the ocean floor. Below is a table describing the advantage and disadvantages of VFT (Hubble and Qui, 2002).

Features	Advantages of VFT	Disadvantages of VFT
Use digital and computer Visualization techniques	❑ Integrate diverse types of data in instantly available ways ❑ Present images from a variety of viewpoints and at many different scales ❑ Display non-visual data (geochemistry, etc.) ❑ Helpful for presenting trips to inaccessible areas ❑ Provide an alternative of fieldwork, when time, expenses, and/or logistics are real issues	❑ Do not convey the true 3D nature of objects ❑ Do not convey the non-visual and aural feelings of touch, smell, etc. ❑ Less beneficial than really being in the field ❑ Lack the serendipitous nature of discovery

	❑ Enable presentation of extensive field trips and great variety of landform diversity ❑ Enhance students' experience	
Based on the personal computer and Internet	❑ Enable flexibility of access (time and place) ❑ Provides a repeatable experience which can be used to reinforce concepts in class ❑ Provides an easily experienced preview or review of real field trips	❑ Having limited interaction with a computer ❑ Not interacting with people in a flexible manner
Multiple styles of access e.g. CDROM and websites	CD-ROMs are convenient to acquire and use ❑ Information rich	CD-ROMs can only provide a finite limited amount of information ❑ Visiting a website can be difficult and depends on many factors, such as availability of computers, load on the network, number of connections, and reliability of service provision.
Wide variety of VFT available online	❑ Hold abundant materials and information ❑ Offer rich resources of learning and teaching	❑ Easy for students to get lost among lots of websites ❑ Many websites are ephemeral rather than permanent
No standard quality for current VFT	❑ Available for users of different levels and demands	❑ Often difficult to find a suitable one for teaching and learning ❑ The abundant websites are not quality controlled
Designed to be interactive like computer games	❑ Interesting and attractive to students and an alternative experience for users	❑ It is easy for students to be obsess over particular sites, which raises the problem of time management

Table 1: The advantages and disadvantages from users' standpoint

2.6 Current VFT

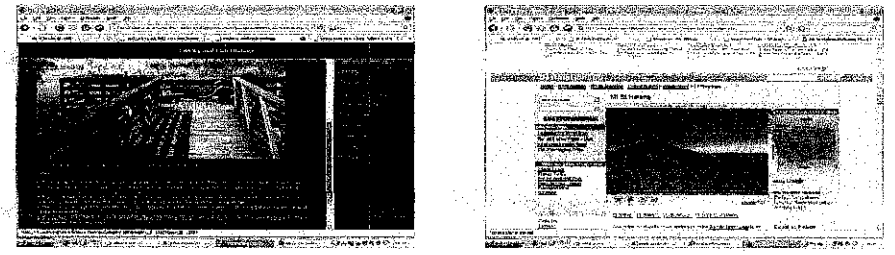


Figure 1: VFT that are currently available

No.	Drawbacks of current VFT	Example of site	Links
1.	Static images	Agriculture in the classroom	http://www.agclassroom.org/teacher/tours.htm
2.	Static text	Zoo Atlanta	http://www.zooatlanta.org/home.htm
3.	Long description	Virtual Hawaii	http://satftp.soest.hawaii.edu/space/hawaii/virtual.field.trips.html
4.	Low interactivity	Factory tours online	http://manufacturing.stanford.edu/onlinetours.html
5.	Dull	LDS home schooling in California	http://ldshomeschoolinginca.org/vft.html
6.	No virtual tour	Nasa quest	http://quest.arc.nasa.gov/index.html

Table 2: Example of current VFT drawbacks

The number of VFT available is enormous. If students search for VFT websites on the Internet using a search engine, such as Google, they will find 1,630,000 websites that have 'virtual field trips' as keywords. Moreover, there are no standards set to build VFT. The information about different countries and places around the world available at http://surfaquarium.com/virtual.htm is mainly just photographs and descriptive text. VFT are differently designed and have different aims and contents.

Hubble and Qui (2002, pg. 76) also mentioned that even though VFT are widely used, we must keep in mind that surveys show that while students enjoy VFT, they do not want the real field trips to be replaced (Spicer and Stratford 2001). This is because VFT has no level of presence and actual field trips provide real experiences. Picking up rocks, dealing with the snake or mouse hiding beneath the rock is another real experience that also is a part of field training. These benefits are absent from VFT.

CHAPTER 3

METHODOLOGY / PROJECT WORK

3.1 Methodology

Paul and Fiebich (2002), view digital storytelling from a comprehensive taxonomy as explained in details below. This taxonomy which has inspired many interactive digital storytelling creators and researchers is used as a guide for this research especially in designing and developing the research artifact, the digital storytelling with panoramic images. Below explained each of the steps taken in making this project a success:

3.1.1 Procedure identification

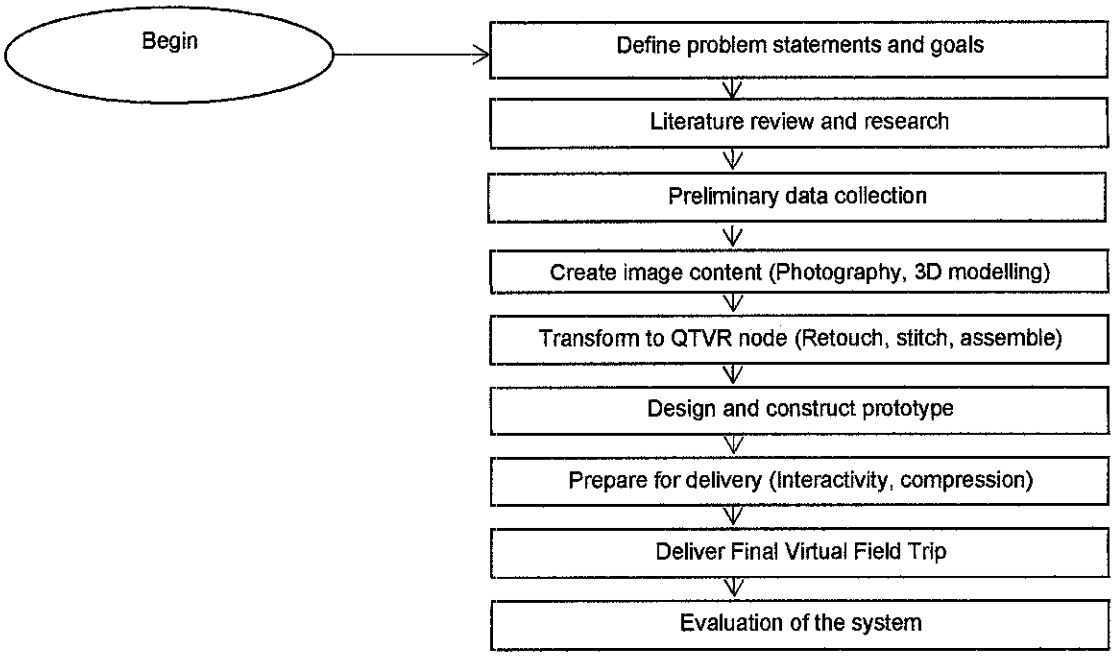


Figure 2: Project development steps adapting *QTVR Creation Steps* (Kitchens, 2006)

3.1.2 Preliminary Data Collection

Research work has been carried out on the relevant work done to guide in understanding the fundamental concepts of using 3D panoramic images to create a virtual environment. Materials related to virtual reality, taking and stitching panoramic images has been studied and referred to in order to grasp the basic idea on the steps involved in creating the VFT. Some help from UTP's technician, Mr Rasky was also sought to assist the project.

3.1.3 Literature Review and Research

Articles and journals are reviewed to be use as a guide in taking the photographs and creating the VFT.

Through the research that has been carried out, it is learnt that in order to create a complete and realistic VFT for a large and complex environment, a large amount of photographs are needed, these large amount of photographs will require a huge memory space for insufficient memory space will lead to a lag in the VFT; the virtual scene might not display on time and this will affect the quality of the VFT. Thus compression, prefetching and also caching mechanisms will be needed to create a smooth virtual walkthrough for a large and complex environment. In order to ensure that the current project developed is flexible enough to add in the compression, prefetching and caching functionality in the future enhancement, it is found that developing the VFT in OpenGL and C++ will give the greatest flexibility and more control to the developer to modify any current features just to fit in the new enhancement.

Literature review and research stage is carried out throughout the project development phase to continuously find the best option in creating the VFT and also to keep track of the latest technology and idea used in creating the VFT.

3.1.4 Capture and Create Content

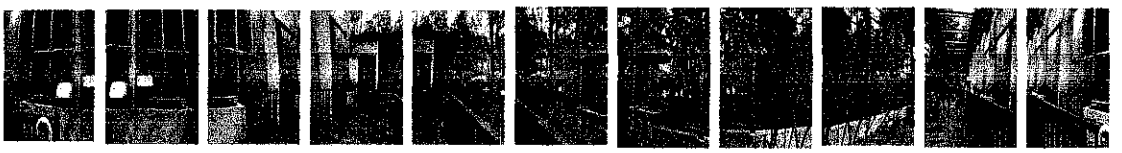


Figure 3: Raw Data Collected

To create VFT, some form of imagery is needed to start. It will be taken as the main source photography. A term coined for panorama photography is *interactive* photography. Rather than creating a single photographic image, where the subject it chosen, framed, lit, and then get a rectangular-shaped result, when photographing for a panoramic movie of picture, all possible point of view from one position is recorded. Once done, the viewer is able to interact with the photograph in whatever way one pleases.

3.1.5 Transform Content into QTVR node

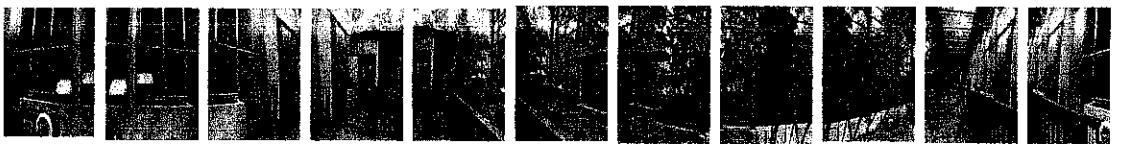


Figure 4: Individual images used to create a panorama movie

Figure 5: The stitched panorama image

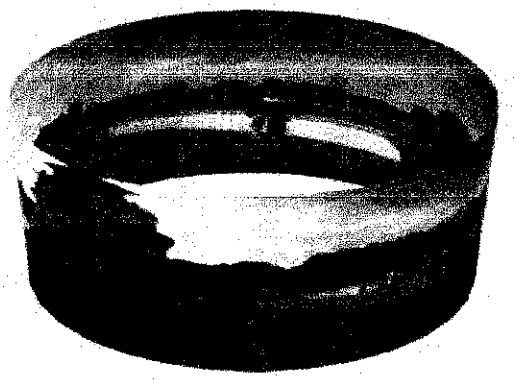


Figure 6: A panorama image as a cylinder

Once an environment has been lit and shot, then the content resources are transformed into a QTVR movie. This is the step where the raw individual images are assembled for a panorama movie. The result is the final, completely assemble source.

To accomplish these steps, QTVR authoring tools are used. There are a variety of authoring tools for creating QTVR content in which are newly available nowadays. More emphasis will be put in the concept rather than the specific tools, because the tools are changing rapidly and constantly. Once the concept is grasped, it can be applied to any tools that are readily available.

3.1.6 Prepare for Delivery

Once the source images have been made, further steps are taken to be prepared for the output. When there are two or more panoramic photographs, they need to be linked to one another. To be able to jump from one node to another, hot spots are placed in the movie or images and the movie is compressed for playback. This is the stage where interactivity between the VFT and the user are developed.

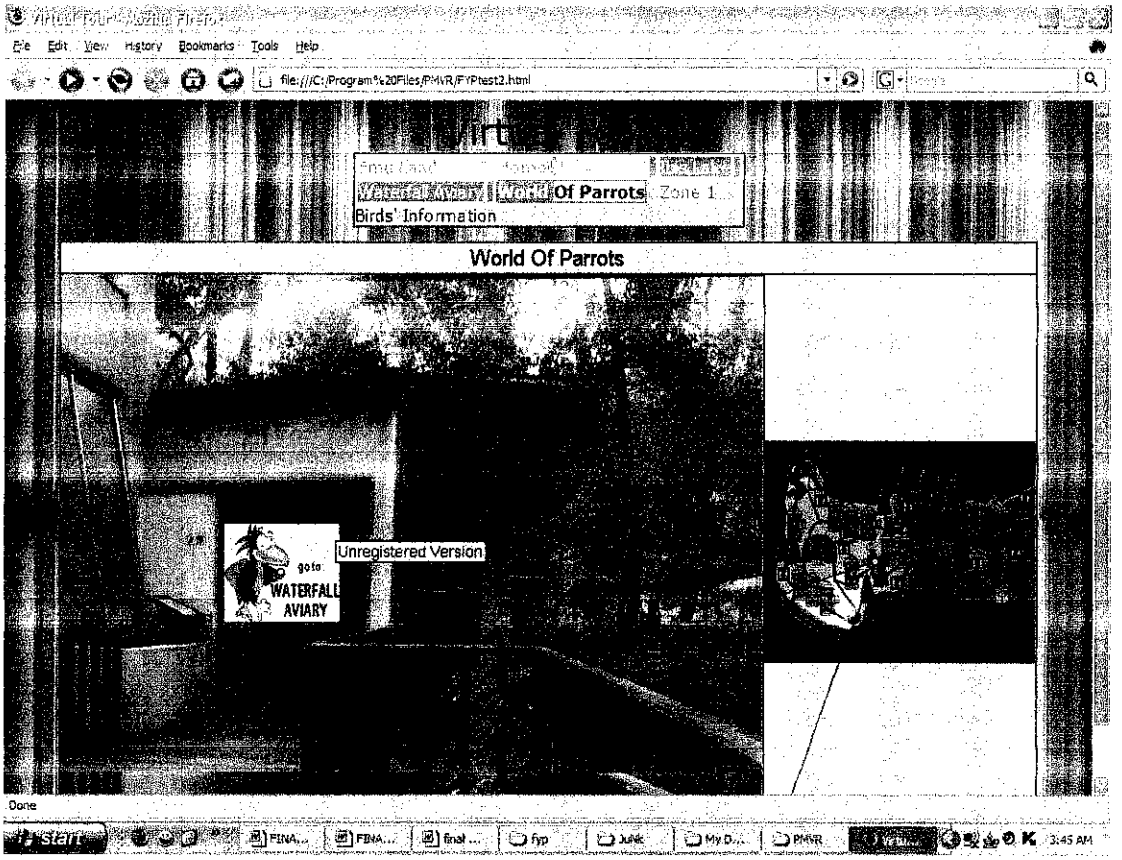


Figure 7: Hot Spot that links to another node

3.1.7 VFT Delivery

In this stage, the panorama images are integrated into the final delivery medium- a stand alone, delivery on the Web, delivery through a multimedia project, or incorporation into custom playback software that is written from scratch.

3.1.8 Evaluation of System

After the VFT prototype has been built, evaluations are conducted on various aspects to measure the quality of the VFT created. Evaluations are carried out on the memory storage consumed by the VFT prototype, smoothness of the VFT as well as the quality of the virtual scene display and also the retention effect that the VFT has on the users.

3.2 Tools Required

No high performance or super computer is needed to implement the VFT prototype. Only a personal ASUS laptop installed with only Microsoft Windows XP Professionals Version 2002 Service Pack 2 operating system is used. The processor used is Intel Celeron M420 CPU, 1.70 GHz with 512MB of Ram and a hard disk space of 38.1 GB.

3.2.1 Hardware

Hardware	Model	Reason of usage
Central Processor Unit (CPU)	Intel ® Celeron	Compatible and stable
Main Memory	512 Megabytes(MB) or above	To support the Operating System
Digital Camera	Nikon	To capture photos
Tripod & Panorama Tripod Head	Novoflex VR-SYSTEM PRO Panorama Adaptor	Allows multi-row and spherical stitched pictures as well conventional panoramas to be created

Table 2: Hardware tools

The key material in implementing the VFT is photographs, thus it is crucial in selecting the type of digital camera which can produce the sets of photographs with the desired quality. This is to ensure that the virtual walkthrough constructed has good display quality. The selected digital camera is Nikon COOLPIX 5900, which has 3x zoom and has the capability of capturing digital photographs with 5.1 Megapixels resolution. Tripod is used when capturing the photographs. This is to enable the ease of stitching the photos together. A panorama tripod head is also used to take photograph. It is a specially designed spherical tripod head allowing the photographer to adjust a camera/lens "entrance pupil" exactly over its correct rotational axis. This helps to eliminate parallax error inherent when shooting multiple images side by side. Without parallax a photographer can seamlessly stitch multiple photographs together forming a larger higher resolution composite image.

3.2.2 Software

Software purpose	Software tried out	Software used for VFT
Creating animation	Macromedia Flash 8	
	Macromedia Flash MX	Macromedia Flash MX
	Adobe Flash CS3 Professional	Adobe Flash CS3 Professional
Design of background, hotspots, panoramic frame, buttons, and birds' information	Adobe Photoshop 7	Adobe Photoshop 7
	Free Web Buttons	
	Artful GIF Animator	
	Animated GIF Producer	
	Button Gadget	
	Flash Creator	
	Icon Cool Editor	
	Likno Web Button Maker	Likno Web Button Maker
	Styleskin 7.0	
	Web Button Maker Deluxe	Web Button Maker Deluxe
Stitching still images into 3D panoramic images	A3D Stitcher	A3D Stitcher
	Photovista	
	Spin Panorama Professional 3	Spin Panorama Professional 3
	Swift 3D Version 2	
Audio converter	Allok MP3 to AMR Converter	Allok MP3 to AMR Converter
Video Converter	3GP Video Converter	3GP Video Converter
Virtual Tour developer	Easypano Tourweaver Pro 2.0	
	Panoview Demo version 1.0	
	VRBrochure Project 6.3	
	PanaVue Image Assembler	
	PMVR Virtual Tour Editor	PMVR Virtual Tour Editor
	ArcSoft Panorama Maker 4	
	Enigma Walkthru	
	Fairstars Audio Converter	

	0-360 Unwrapper Stagecast Creator 2 Web Eval Studio 2007 Easypano Tourweaver Pro 3.0	 Easypano Tourweaver Pro 3.0

Table 3: Software tools

3.3 The flowchart

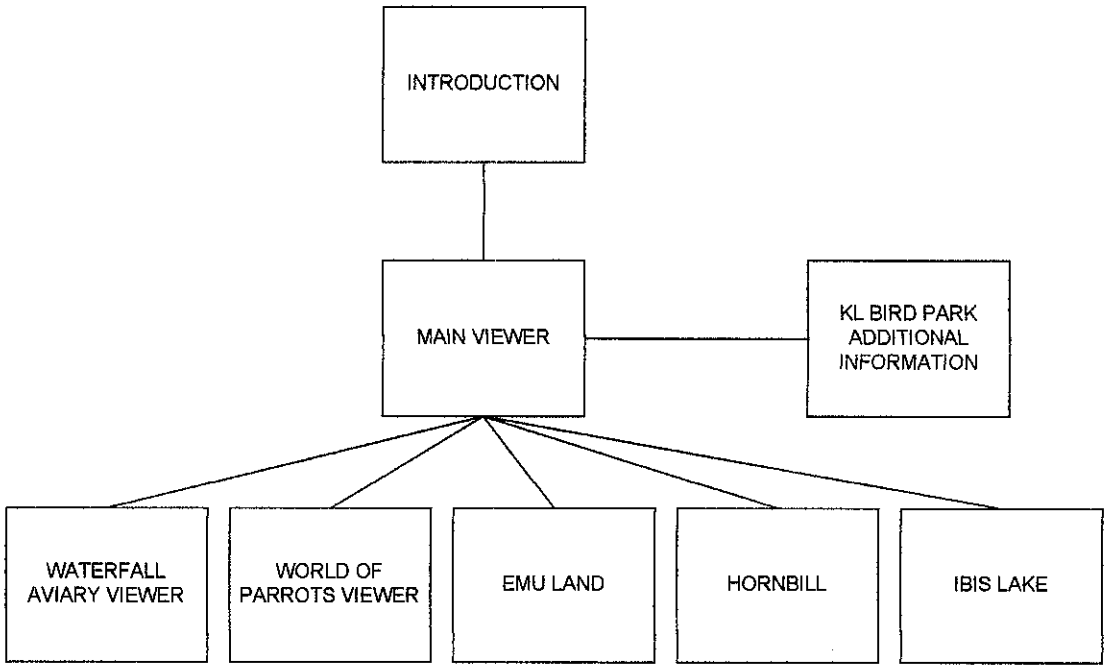


Figure 8: KL Bird Park VFT flowchart

An information flowchart is simply an outline presented as a box diagram with lines that show the access routes that consist of the project's topic categories, levels, and links.

Three forces drive the design of a flowchart:

- Content: The organization and structure mapped out for the information.
- Usability: The topic categories and access routes that the audience will expect to find.
- Simplicity: The need to keep the design clear and focused to control production time and costs.

When the user run the application, the flash animation and narration will play as an introduction to the KL Bird Park VFT. The user will be prompted to click the "enter" button to lead them to the main viewer which consists of the panoramic image viewer. The viewer consists of 5 thumbnails; Waterfall Aviary, World of Parrots, Lake Ibis, Emu Land and Hornbill which allows participants to jump to another scene with one click. Participants can also jump to another scene by clicking on the hotspots embedded in the panoramic images. The hotspots also hold fun facts about the birds. The main viewer is also linked to the KL Bird Park's Information page which consists of the entrance fee and also instruction and map to guide users to the location.

3.4 The Sneak Preview

The Waterfall Aviary Viewer

Figure 9: Waterfall Viewer, KL Bird Park VFT

3.5 The Storyboard

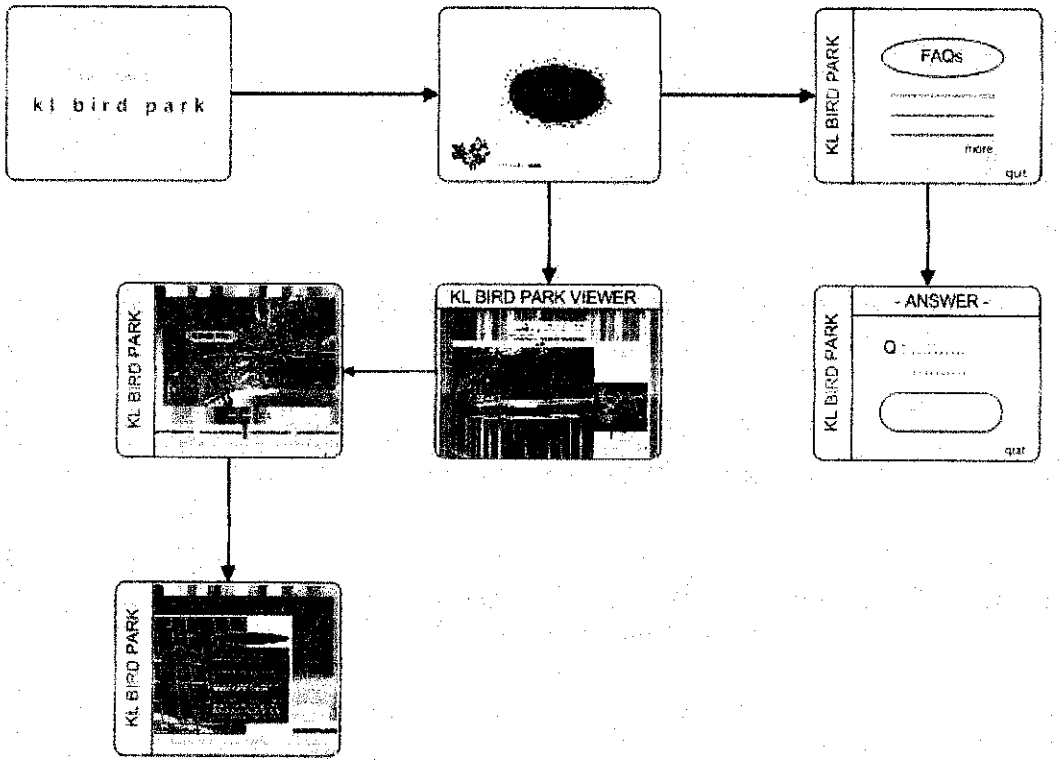


Figure 10: The Storyboard

Like the flowchart, the storyboard is a living document that's modified and updated as long as the design process continues.

When the user run the application, the flash animation and narration will play as an introduction to the KL Bird Park VFT. The user will be prompted to click the "enter" button to lead them to the main viewer which consists of the panoramic image viewer. The viewer consists of 5 thumbnails; Waterfall Aviary, World of Parrots, Lake Ibis, Emu Land and Hornbill which allows participants to jump to another scene with one click. Participants can also jump to another scene by clicking on the hotspots embedded in the panoramic images. The hotspots also hold fun facts about the birds. The main viewer is also linked to the KL Bird Park's Information page which consists of the entrance fee and also instruction and map to guide users to the location.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Results of Survey

The survey was conducted to gather information on the importance of field trips. The result is based on a total of 108 respondents from UTP.

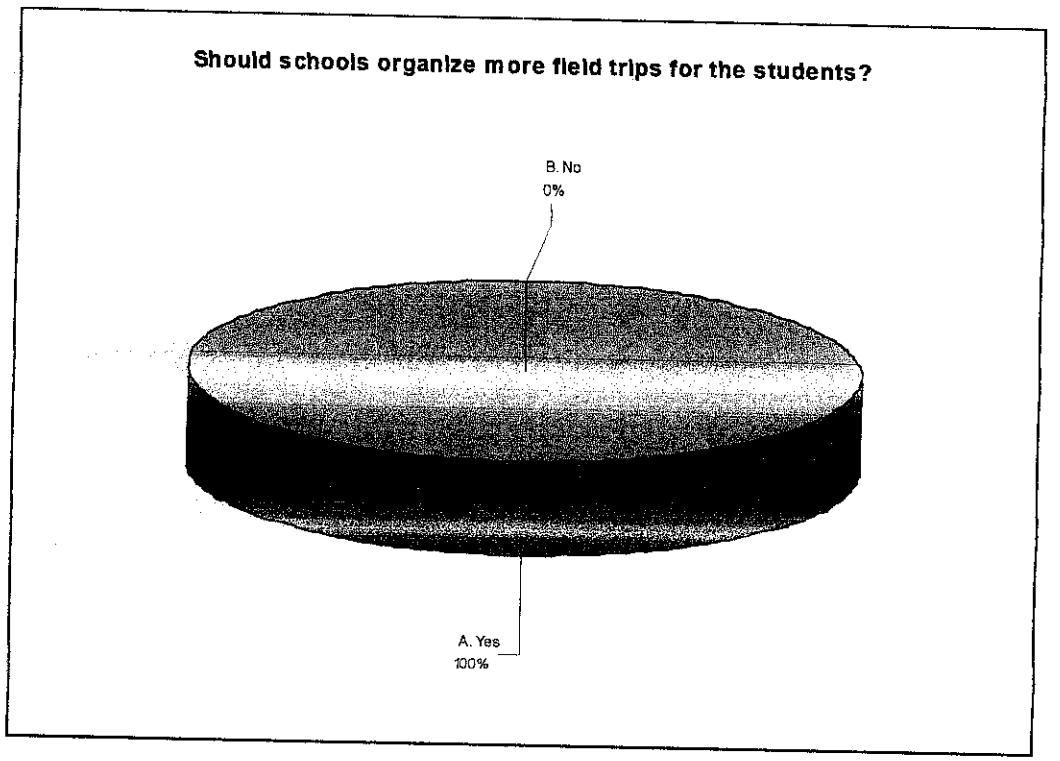


Figure 11: Pie chart shows students agree that school should organize more field trips

This pie chart indicates that students, regardless of age, gender or personality look forward to traditional field trips. Traditional field trips are a different way for students to explore and learn. The students will be excited to embark on the field trip even if the location is a boring museum.

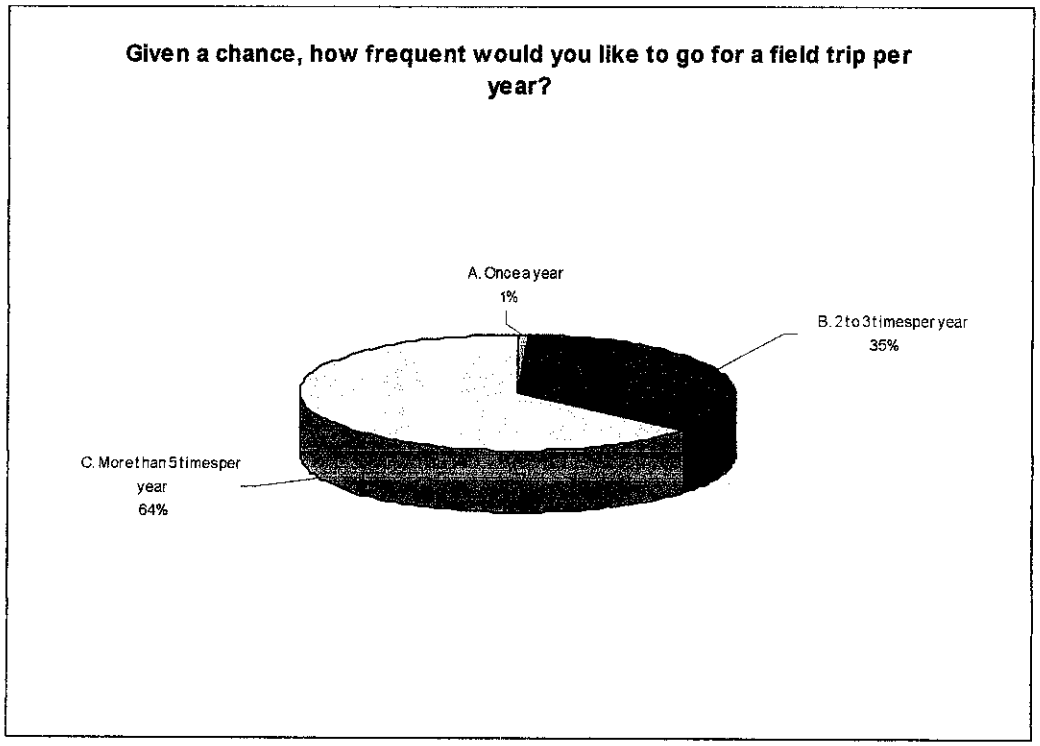


Figure 12: Pie chart shows that students would like to go on as many field trips

From this pie chart, it is concluded that most of the students would like to go on as many field trips as they could. 64% students would love to go on field trip as much as they could. There was 1 similar feedback that was received from the other 36% students which was that the fees to attend such field trips were too costly and that their parents could not afford it. Other feedbacks are such as the buses were smelly and uncomfortable and that the organizers will not take any responsibility if something happen to them.

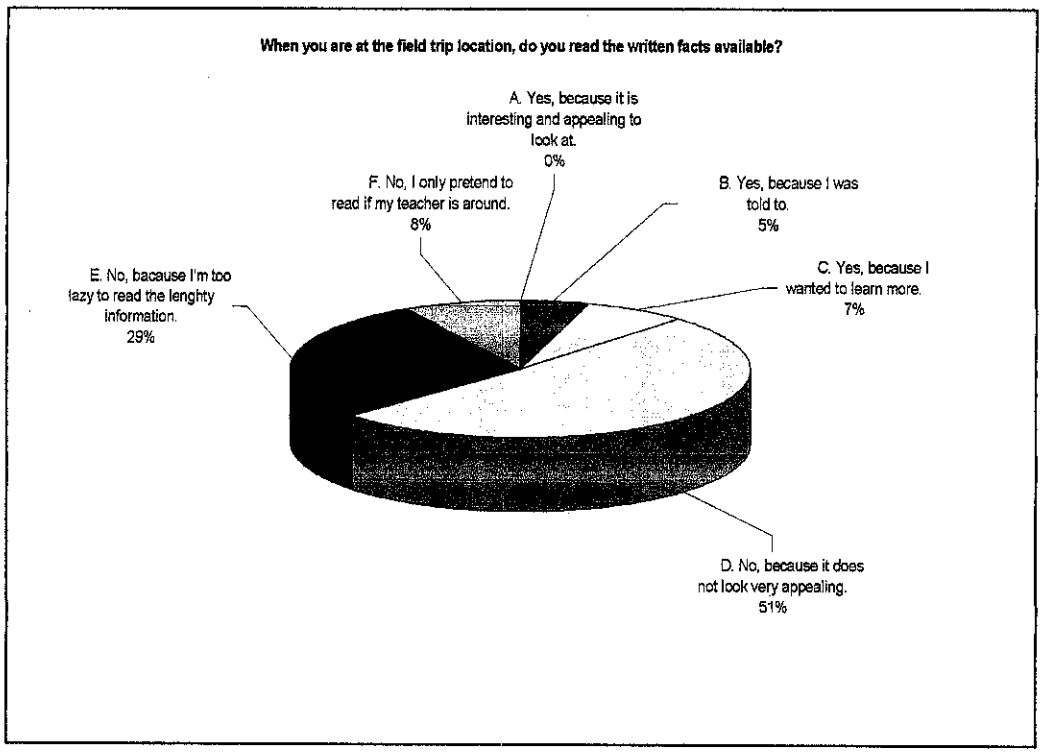


Figure 13: Pie chart shows is students do not read the written facts available

It can be concluded that the information that are placed at the field trip site, do not draw visitors to read them. 51% respondents agree that the information available does not look very appealing, and 29% agree that the way the information is display looks very long and respondents are too lazy to read them.

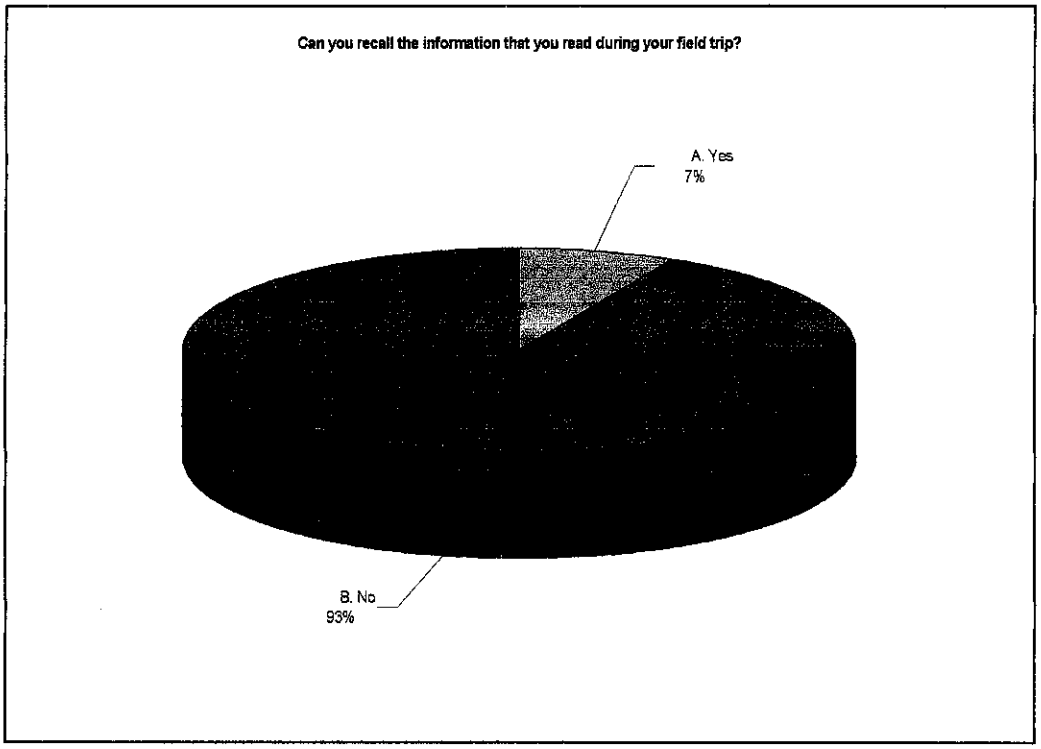


Figure 14: Pie chart shows is students can recall the information from their field trip

This pie chart addresses the issue of field trip participants not being able to recall the information that they have read at the field trip site. They are able to remember what the place look like and can describe in detail every other visual aspect of the field trip but were not able to remember the information available at the site which consist of static texts and still images. The VFT can help reduce this problem. The participants of the informal usability testing for the VFT managed to answer all of the questions from the quiz given after they had explored the VFT. This is because, the information of the birds were attractive and interactive. The participants had to uncover the hidden information by clicking on the hotspots.

4.2 The Completed System

KL Bird Park Virtual Field Trip

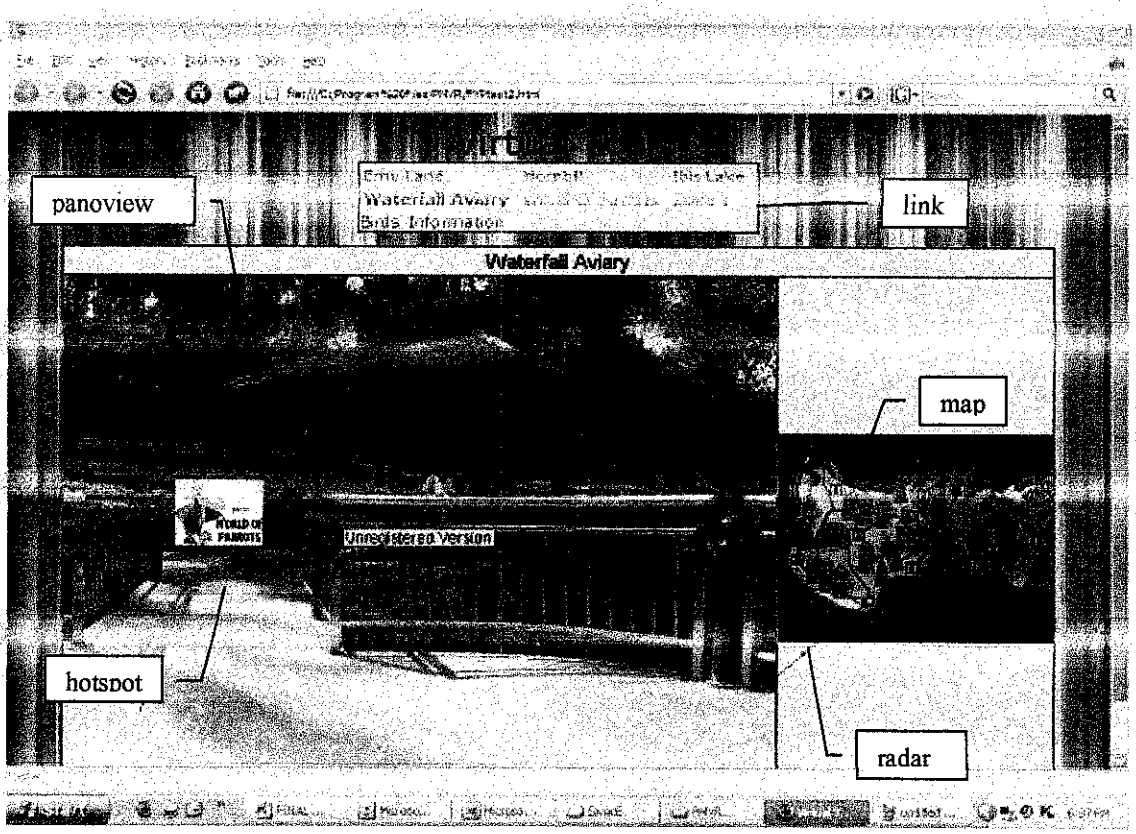


Figure 15: VFT main viewer

The VFT main viewer consists of the links to other scene, the panoview which is the panoramic images viewer, hotspots on the panoramic images, and also the map which is embedded with radars. The hotspot acts as interactivity between the user and the system. When clicked, it can pop up a window which contains images or information and can also jump to another scene. The interactive map assist user on their whereabouts and also acts as a link for user to jump to another scene. The radar turns 360 degree and turns concurrently with the panoramic images. Users are able to click on the panoramic images and drag the scene 360 degree as if they are standing on one spot and turning 360 degree or let the panoramic image viewer run and turn automatically.

Hotspots

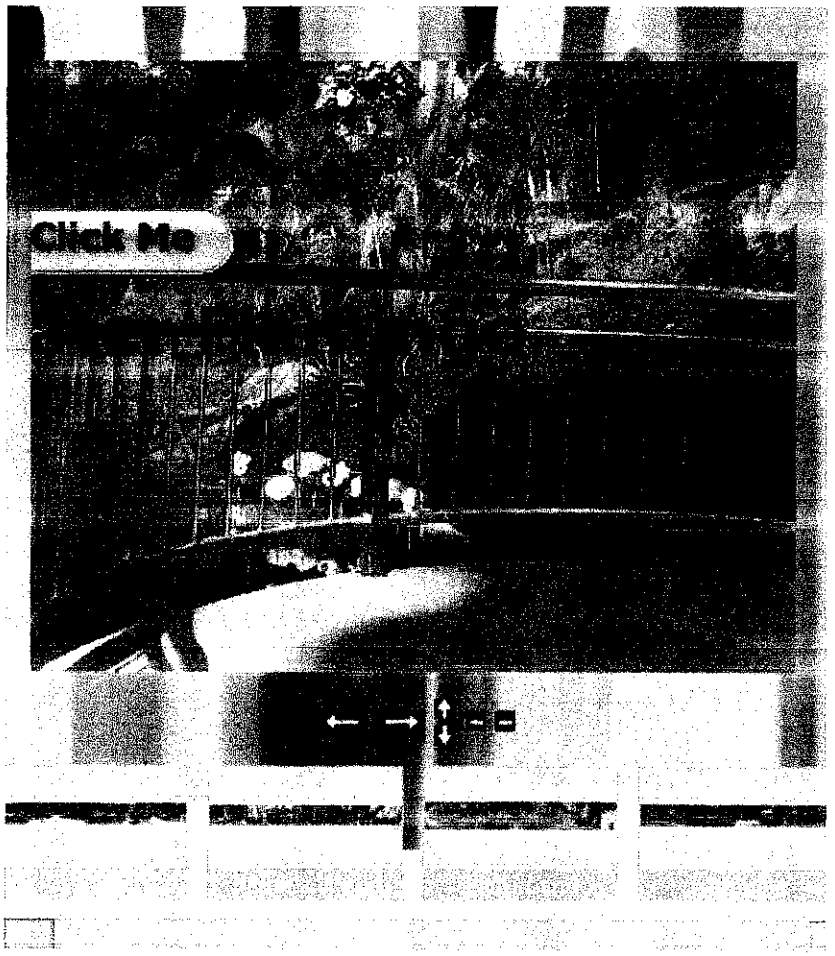


Figure 16: Hotspot

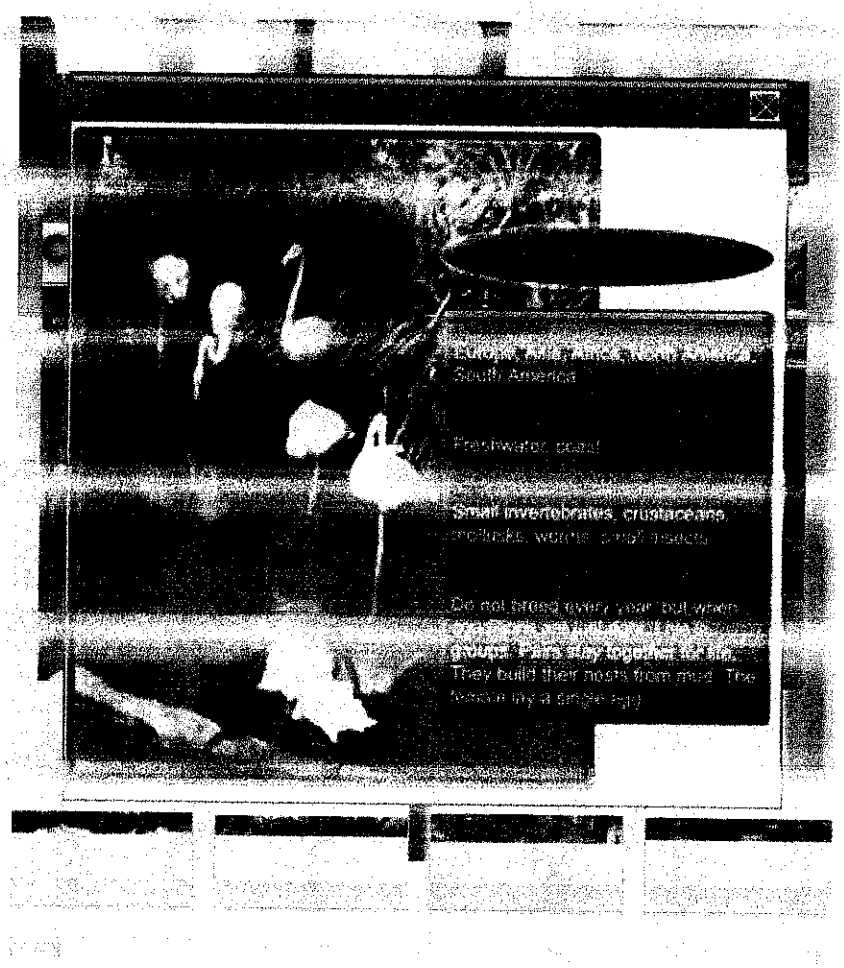


Figure 17: Bird's information pop up when hotspot is clicked

4.3 The Evaluation of the System

An informal usability testing of the system was conducted. A few people were asked to explore the system and voice out their comments. They were also verbally quizzed on the birds' information available at the VFT. This is to test whether the VFT were able to attract them to read the information available and whether the VFT helped them to recall the information. All of them answered the entire questions given correctly. And all of the feedbacks were positive. The system received high acceptance level.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

The school children in Malaysia are already familiar with the traditional field trips and have not yet been exposed to virtual field trips that are interactive and engaging. This project has proven to be beneficial. From the survey that was conducted, one of the issue was that 88% of the respondents who participated in traditional field trip do not read the information that are available at the field trip location and 93% could not recall what they have read. This project was able to draw participants to read the birds' information provided in the VFT, and were able to help them to retain and recall the birds' information. One of the feedbacks from the participants was that this project should be the new standard for future VFT developer and designer to follow. The 3D panoramic images that were included in the VFT increased the level of presence and should be used by the tourism industry intensively. Through this VFT, constraints such as money, time, energy, and distance can be reduced. The proposed project is intended to encourage multimedia producers and authors, photographers or even anyone who has very little knowledge about multimedia, to embark on such project because it is doable and will enable them to contribute to the children in hopes of enriching their knowledge.

Due to the time constraint, the VFT was not published on the web as only runs as a standalone application. And because Virtual Tours are not widely used, more than 10 virtual tour software were tried out to find the best suitable one to develop the VFT. Another problem encountered during this project was that the suitable software was a trial version, therefore there were limited functions that can be used. Therefore, the videos taken from the Bird Show held at the KL Bird Park cannot be embedded in the VFT. In the future, it is also recommended that the whole bird park will be included in the VFT.

REFERENCES

Roger Schank, 1990, "Tell me a story", <http://www.teachingteachers.com/index.htm >

Steuer J., 1992, "Defining Virtual Reality: Dimensions Determining Telepresence", *Journal of Communication*

"7 Things You Should Know About Digital Storytelling", < http://www.educause.edu/eli >

Glister P., 1993, *The Internet Navigator*

Tim Berners-Lee, 1997, < http://www.w3.org/1998/02/Potential.html>

Centre for Digital Storytelling, <http://www.storycenter.org/about.html>

Adobe Systems Incorporated, <http://www.adobe.com>

J.D. Lasica, 2006, "Digital Storytelling: A Tutorial in 10 Easy Steps, Expert tips on creating a polished, professional digital video", <http://www.techsoup.org/learningcenter/techplan/page5897.cfm>

Aliaga, D. G., Funkhouser, T., Yanovsky, D. & Carlbom. I., *Sea of Images*. IEEE, (pp.331-338)

"Potential Applications of Digital Storytelling in Education", <http://www.vf.utwente.nl/~theune/VS/Frank_van_Gils.pdf>

Frank van Gils, University of Twente, Electrical Engineering, Mathematics and Computer Science.

Stefan Göbel , June 2004, "Technologies For Interactive Digital Storytelling And Entertainment: Second International Conference", <http://books.google.com.my/books?vid=ISBN3540222839&id=SdPo_MOxvEAC&pg=PA129&lpg=PA129&ots=RM7muJsXae&dq=digital+storytelling+methodology&sig=rv4GXf-ldxDlWnzozo14Q2D3o4g#PPP1,M1>

Bauer M., *Image-based rendering for real-time applications*, IEEE

Chim, J., Lau, R. W. H., Leong, H. V., and Si, A., 2003, *CyberWalk: A Web-Based Distributed Virtual Walkthrough Environment*, IEEE Vol. 5, (pp.503-515)

Weili Qiu, October 2002, *The Advantages and Disadvantages of Virtual Field Trips in Geoscience Educatio*, The China Papers

Prof John Cram, *Seeing mangrove swamps from a distance: Development of a virtual field trip*, School of Biology, University of Newcastle upon Tyne. UK

Susan A. Kitchens, 2006, *The Quicktime VR Book*

Michelle Nicolosi, 2002, "Elements of Digital Storytelling: Developing a Lexicon of Terms", *Online Journalism Review*, <http://www.inserttexthere.com/storytelling.htm>

Rafaeli, S., 1997, "Sage Annual Review of Communication Research: Advancing Communication Science", *Interactivity: From New Media to Communication*

Rafaeli, S., 1997, "Journal of Computer-Mediated Communication", *Networked Interactivity*

Walter McKenzie, June 2002, *Virtual Field Trips*

Shenchang Eric Chen, 1995, *QuickTime VR: an image-based approach to virtual environment navigation*

Paul N., Fiebich C., 2002, "Elements of Digital Storytelling: Developing a Lexicon of Terms," *2002 Interactive Media Forum*

Paul N., Fiebich C., 2005, <http://www.inms.umn.edu/Elements/index.php>

Lacina, Jan Guidy, 2004, *Designing a Virtual Field Trip,* ERIC

Clark, Kenneth F.; Hosticka, Alice; Schriver, Martha; Bedell, Jackie, 2002, *Computer Based Virtual Field Trips*, ERIC

Placing, Kaye; Fernandez, Anne, 2002, *Virtual Experiences for Secondary Science Teaching*, ERIC

Gina Otto, March 2006, *Virtual Field Trips*, ERIC

Spicer, John I.; Stratford, J., 2001, *Student Perceptions of a Virtual Field Trip To Replace a Real Field Trip*, ERIC

Bellan, Jennifer Marie; Scheurman, Geoffrey, 1998, *Actual and Virtual Reality: Making the Most of Field Trips*, ERIC

Stainfield, John; Fisher, Peter; Ford, Bob; Solem, Michael, 2000, *International Virtual Field Trips: A New Direction?*, ERIC

Roberta Devlin-Scherer, September 2003, "Cost-Free Travel with Virtual Field Trips", <http://www.techlearning.com/showArticle.php?articleID=13100791>

APPENDIXES

Appendix 1: Questionnaire Sample of Field Trip Survey

Appendix 2: KL Bird Park's Map

Field Trip Survey

The objective of this survey is to gather information on field trips made by students during their primary and secondary education years. The results of this survey would be used for resarch work and may be published as statistical report.

Please answer all questions in all sections.

A. Student Background

1. Age:_____
2. Gender:_____
3. Programme:

    A. Computer Information System
    B. Electrical & Electronic Engineering
    C. Chemical Engineering
    D. Mechanical Engineering
    E. Civil Engineering
    F. Petroleum Engineering

4. Year /semester:_____

B. Primary Education – Year 1 to Year 6

1. What is the name of your primary school? Please include its address - town and state only.

   _____

2. How many field trips have you made during your primary education?
   - A. 0
   - B. 1
   - C. 2
   - D. 3
   - E. 4
   - F. 5 or more
   - G. Cannot remember

3. What is(are) the purpose of these field trips ? (You may circle more than one answer)
   - A. Science field trips
   - B. Co-curiculum activities (e.g. Camping)
   - C. General educational trips (e.g. museum, zoo, exhibition)
   - D. Entertainment// Recreation (e.g. theme parks)
   - E. Others: (please specify:.....)
   - F. Don't know

4. When was the trip conducted? (You may circle more than one answer)
   - A. During weekends
   - B. During schools holidays
   - C. During schools' days
   - D. After Examination

5. How long was the trip? (You may circle more than one answer)
   - A. 1 day
   - B. 2 days
   - C. 3 days
   - D. More than 4 days

6. On average, how many students went for each trip? (You may circle more than one answer)
   - A. less than 10
   - B. 10 to 20 students
   - C. 30 – 40 students
   - D. 50- 80 students

7. How many teachers accompanying ?
   - A. Less than 3
   - B. 3 to 5 teachers
   - C. More than 5 teachers

8. Field trip locations. Please list the places that you went for the field trip.

   _____

   _____

   _____

9. Have your school arrange trips outside Malaysia?

   A. Yes B. No.

C. Secondary School Education – Form 1 to Form 3

1. What is the name of your lower secondary school?

   _____

2. How many field trips have you made during your lower secondary education?
   A. 0
   B. 1
   C. 2
   D. 3
   E. 4
   F. 5 or more
   G. Cannot remember

3. What was (were) the purpose of the field trip(s) ? (You may circle more than one answer)

   G. Science field trips
   H. Co-curiculum activities (e.g. Camping)
   I. General educational trips (e.g. museum, zoo, exhibition)
   J. Entertainment/Recreation (e.g. theme parks)
   K. Others: (please specify:.....)
   L. Don't know

4. When was the trip conducted? (You may circle more than one answer)
   A. During weekends
   B. During schools holidays
   C. During schools' days
   D. After Examination

5. How long was the trip? (You may circle more than one answer)
   A. 1 day
   B. 2 days
   C. 3 days
   D. More than 4 days

6. On average, how many students went for each trip? (You may circle more than one answer)
   A. less than 10
   B. 10 to 20 students
   C. 30 – 40 students
   D. 50- 80 students
7. How many teachers accompanying?
   A. Less than 3
   B. 3 to 5 teachers
   C. More than 5 teachers

8. Field trip locations. Please list the places that you went for the field trip.

   _____

   _____

   _____

9. Have your school arrange trips outside Malaysia?

   A Yes B. No

D. Upper Secondary School Education – Form 4 to Form 5

1. What is the name of of your upper secondary school?

   _____

2. How many field trips have you made during your upper secondary education?
   - A. 0
   - B. 1
   - C. 2
   - D. 3
   - E. 4
   - F. 5 or more
   - G. Cannot remember

3. What is the purpose of the (those) field trip (s) ? (You may circle more than one answer)

   - A. Science field trips
   - B. Co-curiculum activities (e.g. Camping)
   - C. General educational trips (e.g. museum, zoo, exhibition)
   - D. Entertainment/Recreation (e.g. theme parks)
   - E. Others: (please specify:.....)
   - F. Don't know

4. When was the trip (s) conducted? (You may circle more than one answer)
   - A. During weekends
   - B. During schools holidays
   - C. During schools' days
   - D. After Examination

5. How long is usually the trip? (You may circle more than one answer)
   - G. 1 day
   - A. 2 days
   - B. 3 days
   - C. More than 4 days

6. On average, how many students went for each trip? (You may circle more than one answer)
   - A. less than 10
   - B. 10 to 20 students
   - C. 30 – 40 students
   - D. 50- 80 students

7. How many teachers accompanying?
   - A. Less than 3
   - B. 3 to 5 teachers
   - C. More than 5 teachers

8. Field trip locations. Please list the places that you been for the field trip.

   _____

   _____

   _____

9. Have your school arrange trips outside Malaysia?

   A Yes B. No

E. Benefits of field trips. Please circle your response.

1. Please rate the importance/usefulness of field trip to you in terms general knowledge gain

Not useful 1 2 3 4 5 6 7 Very useful

2. Please rate the importance/usefulness of field trip to you in terms subject (science, geography) knowledge gain

Not useful 1 2 3 4 5 6 7 Very useful

F. Should schools organize more field trips for the students?

A Yes B. No

If yes /no, state why:.....

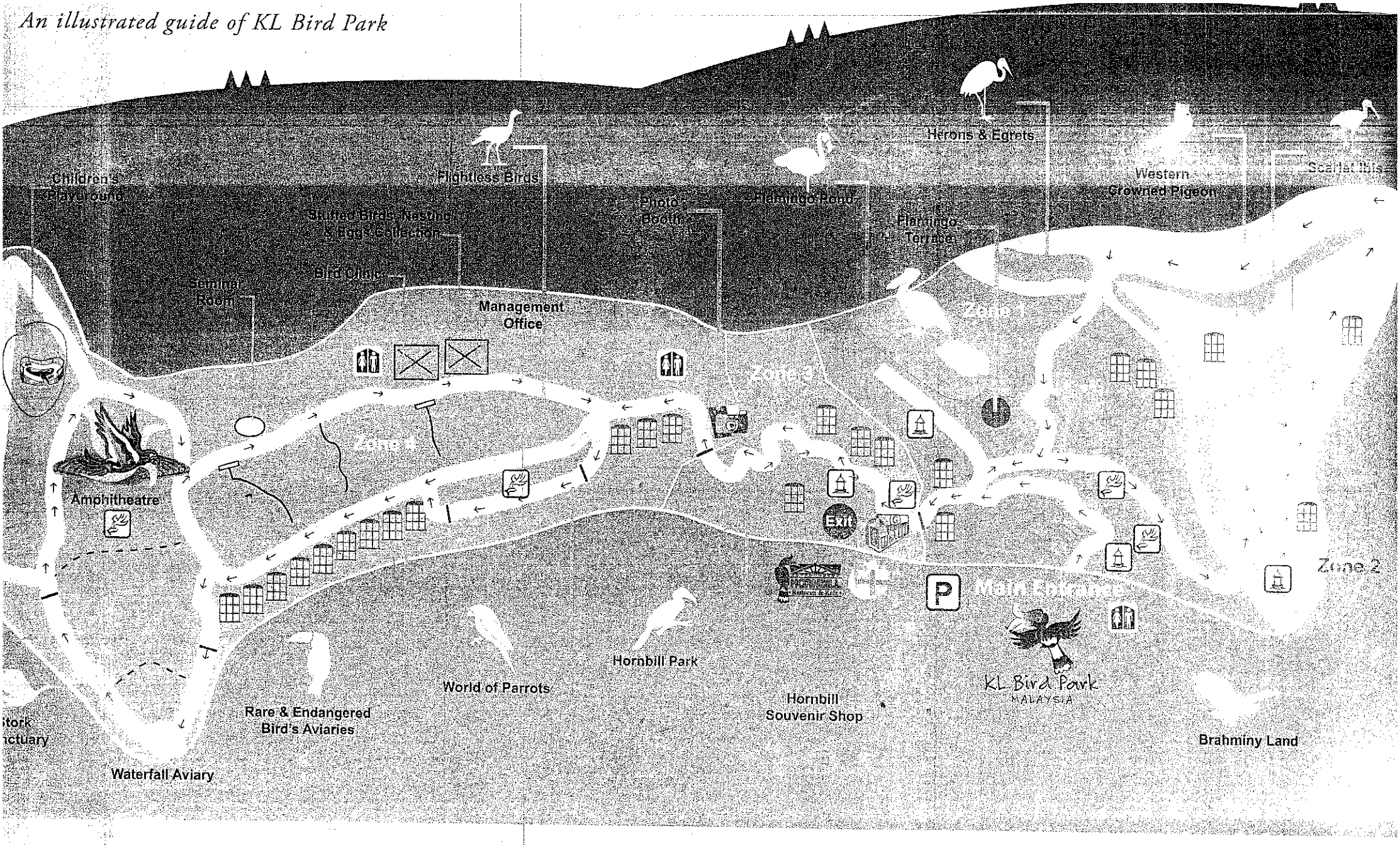
G. Given a chance, how frequent would you like to go for a field trip per year?
A once a year B. 2-3 times a year C. More than 5 times a year

H. What kind of field trips do you prefer most? Please rank according to your most preferred as 1 and least as 5.

A. Curriculum related (e.g. Science field trips)....._____
B. Co-curiculum activities (e.g. Camping)....._____
C. General educational trips (e.g. museum, zoo, exhibition)....._____
D. Entertainment/Recreation (e.g. theme parks)....._____
E. Others: (please specify:.....)_____
F. I have no preference

THANK YOU FOR YOUR TIME AND COOPERATION

An illustrated guide of KL Bird Park



Kindly follow these paths marked with arrows