Panoramic Multimedia Walkthrough of UTP Campus

by

Ainul Azyawati Binti Mat Dan

Dissertation submitted in partial fulfillment of
the requirements for the
Bachelor of Technology (Hons)
(Information & Communication Technology)

NOVEMBER 2006

University of Technology PETRONAS
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan

t
GA
76
.A795
2006
1) computers
2) computer simulation

CERTIFICATION OF APPROVAL

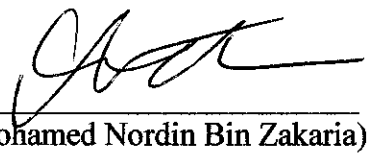
Panoramic Multimedia Walkthrough of UTP Campus

by

Ainul Azyawati Binti Mat Dan

A project dissertation submitted to the
Information & Communication Technology Programme
Universiti Teknologi PETRONAS
in partial fulfillment of the requirements for the
BACHELOR OF TECHNOLOGY (Hons)
(INFORMATION & COMMUNICATION TECHNOLOGY)

Approved by,



(Mr Mohamed Nordin Bin Zakaria)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
November 2006

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.

AINUL AZYAWATI BINTI MAT DAN

ABSTRACT

This report is on the project that aims to apply the concept of Virtual Walkthrough using Panoramic Images to promote the facilities available in the campus of University of Technology PETRONAS (UTP). A panorama can be defined as a wide picture or image that shows 100^0 to 360^0 widths. The end result of the project will be a Web application that provides imaging information about the hotspots in UTP. The system is meant to promote UTP to potential students who want to enroll themselves into the university; the majority is students who have just left secondary school. This project is aimed to contribute towards multidimensional disciplines such as virtual reality technology and multimedia.

ACKNOWLEDGEMENTS

My deepest gratitude goes towards every single person who was involved in making this project a success. My first wish goes to my supervisor, Mr Mohamed Nordin Bin Zakaria. He guided me throughout the course of this project and gave me meaningful advices that will be remembered as long as I am in this career.

I would like to thank all of my friends for showing support and lending helping hands when asked for. Special thanks go out to Mr Mohd Faqrudin Ismail, Mr Mohd Hanafi Jawati, Ms Nurzamzaira Zaib, Ms Normalayati Abdul Aziz, Ms Zazilawati Zamri, and Ms Juraidah Hashim.

To all my fellow students who took their time to help me in every way they can. To my friends and my family who gave me psychological support. To my colleagues who helped me in the technical matters. You have my deepest and sincerest gratitude.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

This project aims to apply the concept of panoramic walkthrough using high resolution panoramic images to portray the surroundings in the campus of University of Technology PETRONAS (UTP). Panoramic images are growing rapidly in areas such as real estate and travel, and in games and oil plants, which requires the application of semi-immersive Virtual Reality. This project uses panoramic images to promote the surrounding environment and life offered at the campus of UTP in Tronoh, Perak.

1.2 PROBLEM STATEMENT

In order to gain the interest of potential students to come and further their studies in UTP, the university needs a new promotional strategy. The strategy that the university chooses has to be different than other universities that are competing for the same students to join their study program.

Currently, new students are shown around the university campus during the orientation week. However, the university campus is growing rapidly over the years. It is becoming harder to go around the whole campus on foot just to look around and get familiarize with the surrounding. New methods are needed to solve this problem.

If the university does not take any action to solve this problem, they will lose their good reputation as one of the most prestigious private universities in Malaysia. They may lose their source of income if the financiers are convinced the university is not gaining good reputation. More importantly, the university is risking the chance of losing potential highly qualified students to other local universities because of it's incapability to display its advanced facilities to interested audiences.

The right amount of exposures to the available facilities in the campus area may just be the answer to the problem mentioned. The audience can get familiarize with the surrounding area without having to walk around the whole campus. I propose the use of panoramic images for this purpose. Using the right tools combined with the latest technology, the Panoramic Walkthrough of UTP will be the most effective method of taking a walk around campus. The technology used is aimed to attract young audiences, mainly potential students for the university.

1.3 OBJECTIVES AND SCOPE OF STUDY

1.3.1 Scope of Study

This project is based on 360-degrees panoramic images captured around UTP campus buildings and landscapes and turned into cylindrical projection panoramic images. The panoramic images are then included into an informative website about UTP. The website will be used to gain the interest of prospective students of new intakes during road shows or UTP promotional events.

1.3.2 Objectives

The objectives of this project are:

- To develop a website that would become the promotion tool to promote the advanced facilities in UTP campus.
- To help UTP to create a new promotional tool.
- To create an innovative product that would attract the attention of target audience (secondary students).
- To study on the effects of panoramic imageries in attracting visitors to certain places.
- To study the effects of panoramic imageries in familiarizing viewers with certain places.

All of the mentioned objectives have to be achieved during the final phase of the project. The mission of this project is to develop an informative website that applies the concept of virtual walkthrough using panoramic imageries of UTP campus. The vision of this project is to develop a promotional method that would be attractive, effective, and efficient.

The rest of the chapters will describe the project in detail.

CHAPTER 2

LITERATURE REVIEW AND THEORY

2.1 DEFINITION

The following are the definitions of important terms used in this project. In order to understand the essence of the concepts used, you have to understand the following definitions.

2.1.1 Panoramic Images

2.1.1.1 Definition of Panorama

A panorama can be defined as a wide picture or image that must exceed 100 degrees of width, a bit less than one-third of the total field that surrounds the viewer. The best example for panorama is in cinema where movies are projected on wide screen to enhance viewer's immersion to the film. Other applications of panorama are in virtual reality and website navigation. Aspect ratio is the ratio of the image width to the image height. For cinema images, the aspect ratio is about 20:9.

2.1.1.2 Types of Panoramic Images

There are a few types of panoramic image; planar (flat), cylinder, sphere, and cube. The following are a brief description of each type:

- *Planar*

  Planar image is flat, like normal photographs, and intended to be viewed as it is without any perspective correction.

- *Cylinder*

  Cylindrical panorama is viewed as if the image is curved inside a cylinder. However, viewers for displaying panoramic images are available in many languages that display the image as if it was flat.

- *Sphere*

  Spherical images are represented exactly 360^{o} on the horizontal axis and 180^{o} degrees on the vertical axis. The image is mapped inside a sphere. The horizontal curves can be viewed as flat image but the top and the bottom will seem compacted. The sphere is the best format for panoramic viewing because it allows larger vertical view than the other types.

- *Cube*

  Cubic images allows viewer to look straight up at the ceiling and straight down at the floor. Like a dice, a cube has 6 different faces of images which when put side by side, looks like normal flat photo. It is the easiest method for creating panoramic images.

2.1.2 Panoramic Photography

2.1.2.1 History

Photography has been a representation of the world since 1839. The human field of vision is wider than it is high. Therefore, photographers tried to assemble images horizontally in order to represent the entire scene laid out in front of them. Panoramic photography was developed right from the start of photography. A panorama can be any image covering from 100 to 360-degrees of view.

The very word "panorama" was coined by the Irish painter Robert Barker (1739-1806). Barker patented his invention, an enormous circular painting that represented the city of Edinburgh. With showings of his painting in Glasgow and London, he made a fortune. He hired assistants and sold licenses in other countries. The Frenchman Pierre Prévost popularized the panorama on the Old Continent, and he is frequently cited as its inventor whereas he was merely the clever and successful holder of the patent in France.

One of Prévost's assistants, the young landscape painter Louis-Jacques Mandé Daguerre, Figure 1, made his fortune with a similar process, which he called the Diorama. Instead of being merely a large landscape painting, the Diorama was a painted representation of Napoleonic battles. Enormous paintings, painted on a sheer fabric, were illuminated in such a way as to convey action and movement in the battle scene. Opening in 1822, the Diorama was an enormous commercial success.

Figure 1: Louis-Jacques Mandé Daguerre

Panoramas at this time were extremely popular, and the suffix "rama" entered the language at that time. It can be found on countless words coined since then, and can even be seen in a famous French novel, Balzac's *Père Goriot*, in which the characters entertain themselves at dinner by coining new words with the then-fashionable new suffix.

It is with the money earned with his Diorama that Daguerre was able to retire and devote himself to the invention of photography, picking up where Nicéphore Niépce had left off. Niépce had created poor-quality images as early as 1822 using bitumen of Judea emulsion, but exposure times exceeded ten hours and the process was never practical. After some fifteen years of additional experimentation, Daguerre elaborated a process in which a silver plate, exposed to iodine vapor, was used as "film". The image, after an exposure of just a few minutes, was "fixed" with sodium hyposulfite. Thus the invention of the silver-based emulsion and the discovery of sodium hyposulfite (universal fixer) can be attributed to Daguerre. He made this process public in 1839 and gained world-wide renown as the inventor of photography.

Other scientists were also working on similar processes at the time. Among them are an Englishman, William Henry Fox Talbot, and the Frenchman Hippolyte Bayard, who independently and simultaneously invented the concept of "negatives" and prints on paper, processes that they revealed to the world after Daguerre's invention had already been made public.

As early as 1846, special cameras were developed to allow the capture of extremely broad fields of view. To be called "panoramic" an image must exceed 100 degrees of width, a bit less than one-third of the total field that surrounds the viewer. In order to obtain such a broad view, certain designs use a lens that rotates from one side to the other, exposing film or a plate which must be held against a curved back so that the exposure is consistent. The Japanese Widelux and Russian Horizont cameras use pivoting lens design. Other high-performance cameras, such as the Hulcher or Globus, can take images that describe a complete circle around the viewer. The entire camera rotates on a pivot as the film moves through the camera at the same rate as the spin. The mechanics are complex; all parts must be made with great precision so that exposure is consistent through the entire frame. As a result, such cameras are quite expensive; an additional difficulty arises from the fact that very few photo labs are able to make prints from 35mm negatives or transparencies that may exceed 20cm (8 inches) in length.

A Widelux camera was used to make the image below. The camera uses 35mm film and creates an exposure that measures 24x59mm, and which covers a field of 140° (measured diagonally across the frame). This image was used by the Talloires Tourist Office for a poster.

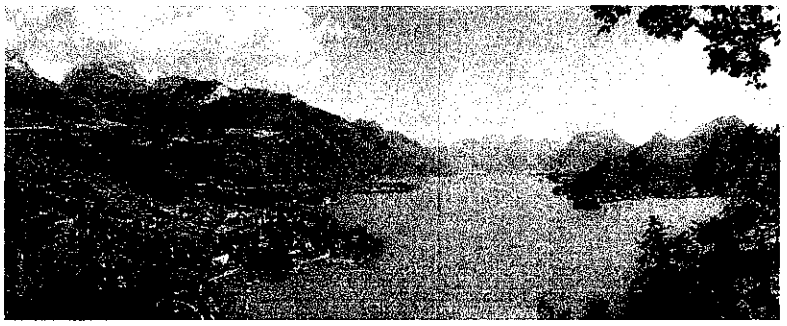


Figure 2: Talloires Bay

Since the invention of digital photography way back in the Nineties, it has become easier, and much more affordable, to use digital images and special software to create panoramas by stitching together a set of images.

Figure 3: Palais de l'Isle

The three images above show the Palais de l'Isle in Annecy and were taken a few seconds apart. The light source is constant, and there is sufficient overlap from one image to the next for the software program to be able to stitch the three images together, averaging data from one frame to the next. However, it should be noted that the sky exposure, inconsistent because of the sun's position on the left side of the picture, resulted in an unattractive image. So the photographer, using PhotoShop, removed the entire sky and replaced it with a relatively even blue tint which serves as a background in the whole image:

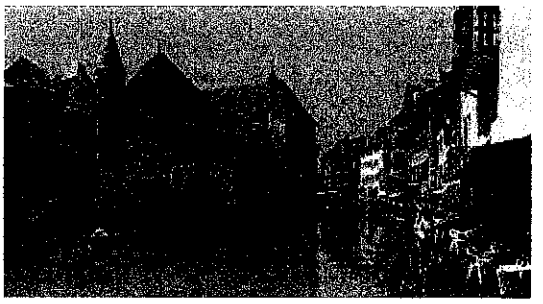


Figure 4: Palais de l'Isle

Much broader images can be made, provided that the camera is pivoted on the very axis of the lens (not of the tripod socket). Rotating the camera over the "nodal axis" of the lens allows the photographer to make undistorted images, such as the one below:

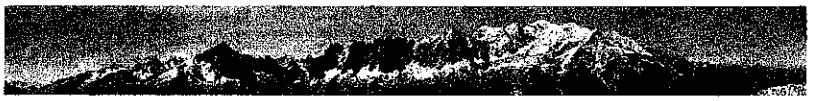


Figure 5: Mont Blanc Mountain Chain

This panoramic view of the Mont Blanc mountain chain, taken from Plan Praz (Mt Brévent) is composed of some eight different pictures stitched together. It covers about 180°.

2.1.2.2 Panorama-Creation Software

Panorama-creation software is usually bundled in the software package included with digital cameras, so that anyone with a digital camera can create panoramas. Each program offers a slightly different feature set, some allowing manual adjustment of inaccurate automatic stitching, some not. Certain programs allow the export of panoramas to web pages, using either plug-ins or java applets. Some of these require some complex coding and as such are not particularly well suited for beginners. It should be noted that any digitized image may be stitched together to compose a panorama. However, all of the programs require images to be absolutely identical in pixel size, so that scanning of images may be more complicated than using digital cameras images.

The following are the descriptions of the software used to create interactive panoramic image in this project.

2.1.2.2.1 Autostitch™

Autostitch™ is the world's first fully automatic 2D image stitching software. Capable of stitching full view panoramas without any user input whatsoever, Autostitch is a breakthrough technology for panoramic photography, VR and visualization applications. This is the first solution to stitch any panorama completely automatically, whether one-dimensional (1D - horizontal) or two-dimensional (2D - horizontal and vertical).

Autostitch is built using cutting edge research from the Artificial Intelligence laboratory at University of British Columbia. It is incredibly simple to use. Just select a set of photos, and Autostitch does the rest: digital photos in, panoramas out. Autostitch is the product of two years of research by Matthew Brown and David Lowe at the University of British Columbia. Individuals or companies are free to use images that they generate using the demo version of Autostitch without restriction or royalties so long as they acknowledge the use of Autostitch in such works. A commercial license to Autostitch provides access to the patent, source code, technical support and updates. Autostitch runs under WINE. The demo version of Autostitch uses spherical projection and is capable of stitching full view 360 x 180 degree panoramas (everything visible from a point). Cylindrical and planar projections are not supported in the demo version.

2.1.2.2.2 GoCubic

GoCubic is a free utility for Windows for creating cylindrical QuickTime 4 panoramas as well as cubic QuickTime 5 panoramas. It implements the sample code freely available from Apple's developer website. GoCubic was originally created by Josh Eskin but is now available from the panoguide site, with Josh's kind permission. Note that GoCubic and the sample code on which it is based are not able to add hotspots or create multi-node QuickTime virtual tours. To create a cylindrical panorama you first need an image that is in cylindrical projection which you will have created using another image stitching program. If you have an equirectangular image (for spherical projection) you will need to convert it to cylindrical format using another program. Note that GoCubic requires the image dimensions to be divisible by 4. If they are not the conversion will fail and you will not see any error message. To create a cubic panorama, you need 6 separate images for each of the cube faces. These should be numbered 1 to 6, with filenames for example "mypano1.jpg" to "mypano6.jpg". Note that contrary to the instructions, these images are:

1. Front
2. Left
3. Back
4. Right
5. Top (facing front)
6. Bottom (facing front)

The cube faces are square shaped images with a vertical and horizontal field of view of both 90 degrees.

CHAPTER 3

METHODOLOGY AND PROJECT WORK

3.1 PROJECT METHODOLOGY

The methodology used to manage the product development process for this project is based on the traditional waterfall model. The model is shown as below:

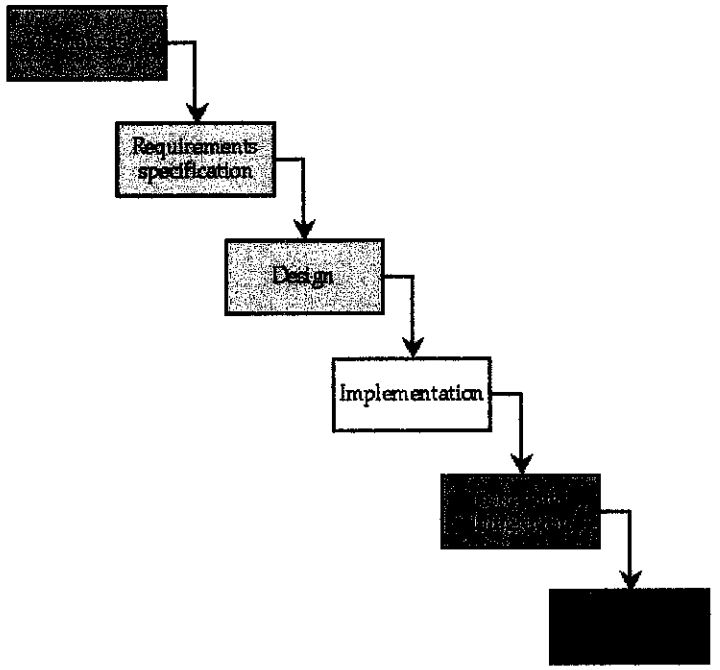


Figure 6: Traditional Waterfall Diagram

Based on the waterfall model, a product development process is a step-by-step incremental process. The first phase, Analysis phase, is for investigating user requirements. The second phase, Specification phase, is to clearly set out necessary features of the product. The third phase, Design phase, is for creating or adapting suitable solutions. The fourth phase, Implementation phase, is where the proposed solution is developed. The fifth phase, Testing and Integration phase is to ensure that the solution solves the original problem. The sixth phase, Integration phase, is to ensure that the solution works in context. The last phase, Maintenance phase, is where the original product can be modified as new requirements are identified. Now let us look at each phase in more details.

In the Analysis phase, the software analyst has to be consciously expert in the user's domain. Most users don't know what they want because most of them don't know exactly what they currently do. Sometimes, the user doesn't even realize of the problem that they have. A good analyzer can recognize a problem and comes up with a solution. The importance of the Analysis phase is to verify whether the problem is worth solving or not. The outcome of this phase is a sufficient understanding of the problem in order to write a requirements specification document.

In the Specification phase, the software analyst has to complete the analysis task. The task is to write down clearly what the required behavior is. The requirements are written as formal notations in a structured document with suitable examples. The outcome of this phase is a requirements specification that clearly communicates the required features of the system to the designer.

In the Design phase, the designer needs to develop a solution to meet the requirements by drawing on past experiences and standard techniques. The developer often needs to innovate at some level to distinguish their product with other products in the same field. There can be many possible solutions to the problem. Hence, the developer has to follow a set of guidelines in developing the designs. The outcome from the Design phase is a design document that clearly communicates the design to the implementers.

In the Implementation phase, the developer writes, documents, and debugs the codes for the product. The codes also should be prepared for testing. During this phase, the developer or the programmer can give feedback to the designer and the analyst whether the stated requirements are achievable or not. If not, then the process has to return to the previous phases. The developer or the programmer can also feed the information to testers and integrators. The outcome of this phase is working code and documentations which are ready to be tested.

In the Testing and Integration phase, the testers check whether the implementation matches the design, meets the requirements, and that the codes work as expected. The testers must test individual modules and then test the whole system. Finally, the testers have to test the new system with existing environment to check whether there are any problems that arises. The outcome of this phase is successfully tested codes that are working correctly.

In the Maintenance phase, the final product is maintained until changes are required. It is common knowledge in software development that users' requirements continue changing over time. Furthermore, no amount of testing can ensure a 100% working programs. Therefore, software changes over time. Changes in requirements could lead to extra implementation and testing, additional design work, or, in the worse case scenario, a new analysis.

3.2 DEVELOPMENT TOOLS

The list of development tools used to build the project Website is:

Project	Development Tools/Equipments/Software	Usage
Website development	• Macromedia Dreamweaver MX	The web development tool, enabling users to efficiently design, develop and maintain standards-based websites and applications.
	• Microsoft Internet Explorer	The web browser.
	• Flash Player 8	The high-performance, lightweight, highly expressive client runtime that delivers powerful and consistent user experiences across major operating systems, browsers, mobile phones, and devices; the flash movie player.
	• QuickTime Player	The player for the QuickTime VR movies.
Panoramic images generator	• Adobe Photoshop CS	The design tool; to create original artwork, corrects color, and retouch and composite scanned images.
	• AutoStitch	The photo lapping and combining tool; the world's first fully automatic 2D image stitching software.
	• GoCubic	The free utility tool for Windows for creating cylindrical QuickTime 4 panoramas as well as cubic QuickTime 5 panoramas.
	• Macromedia Flash MX	The advanced authoring environment for creating interactive websites, digital experiences and mobile content.
Photography	• Digital Camera (4.1 Mega pixels)	To take high resolution photographs.

Table 1: Development Tools

3.3 PANORAMIC IMAGES PREPARATION

This project is heavily depending on the panoramic imageries. Therefore, the photography phase is really important for the success of the project.

Panoramic photography is slightly different from normal photography. It is not hard to learn, but a person has to have the skills in shooting good photographs. The most important equipment is the camera. It does not has to be a special camera, any camera would do. If you use film camera, you will have to digitize the pictures first before editing them. A tripod is not compulsory, but having it would make shooting the photographs much easier. To get good results without using a tripod, make sure you stand in one spot and as you turn to take each picture keep the camera close to your body. Don't move from the spot you are standing on. Don't lean forwards or backwards between shots. Try to stay still and steady.

To start taking photographs, first you have to pick a spot that would be the centre for the view. Hold the camera as still as possible. Then, take a picture. Turn slightly to take the next picture. Make sure that the next picture overlaps the one before by at least 25%. The last picture should overlap the first picture. Take as much pictures as you like. The figure below shows the whole UTP campus.

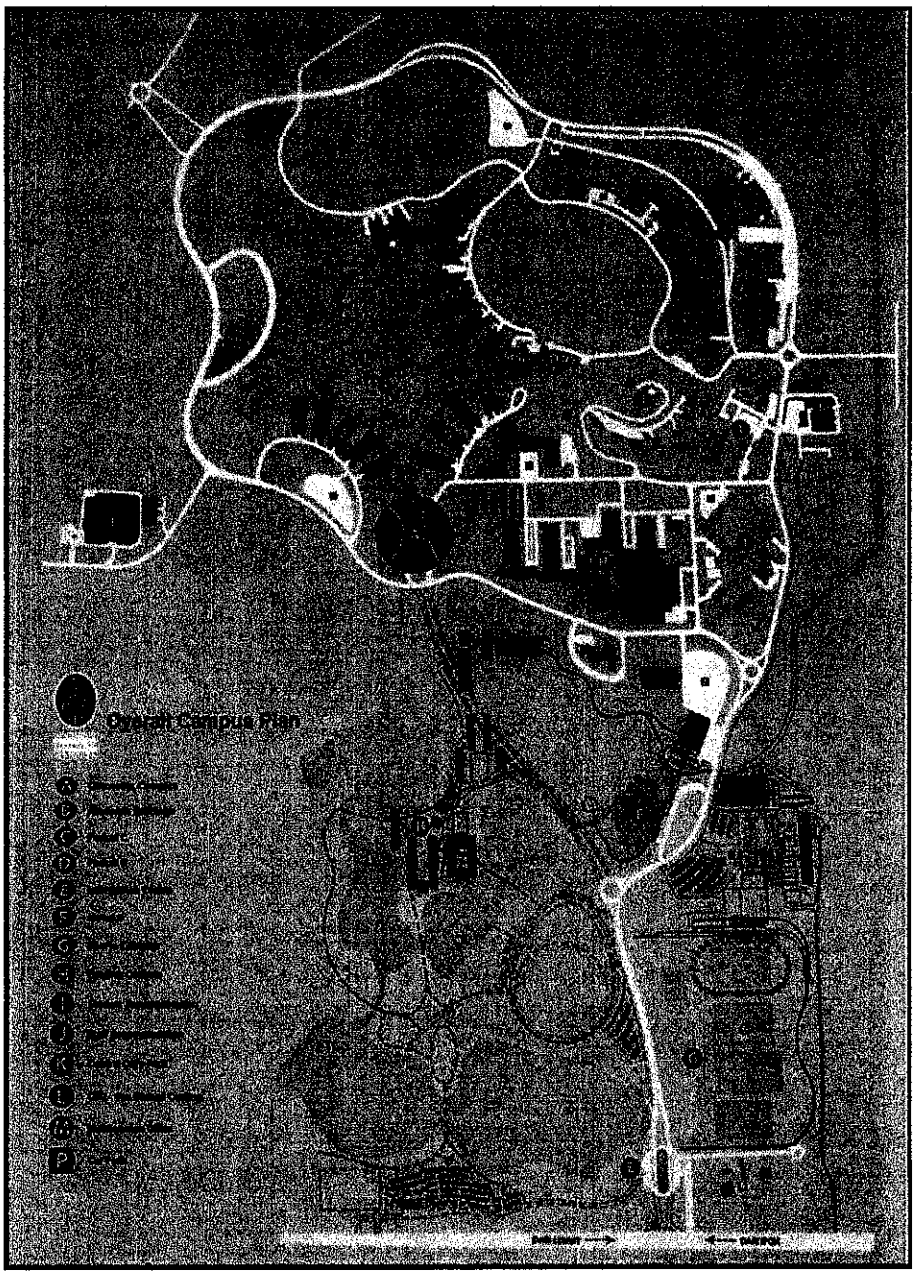


Figure 7: UTP Map

The next step is to stitch the pictures together to form the panoramic image. The simplest tool available on the Internet is AutoStitch. This program is available as free license limited functions demo. To start the stitching process, first start the program. Then select the pictures you want to stitch, and make sure you've got them the right way up and in the right order. Next click the stitch button. Now the program will output the finished stitched up panoramic image of your photographs.

Then the panoramic image will be used in the Flash document that contains the ActionScript to allow user interaction with the image. The Flash document (.fla) is created using Macromedia Flash MX. The output from this program (.swf) is embedded into the webpage for the project using Macromedia Dreamweaver MX.

The panoramic image will also be used to transform into QuickTime movie (.mov). The image is input into a freeware called GoCubic. GoCubic is a tool that outputs panoramic image as cylindrical or cubic projection. For this project, the image is output as cylindrical projection. Then, the QuickTime movie is embedded into the webpage.

The final step is to finish off the design for the webpage. The template design of the webpage is inspired by gaming environments. It uses striking colors with contrasting fonts. This is suitable for attracting young users to view the webpage. The webpage provides multiple choices for the users to view the panoramic images. The images can be viewed as JPEG image, Flash movie, or QuickTime movie. All of the choices will be placed in one place to make it easier for the user to select their best choice.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 RESULTS

The end result of the project is a Website featuring interactive panoramic imageries of UTP campus that provides semi-immersive feeling to the viewers. The works done to accomplish this project are the capturing of photos around the campus, the editing of the photos to generate panoramic image, the development of the Flash document from the panoramic image, the implementation of the Flash movie into the website, the design and development of the website, the testing of the working codes, and finally maintenance of the Website.

4.1.1 Capture Photos

Photographs of the surroundings of UTP campus were captured using Sony Cyber-shot 4.1 Mega Pixels Digital Camera. The photos are taken following the method described in Chapter 3. The places where the photos have been taken are:

- Administration Building
- Chancellor Complex
- Central Core Park
- Co-Curriculum Unit
- Guard Post
- Village 1 (Jaya)
- Village 2 (Lembaran)
- Village 3
- Village 4
- Village 5 (Old)
- Village 5 (New)

- Main Entrance
- Main Field
- Main Hall
- Main Lake
- Main Roundabout
- Mosque
- Multi Purpose Hall
- Pocket C (Orange)
- Pocket D (Light Blue)
- Roundabout (Village 4)
- Sports Complex
- Staff Accommodation
- Staff Parking
- USM Campus (Existing Campus)

4.1.2 Edit Photos

The collection of photos is combined according to locations using AutoStitch software. Then the output, the long version of the photos which is called the panoramic image, is edited using Macromedia Photoshop CS. The following sample shows how the photos are edited.

Figure 8: Raw Panoramic Image in Photoshop CS

Figure 9: Edited Panoramic Image

Expertise is needed to create the best panoramic image output. To ensure the output is high in quality, the photos should be taken when the sun is not out. By doing this, it can avoid blotches in the panoramic image.

4.1.3 Develop Flash Document

The next step to proceed when the panoramic image is ready is to develop the Flash document. The panoramic image is added into the Flash document template which has been added with ActionScript to provide navigation interaction with the user. The finished Flash document (.fla) is then published to become a Flash movie (.swf).

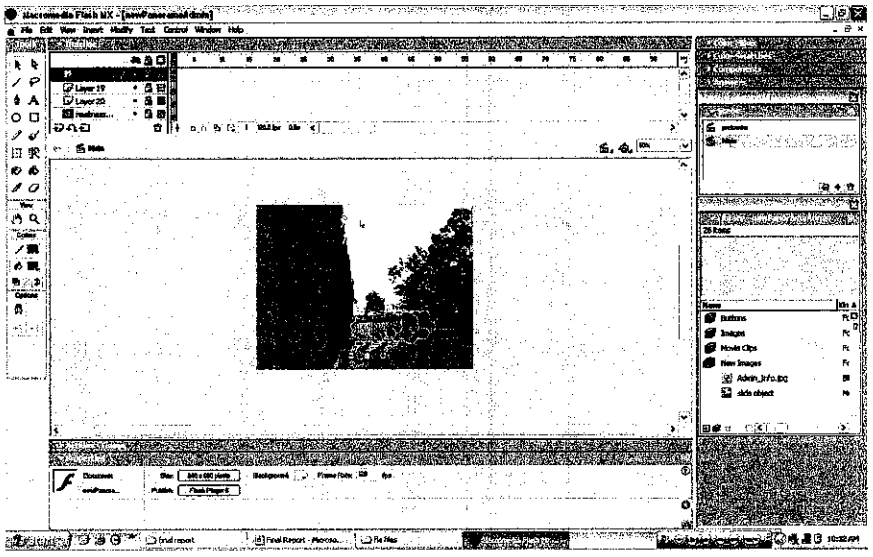


Figure 10: Macromedia Flash MX

4.1.4 Implement Flash Movie

The Flash movie (.swf) is implemented into the webpage. The reason Flash Player is used to play the panoramic image is because it has cross-platform capability. Furthermore, it is smaller in size to download in case the user has no Flash Player in the computer.

4.1.5 Website Design and Development

The following figure is the sample design template used as the background for the website.

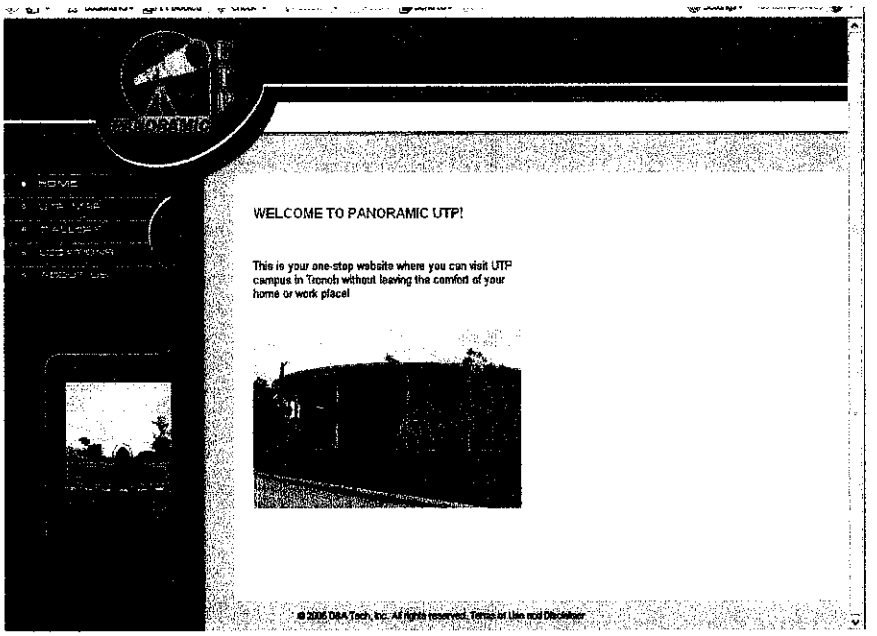


Figure 11: Website Template

The design and the layout for the project website are configured according to the target users' preference. The target user for this project is secondary school students who are potential students to the university.

The next figure is the web page with the interactive UTP map.

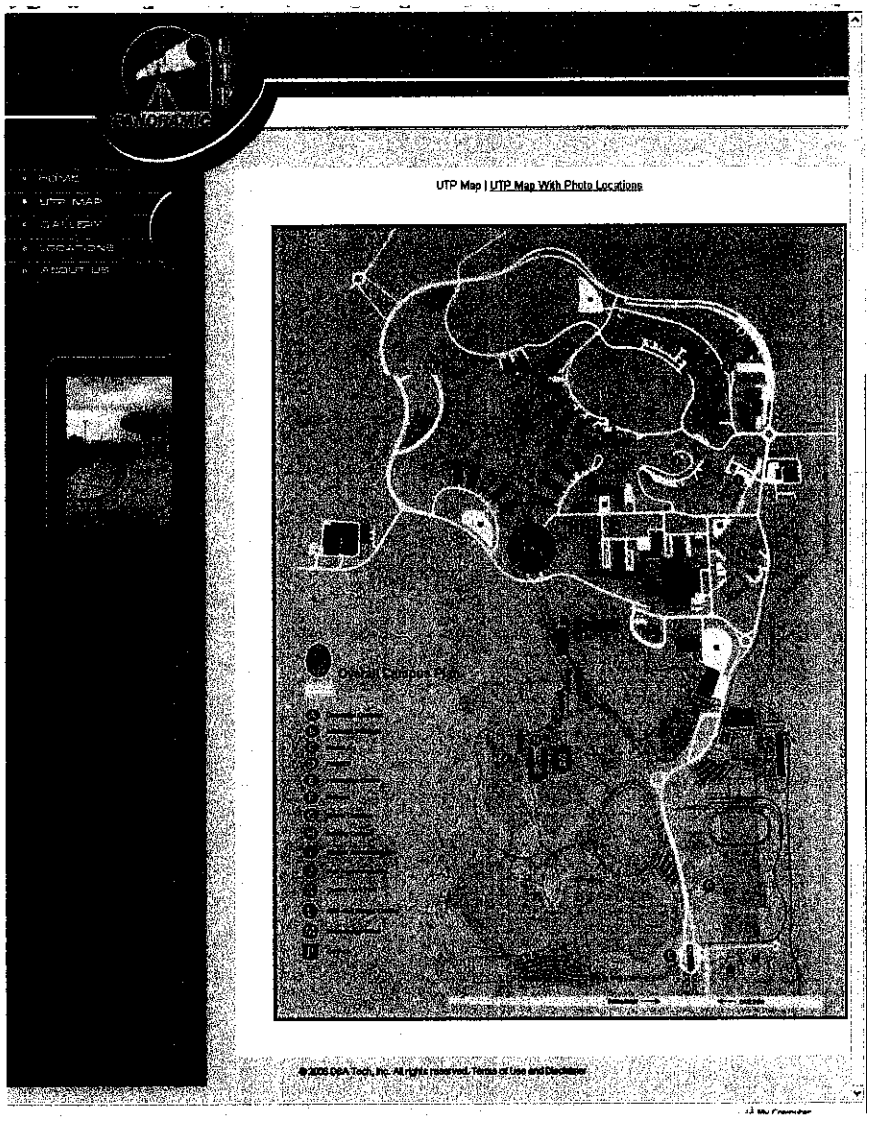


Figure 12: Interactive UTP Map

There are many hotspots on the map where the user can click on to view the Flash movie of the panoramic image of the selected hotspot. The figures below are examples of the Flash movie played on the web page.

Figure 13: Chancellor Complex III Flash Movie View 1

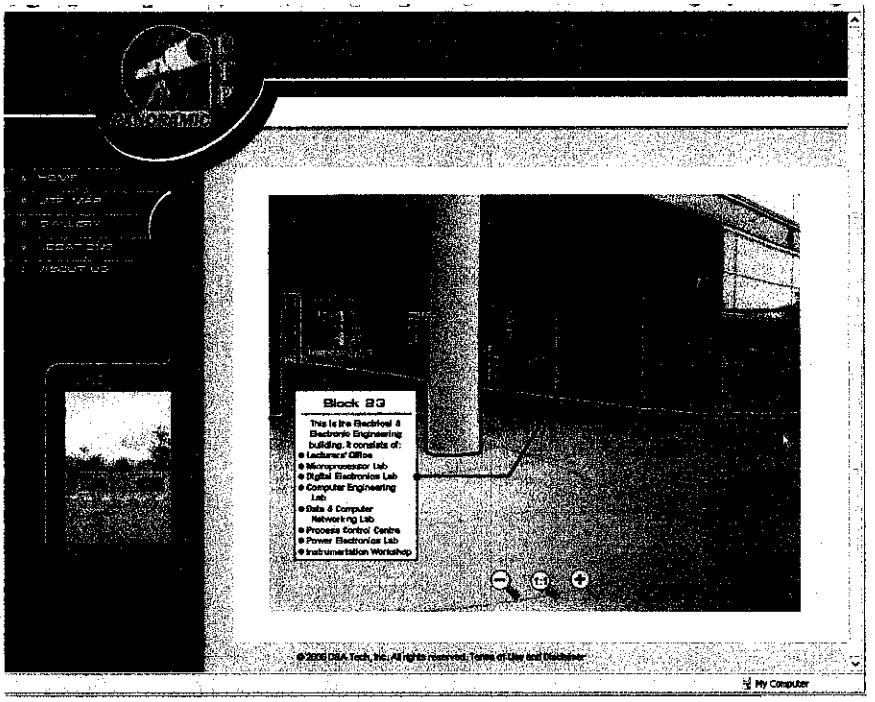


Figure 14: Chancellor Complex III Flash Movie View 2

The user can navigate the cursor around inside the panoramic image to move the image left and right, up and down accordingly. The user can click on the image to stop the moving panoramic image.

4.1.6 Testing

After the Website has been completed; testing is required to ensure that all of the functions are working correctly. First, individual modules are tested. Then, the system is tested as a whole. The Website will be released for public viewing if it succeeded during the Testing phase.

4.1.7 Maintenance

The Website will be maintained by the webmaster from time to time. One of the most crucial modules to maintain is the Latest Events module. This module provides only the latest events in UTP. Therefore, it has to be updated regularly.

4.2 FINISHED PROJECT

The end result of this project is a functional website that provides information as well as clear views of the buildings, landscape, and generally the whole environment of UTP campus in Tronoh, Perak. The aim of this website is to leave an impression to the visitors that they have been someplace before even though they have never been there. This is to make the new place seems familiar. In other words, this website should help potential students to feel like home when they are here in UTP.

The figure below is the Home page of the Panoramic UTP website. The Home page is the starting page for this website. At the Home page, users are given a simple instruction on where to go. Users can select whichever page they want to go to next.

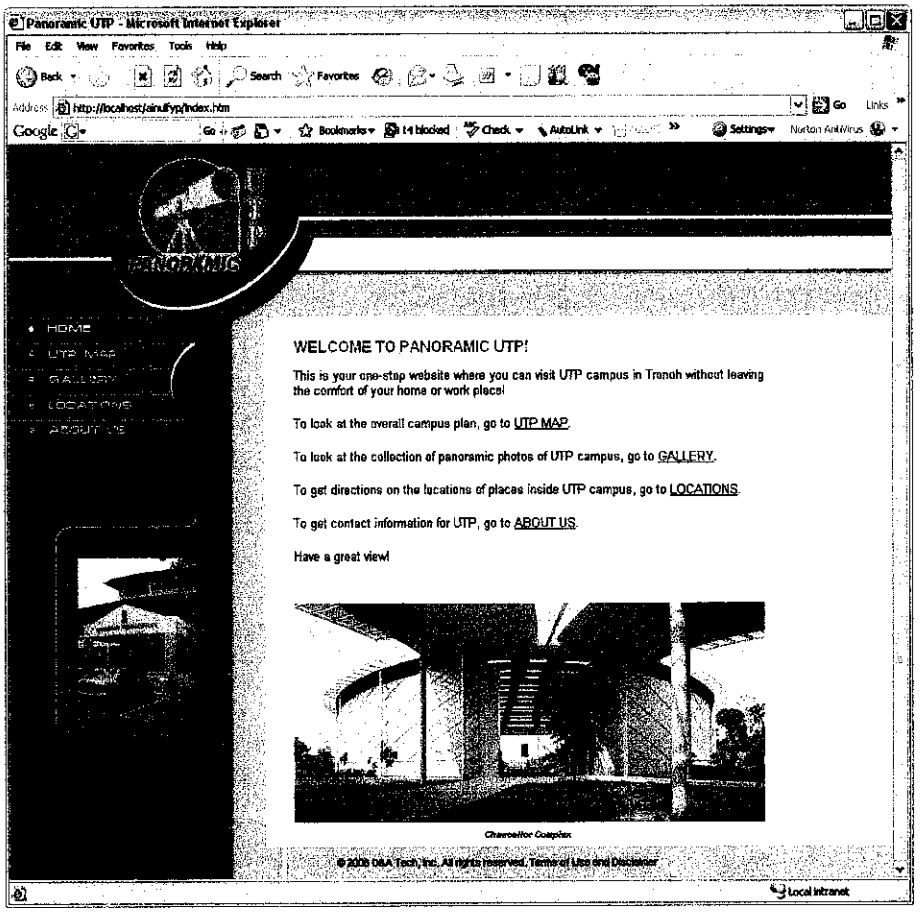


Figure 15: Panoramic UTP, Home Page

The UTP Map is the page user can go to in order to view the overall campus plan map. User can go to this page by clicking on the UTP MAP button at the left side of the page or by clicking on the UTP MAP link on the Home page. The figure below is the UTP Map page.

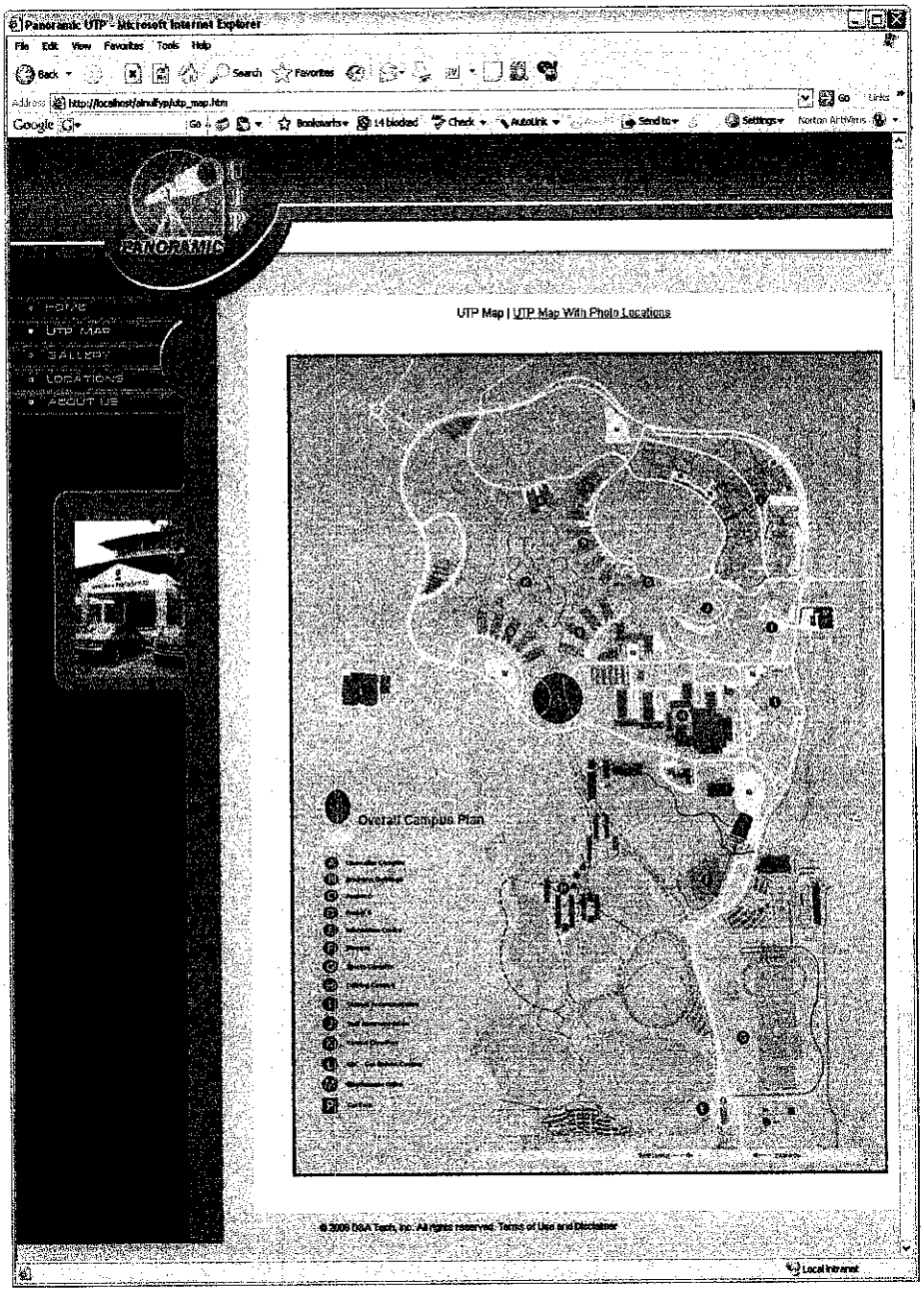


Figure 16: Panoramic UTP, UTP Map Page

The UTP Map page shows all of the locations in UTP campus. It provides a legend for all of the important buildings and locations in the campus. From the UTP Map page, you can go to the UTP Map with Photo Locations using the given link at the top of the page. Below is the figure of the UTP Map with Photo Locations page.

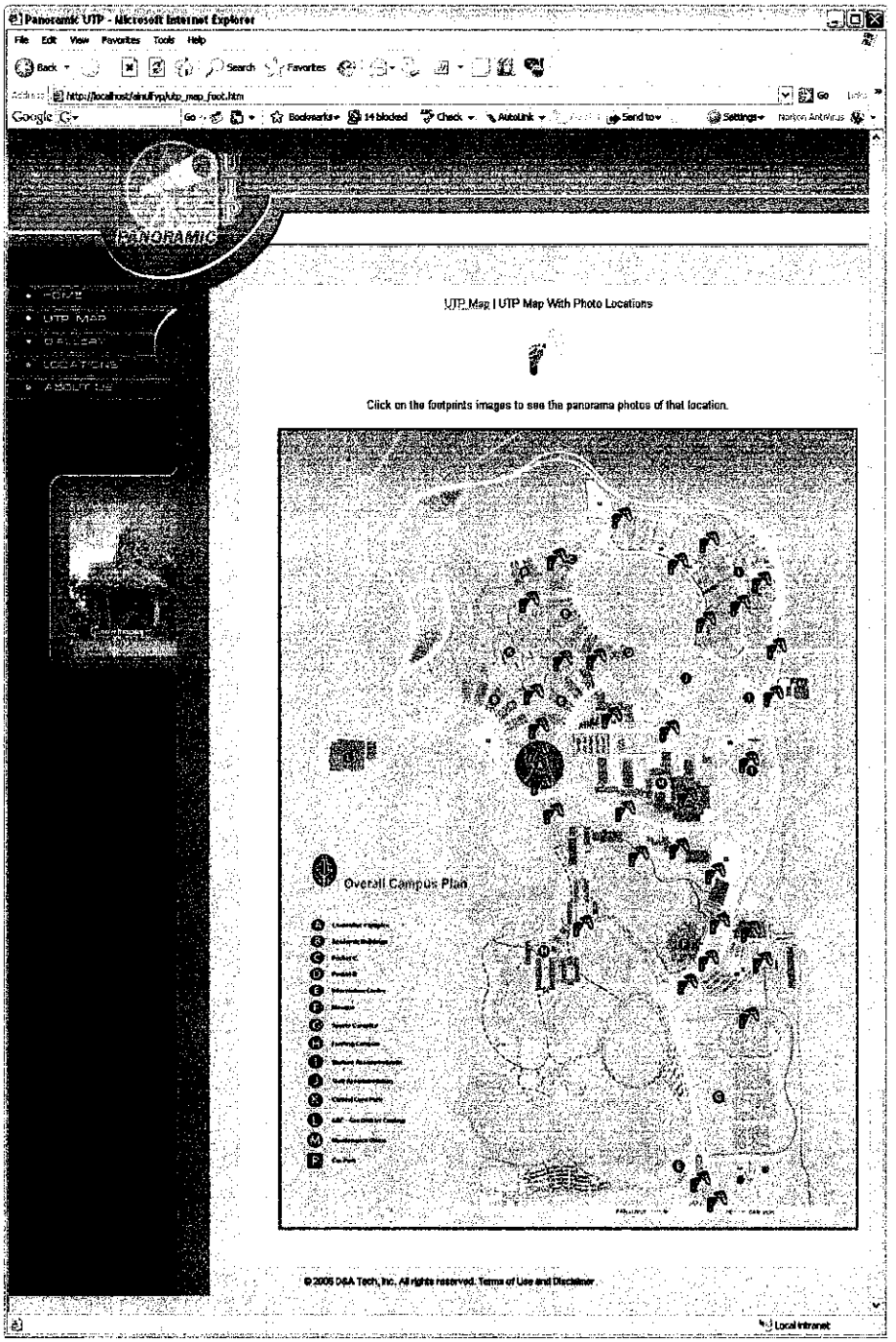


Figure 17: Panoramic UTP, UTP Map with Photo Locations Page

The UTP Map with Photo Locations page shows all of the locations in UTP campus. It provides a legend for all of the important buildings and locations in the campus, just like the UTP Map page. From the UTP Map with Photo Locations page, you can go to the UTP Map page using the given link at the top of the page. The map on this page has little footprints on them. Clicking on any of the footprints will bring the user to the Flash Panorama page of that location.

For example, if the user clicks on the footprints located above the Chancellor Complex, the one just outside the blue circle of the Chancellor Complex, it will open the Flash Panorama page for the Chancellor Complex View III. The page is as shown below.

Figure 18: Panoramic UTP, Flash Panorama Page

The Flash Panorama page is a Hypertext Markup Language (HTML) page with embedded Flash movie (SWF). The Flash movie is interactive. User has to click on the image first to activate the control. Then the user can navigate the cursor around inside the panoramic image and the image will move according to the cursor movement. Clicking on the image will make it stop moving, even though the user moves the cursor. The word 'Paused' will flash at the left bottom corner of the Flash movie. To restart the image movement, user has to click on the image once again. There are also three magnifier icons at the bottom center of the Flash movie. The left magnifier zooms out of the image when clicked. The center magnifier will bring the image back to 100% view when clicked. The right magnifier zooms in on the image when clicked.

The next page is the Gallery page. User can go to this page by clicking on the GALLERY button at the left side of the page or by clicking on the GALLERY link on the Home page. The figure below is the Gallery first page.

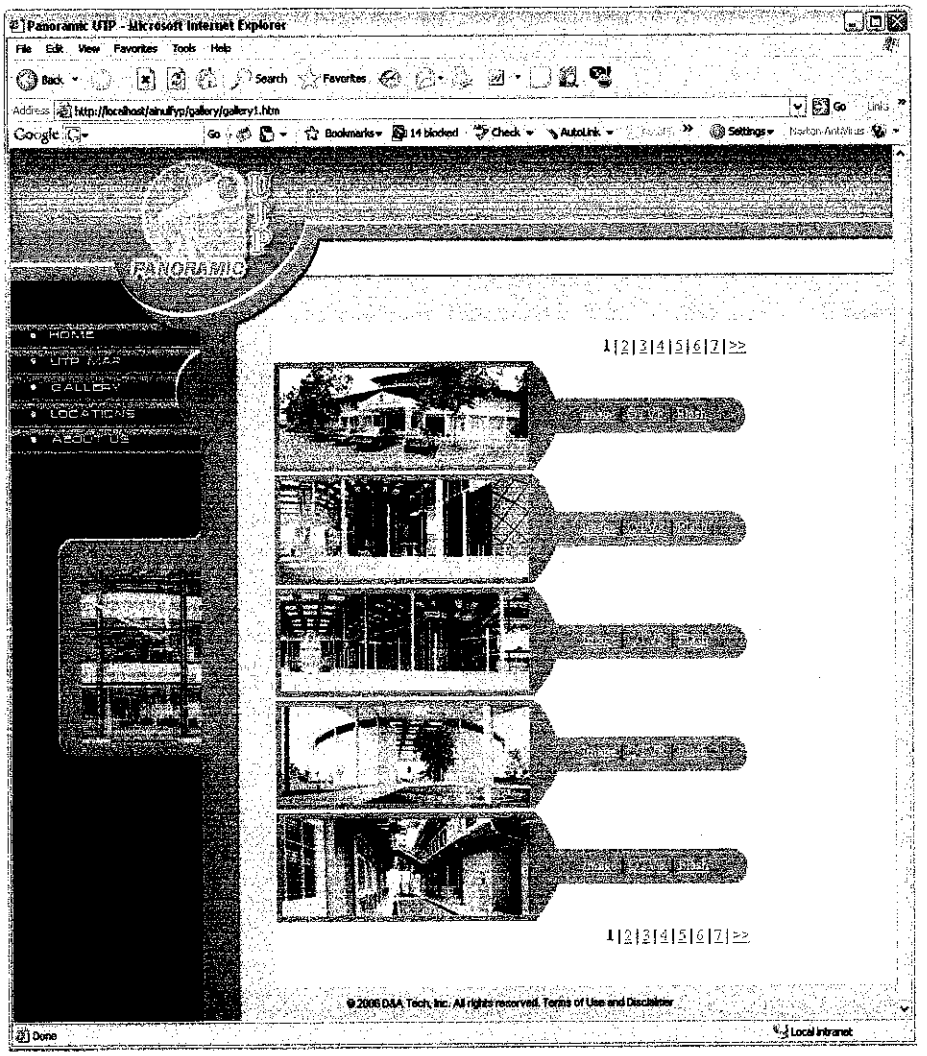


Figure 19: Panoramic UTP, Gallery Page 1

The Gallery page has numbered links at the top and bottom right side of the page. Clicking on any one of the numbers will bring the user to that page of the Gallery. Each page shows Photo Locations of areas around UTP campus. Each photo has three links associated with it; Image, QTVR, and Flash. The Image link will open the full panorama image in JPEG format using the default Internet Explorer. User can view this image by clicking on the link. The QTVR link will open the panoramic image in QuickTime format (MOV) using the default Internet Explorer. The QuickTime movie shows the panoramic image in 360degrees view. The difference between the MOV format and the SWF format is that for the MOV format, user has to click and drag the image to make it move. It also has no information about the buildings in the photo, unlike the SWF movies. This page is for providing variety of choices for the user to view the panoramic image.

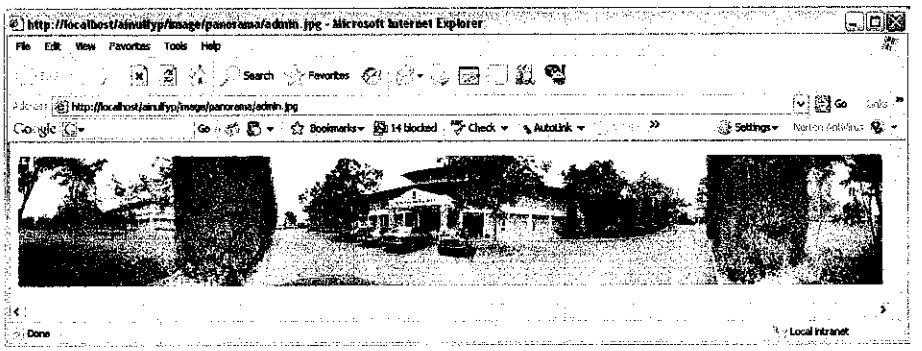


Figure 20: Panoramic UTP, Photo in JPEG Format

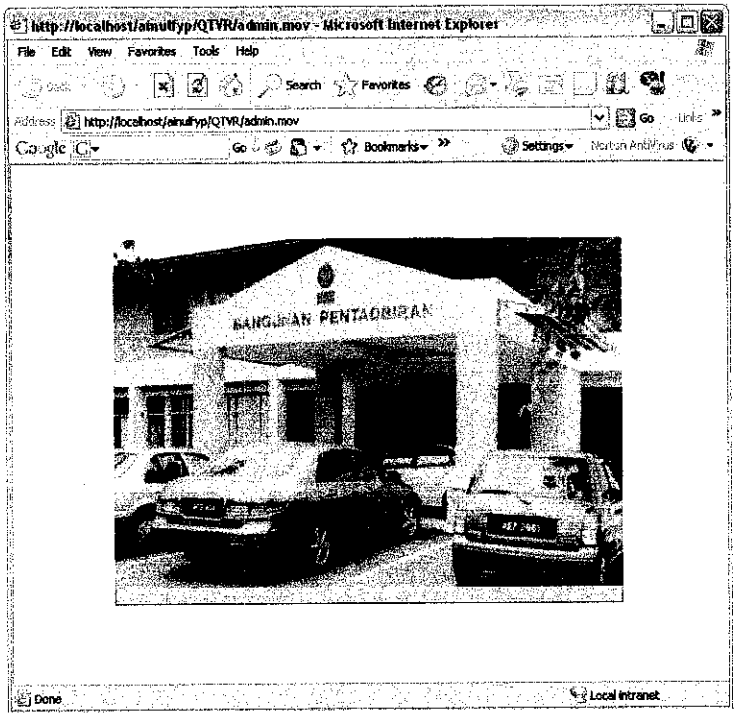


Figure 21: Panoramic UTP, QuickTime Movie

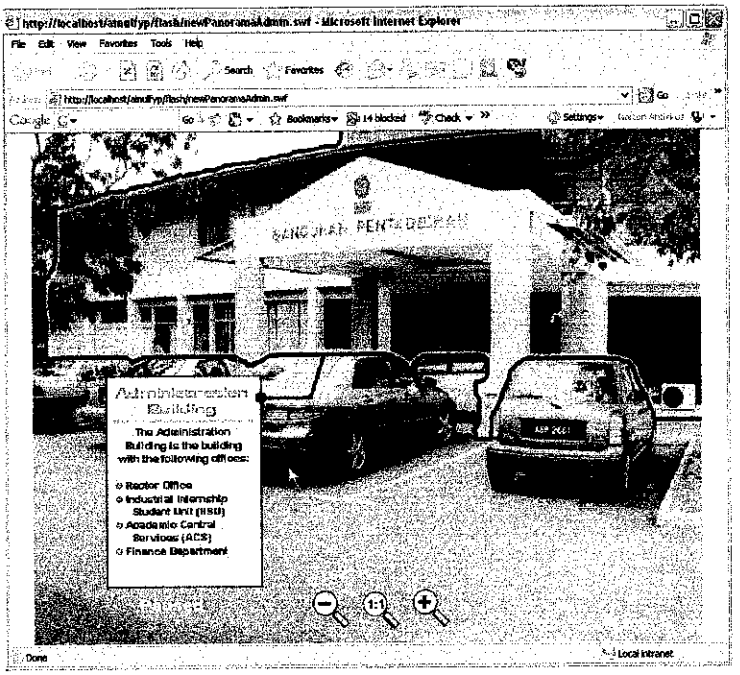


Figure 22: Panoramic UTP, Flash Movie

The figure below is the Locations page.

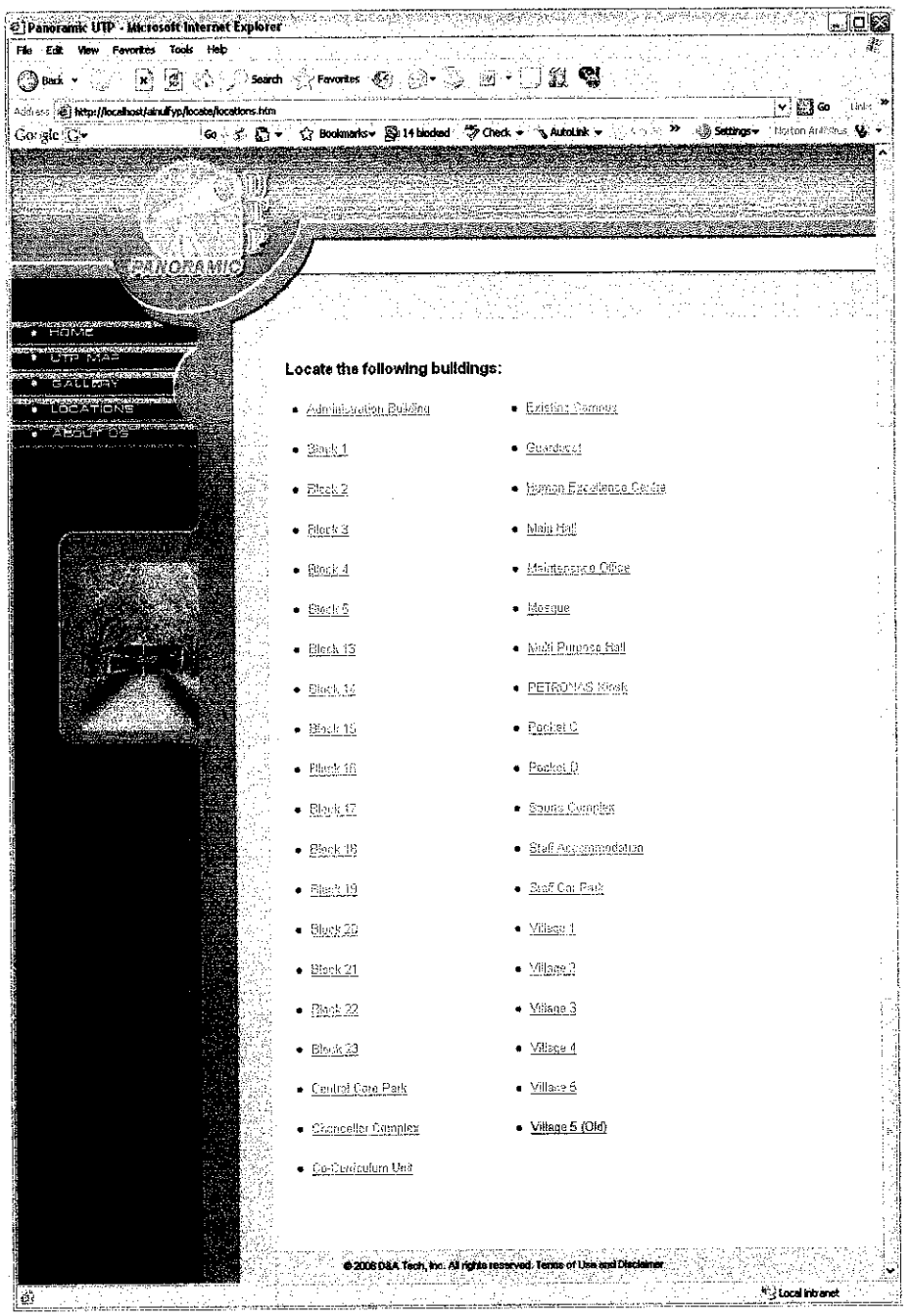


Figure 23: Panoramic UTP, Locations Page

The Locations page is the page the user can go to in order to get the directions to the buildings in the UTP campus. The page has a list of all of the important buildings in the campus. The user can click on any one of the link and it will open another page that shows the direction to that location. A sample of one of the locations direction is shown below.

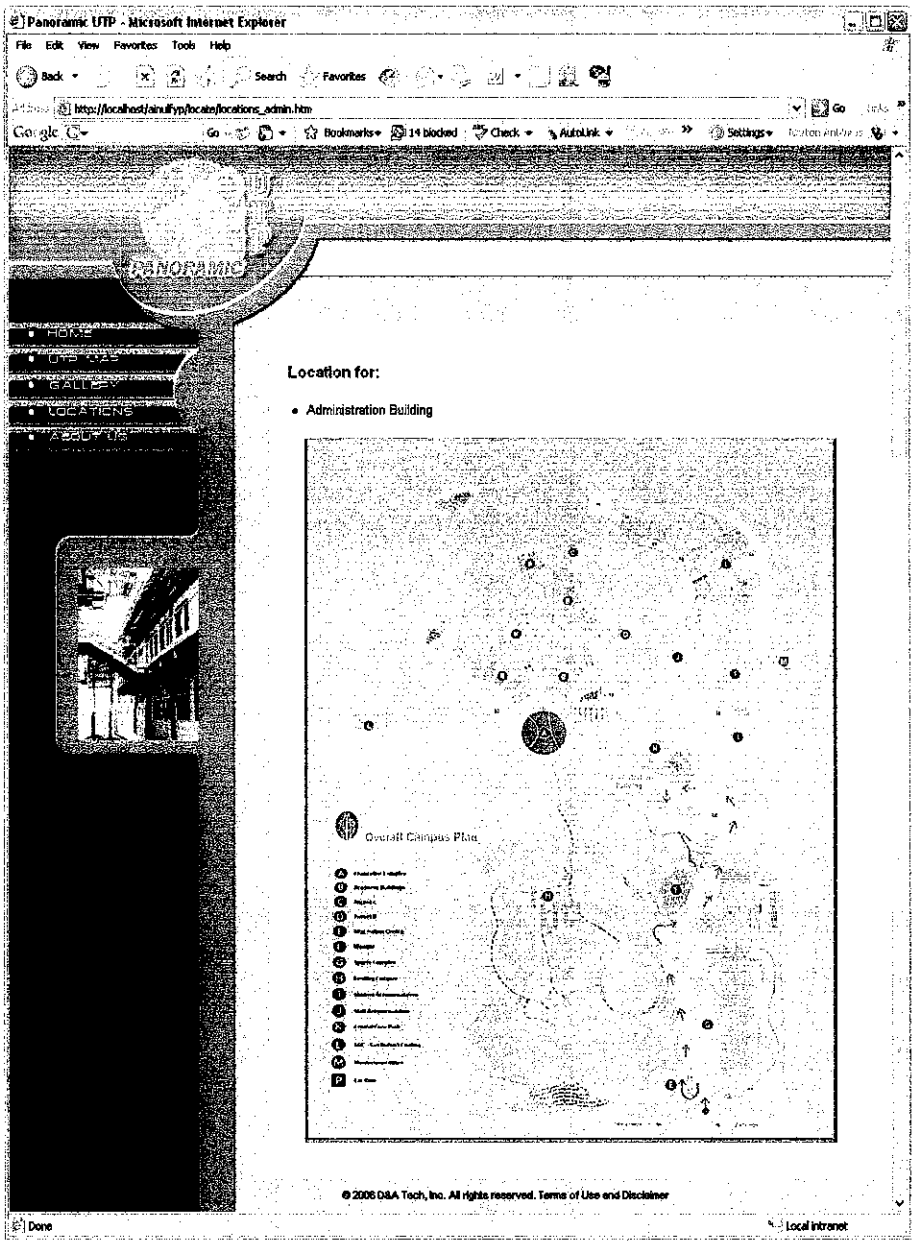


Figure 24: Panoramic UTP, Locations Direction Page

The About Us page is the page that has all of the important contact information for UTP. It provides the address, the telephone number, the fax number, the email address, and the official website address for UTP. The user can use any of the information given to contact the university. Below is the About Us page.

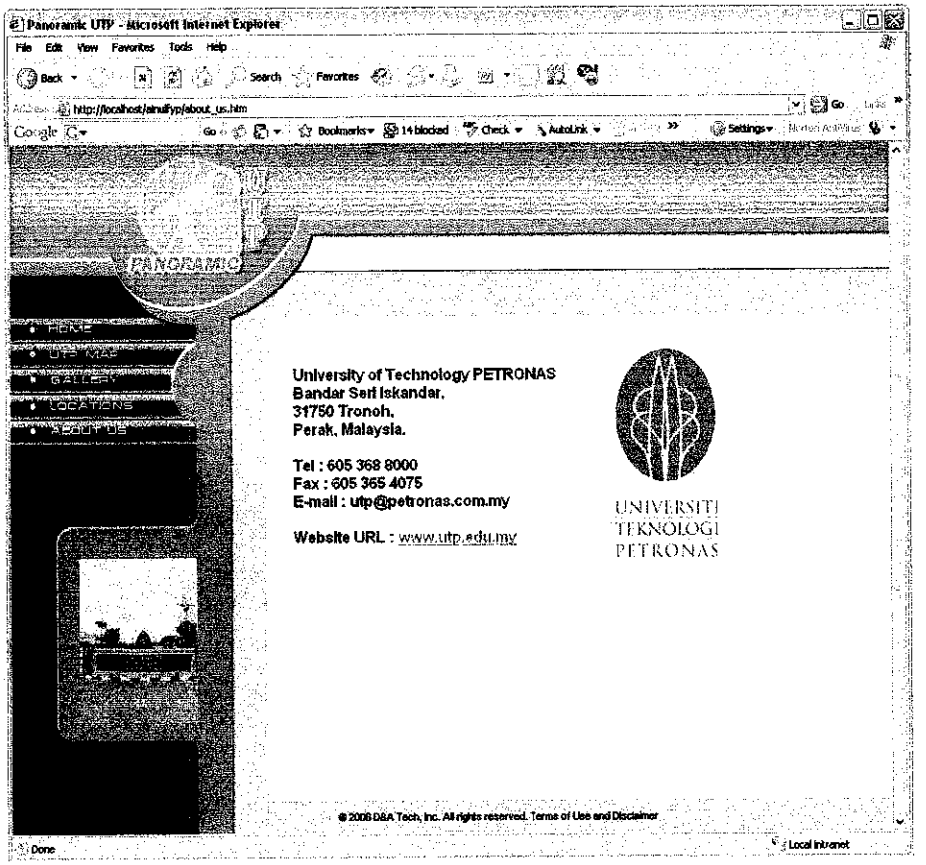


Figure 25: Panoramic UTP, About Us Page

All of the information used in the project website is correct during development time. The webmaster should update the web pages from time to time in order to ensure correctness of information.

4.3 DISCUSSION

More enhancements can be added to the Flash movie to provide more interaction with the users. Currently, there are hotspots on the Flash movie that allows the user to gain more information about the facilities in UTP. For future enhancements, these hotspots can be added with other multimedia elements to capture user interest more effectively.

The development of this project Website is focused on one target user group; secondary school students. For this user group, the aim is to develop a fun, new method for promoting a tertiary education location. Young minds are easily attracted by beautiful objects and new improved technology. That is why this project implements Flash movies into Website environment. It is a good practice to develop a website that looks complicated but is easy to navigate.

Macromedia Flash software is one of the most popular advanced authoring environment for creating interactive websites, digital experiences and mobile contents. It is common to find pages on the Internet that uses Flash software. Other than being popular, Flash has the capability of making the hardest functions look easy. Even people who are beginners with computers can use Flash without any problem.

Other than Flash movies, this project also implements QuickTime movies. It is an optional view. As part of media evaluation, QuickTime VR panoramas and panoramas created using Flash are compared. The Flash panorama requires a simple script to create a complete loop. A similar panorama was created using QuickTime. Sensitive to image alignment, QuickTime requires the use of tripod and careful leveling in order to create the image loop. Furthermore, Flash players are smaller to download to computers that doesn't have it yet while QuickTime player is larger and takes longer to download. That is why Flash movies are the first choice for this project.

Since young people are easily attracted by new technologies, it is wise to keep upgrading this project Website to comply with the latest advances in technology. If this Website is left as it is, it will lose it's attraction within a few years.

CHAPTER 5

RECOMMENDATION AND CONCLUSION

5.1 RECOMMENDATION

The finished website should be ready for use with all the necessary functions. However, there are other upgrades that can be added to the website in the future. The possible upgrades that can be added are:

- Bilingual (Bahasa Melayu and English)
- Multi-Narrators (male and female)
- Tour Guide (website assistant)
- Stand-Alone Kiosk

5.1.1 Bilingual

For future upgrades, the website can provide multiple language contents to cater for a wider range of audiences. English is the most used language on the Internet. Therefore, English is the first language selected. For the upgraded version, the website can be downloaded in another widely used language. In Malaysia, the second widely used language is Bahasa Melayu, the country's national language. Since the target audience is potential students for the university, Bahasa Melayu is the best second language for the website contents. This is because the majority of potential students come from local secondary schools.

5.1.2 Multi-Narrators

Narrator on the website should match the language used for the web contents. Therefore, by providing bilingual contents on the page, the narrator should also be multiplied to match the contents. Other than that, the upgraded version of the website can provide multi-narrators to cater to audiences' preference. Some audiences prefer female voice and others prefer male voice as the narrator. Therefore, it is a smart move to add choices for the audience to select as the website's narrator.

5.1.3 Tour Guide

Microsoft Office provides an assistant for the users called Office Assistant that helps beginners and advanced users use the functions in their product more efficiently. Providing an assistant, or a tour guide, to help users navigate around the website is a smart upgrade from the previous version. The tour guide can assist and gives recommendations to the user on how to navigate around the website and where to go next in order to provide clarity on the best features of the website. Therefore, the future version of the website will be added with a Tour Guide.

5.1.4 Stand-Alone Kiosk

The initial idea is to embed this project website into UTP's official website. This way, it can be accessible on any computer that has Internet connection. However, in the future, hopefully this website can be turned into an application that could be run on stand-alone kiosk. The kiosks can be placed all over UTP as informative information booth for students and visitors.

5.2 CONCLUSION

This project is considered significant and is done at the right time especially for UTP. It is mainly going to be used as a part of the on-going promotion strategy for the university. It is a smart move towards building a strong reputation for the university in the eyes of potential students. In this time, this is very important because there are a lot of challenges among local universities in enrolling students. Furthermore, this project is aimed to contribute towards multidimensional disciplines, for examples, as virtual reality technology and multimedia.

This project gives a lot of focus on the panorama aspect of things. Although panorama has been around since the 19th century, its application in promotional method has not been widely used. It is also not commonly used in Malaysia. Other countries, mainly the United States of America (USA), have applied this concept for a long time. The most common application of panorama in the USA is for real estate.

This project contributes to the application of panorama as a promotional method of a campus environment. Hopefully, with the success of this project, panorama will be applied in other applications in Malaysia such as for tourism and real estate. There is a lot of work that needs to be done in the near future to ensure a successful achievement of the project. The success of this project may be used as a foundation to further develop more sophisticated applications of panoramic images. Upon completion, it is hoped that virtual walkthrough with panoramic images will be used as an effective medium in other applications such as education, advertising, and tourism.

REFERENCES

Daniel G. Riordan & Steven E. Pauley. "Technical Report Writing Today." 7th edition. *Thomson Learning* (1999): 541-4.

Jon McCormack & Damian Conway, 1998–2005.
<http://www.csse.monash.edu.au/~jonmc/CSE2305/Topics/07.13.SWEng1/html/text.html>

Gayle Decker, 2006.
<http://www.personal.psu.edu/faculty/c/v/cvm115/proposal/formulating_problem_statements.htm>

Patrick Collins, June 11, 2001.
<http://www.ucop.edu/irc/nba/hris/projectmeth.html>

Robert F. Jeantet, 2000.
<http://www.sav.org/e/panorama.html>

APPENDICES

Appendix A: Panoramic UTP Website Walkthrough

Appendix B: Internet Information Services (IIS) 5.0 Walkthrough

Appendix C: Macromedia Flash MX Walkthrough

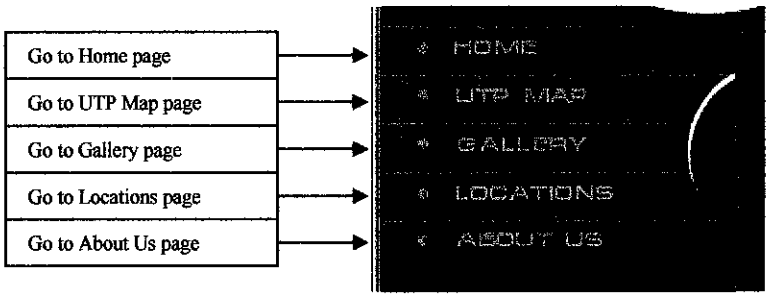
Appendix D: Adobe Photoshop CS Walkthrough

Appendix E: Autostitch Walkthrough

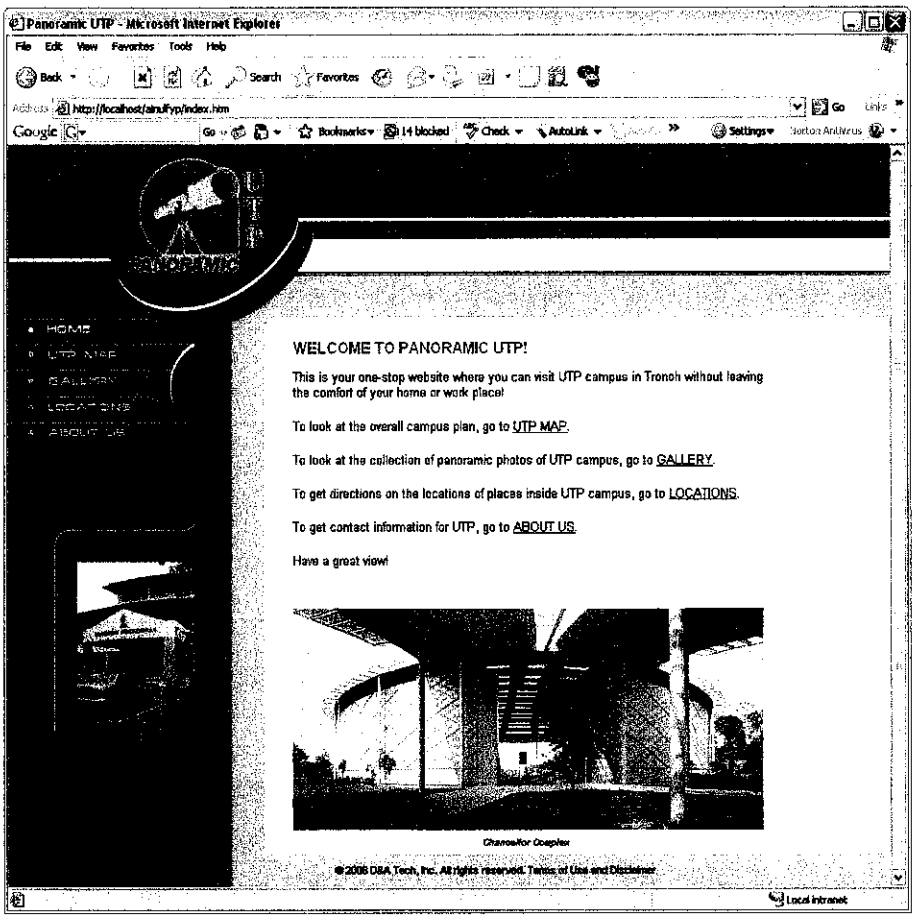
Appendix F: GoCubic Walkthrough

Appendix A: Panoramic UTP Website Walkthrough

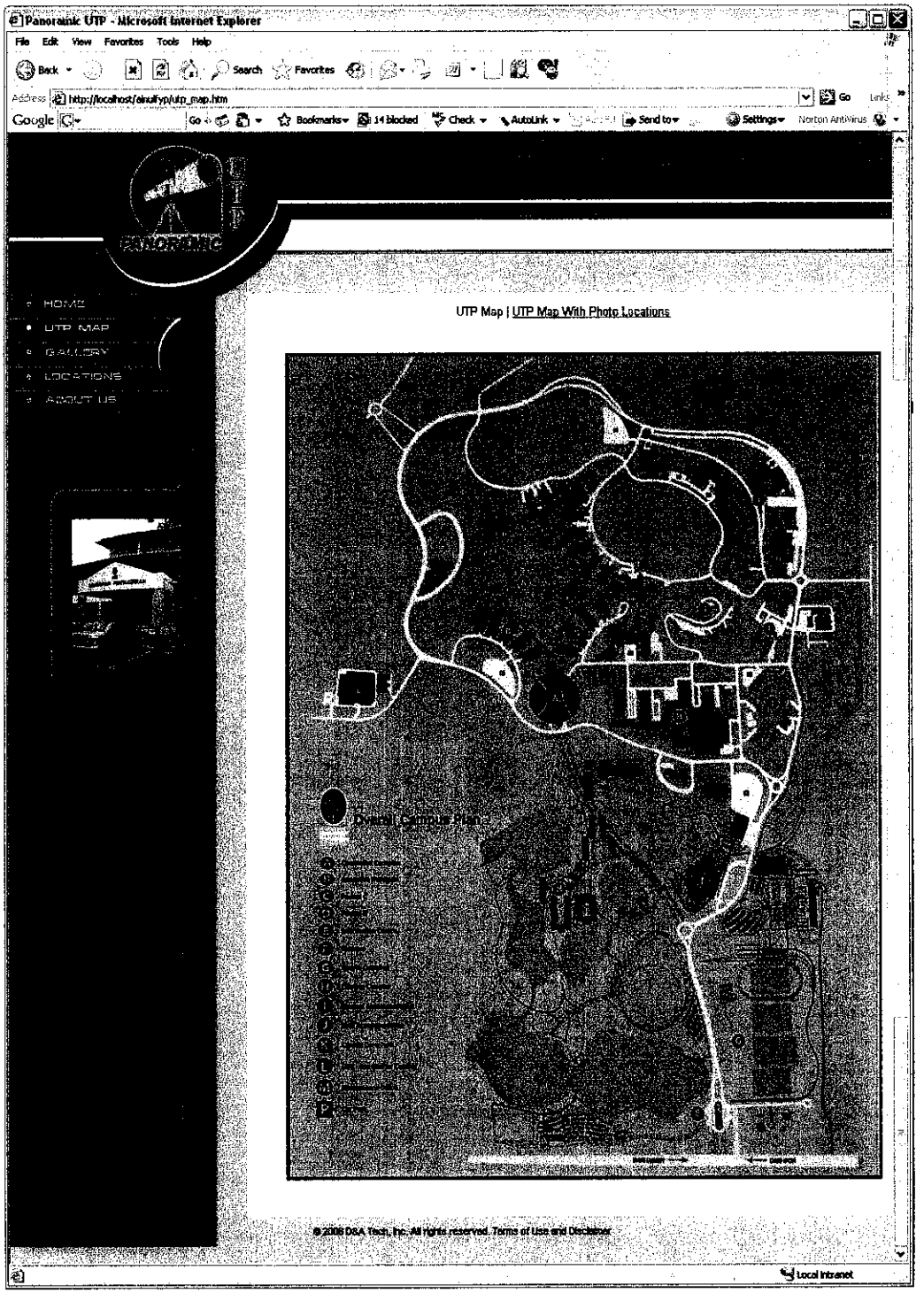
The common buttons on each page is shown as below:



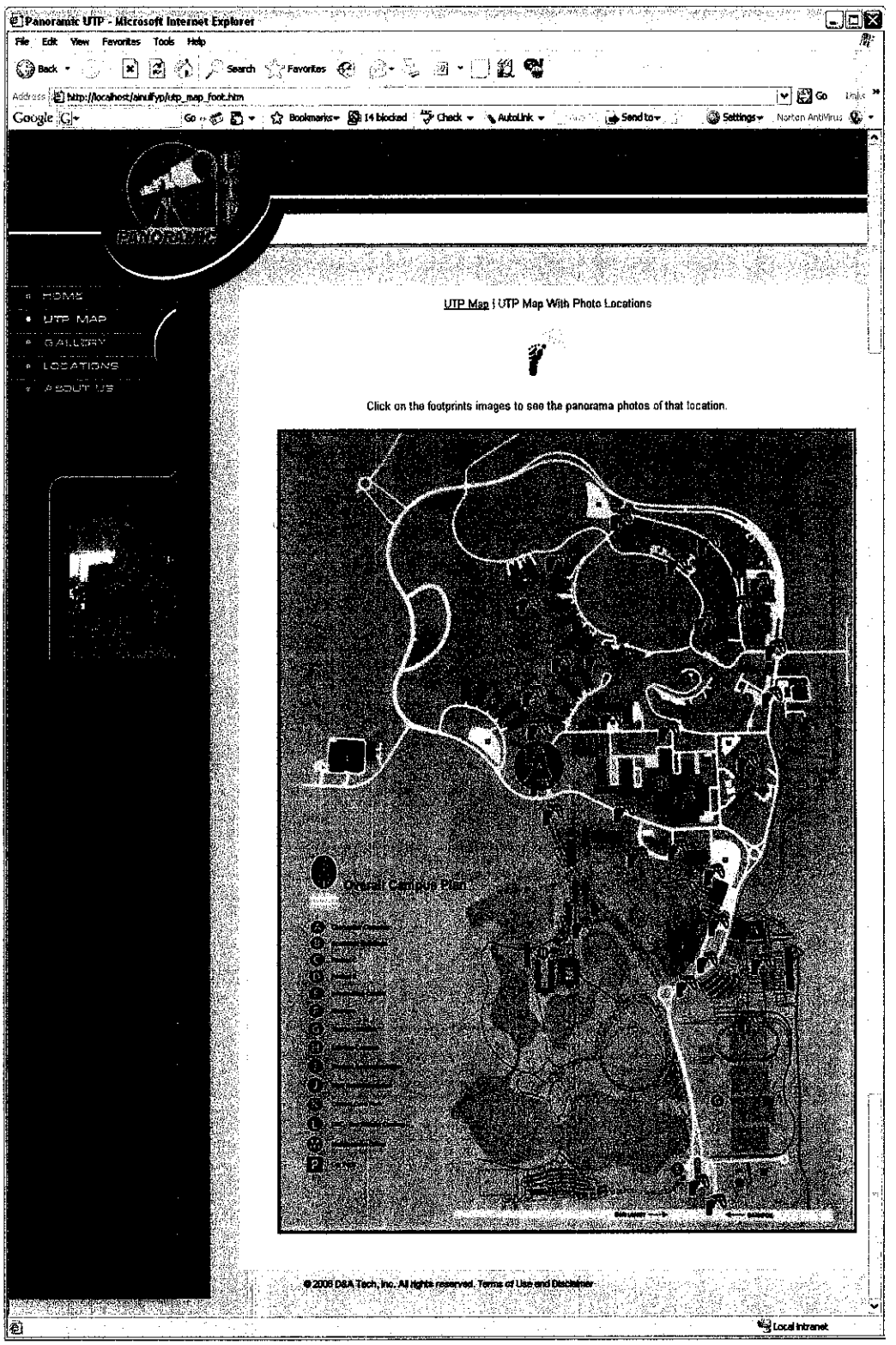
The Home Page:



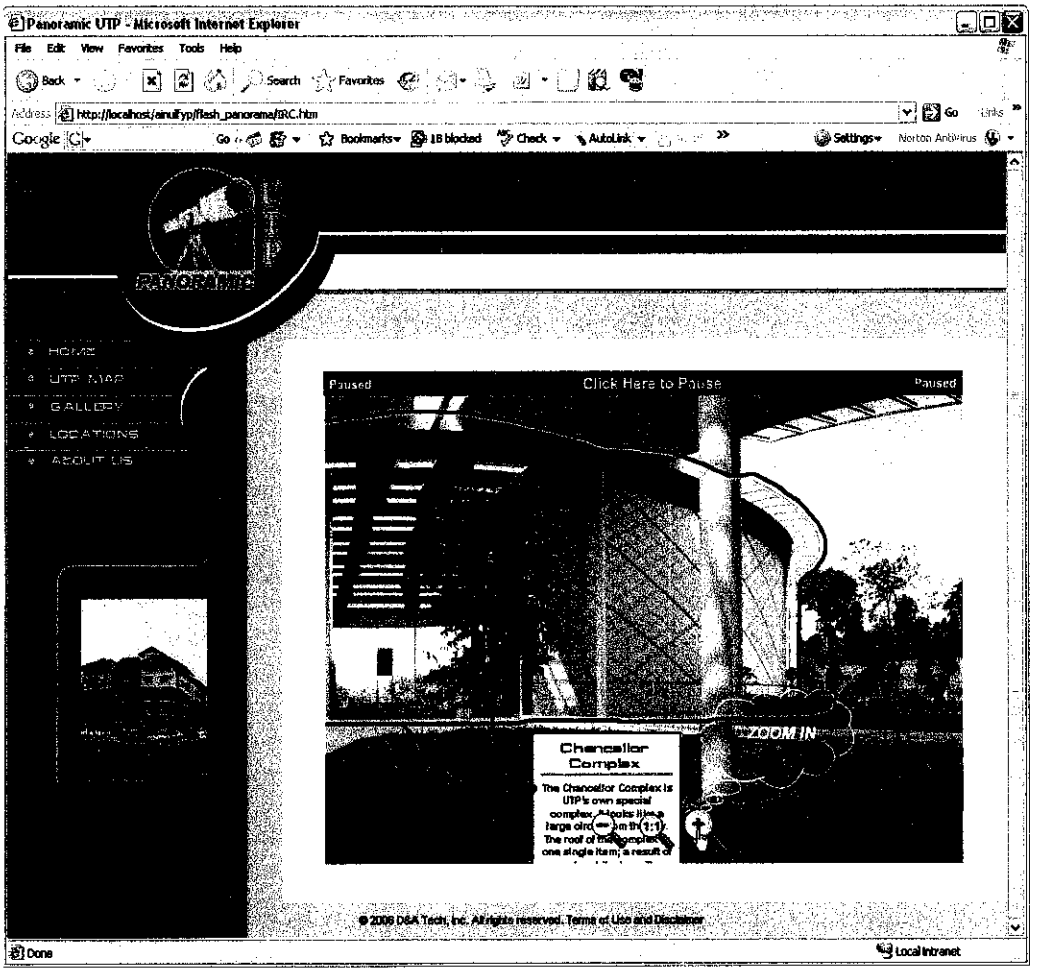
The UTP Map Page:



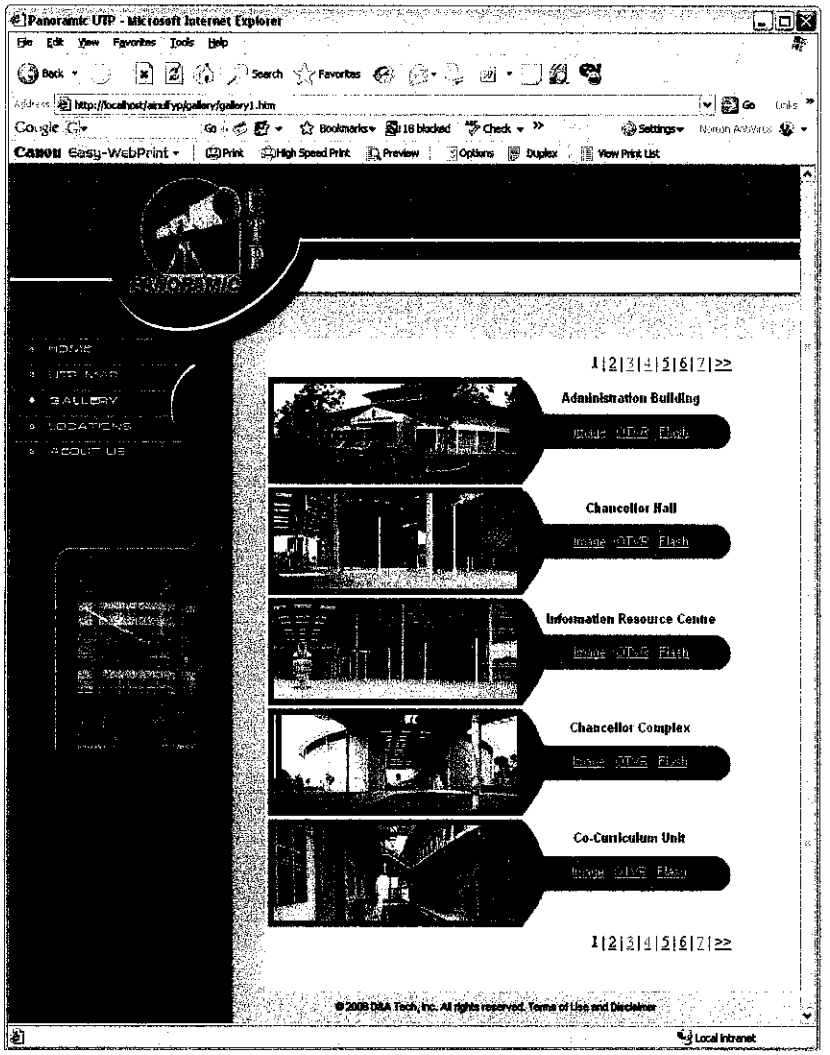
The UTP Map with Photo Locations Page:



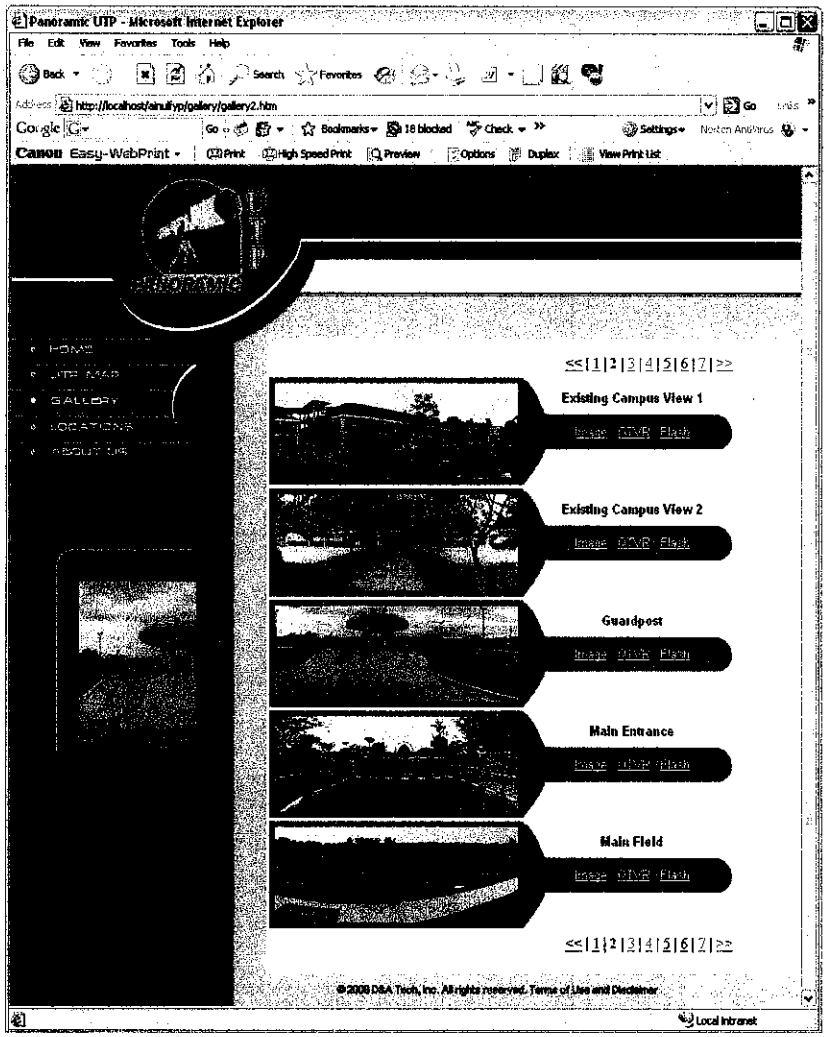
The Flash Panorama page (example):



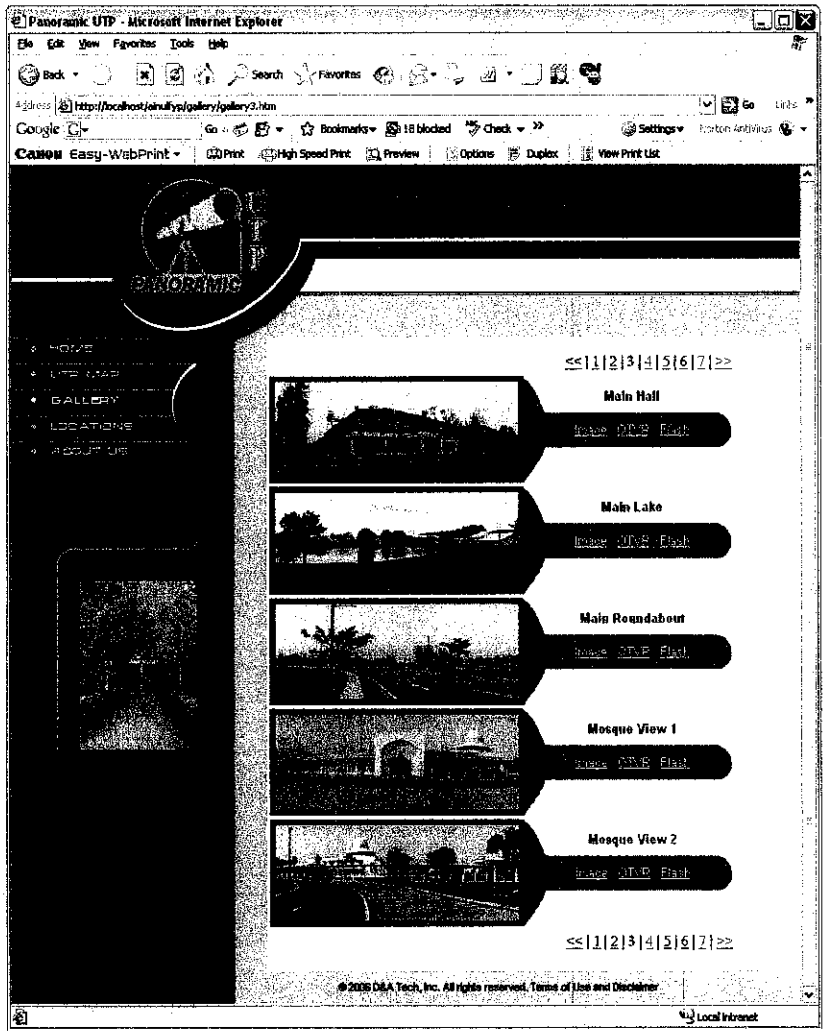
The Gallery page 1:



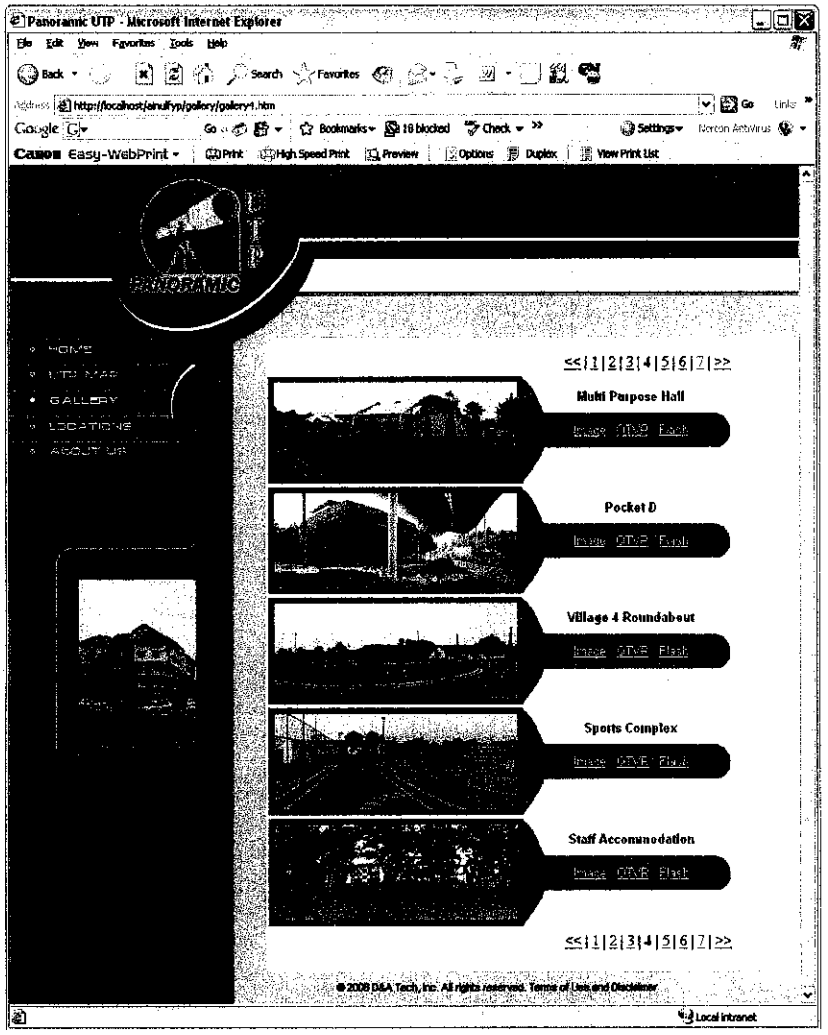
The Gallery page 2:



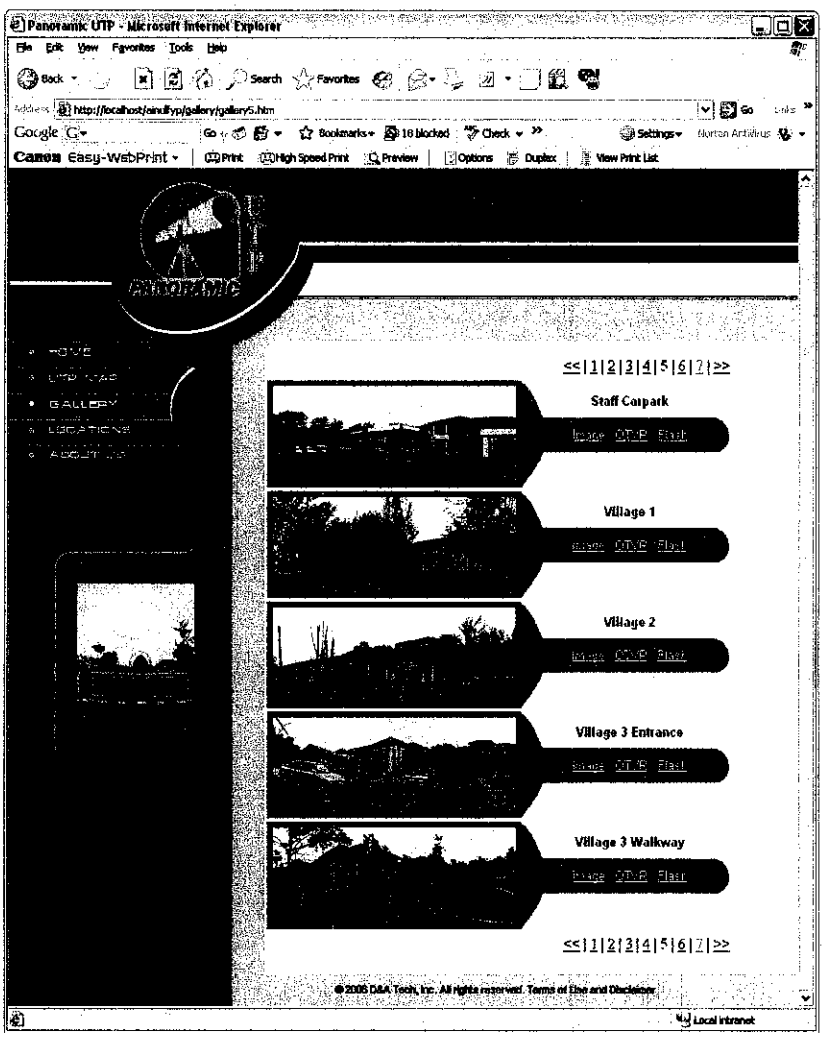
The Gallery page 3:



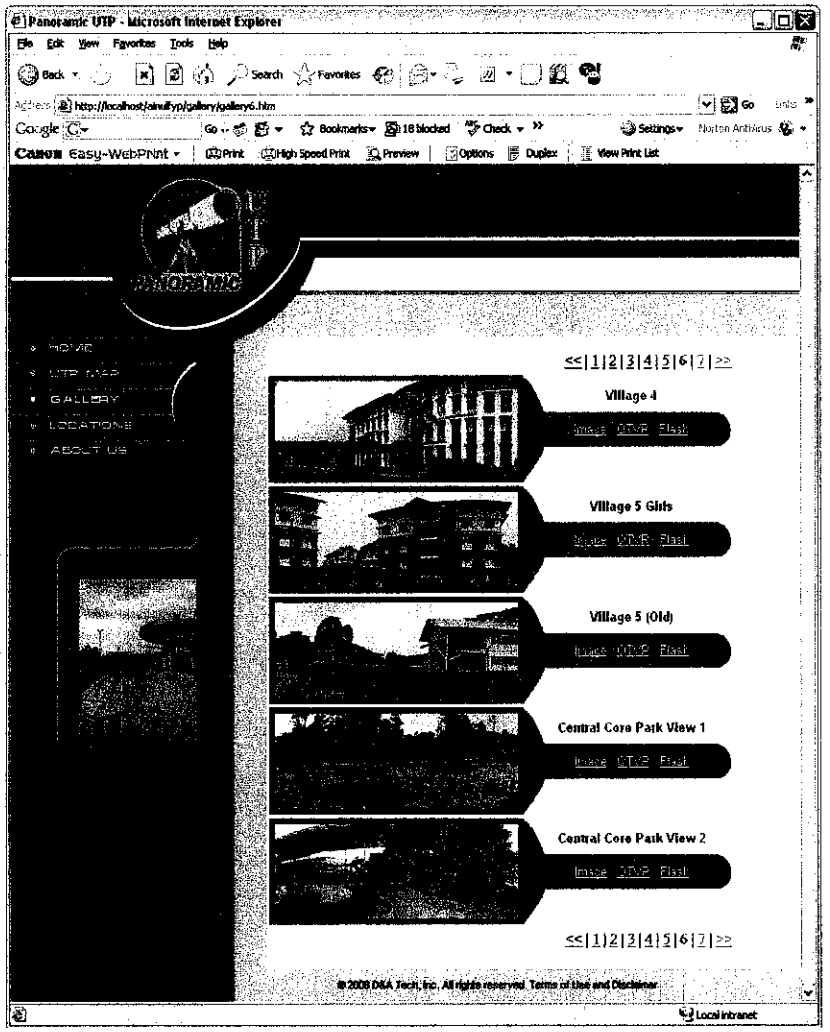
The Gallery page 4:



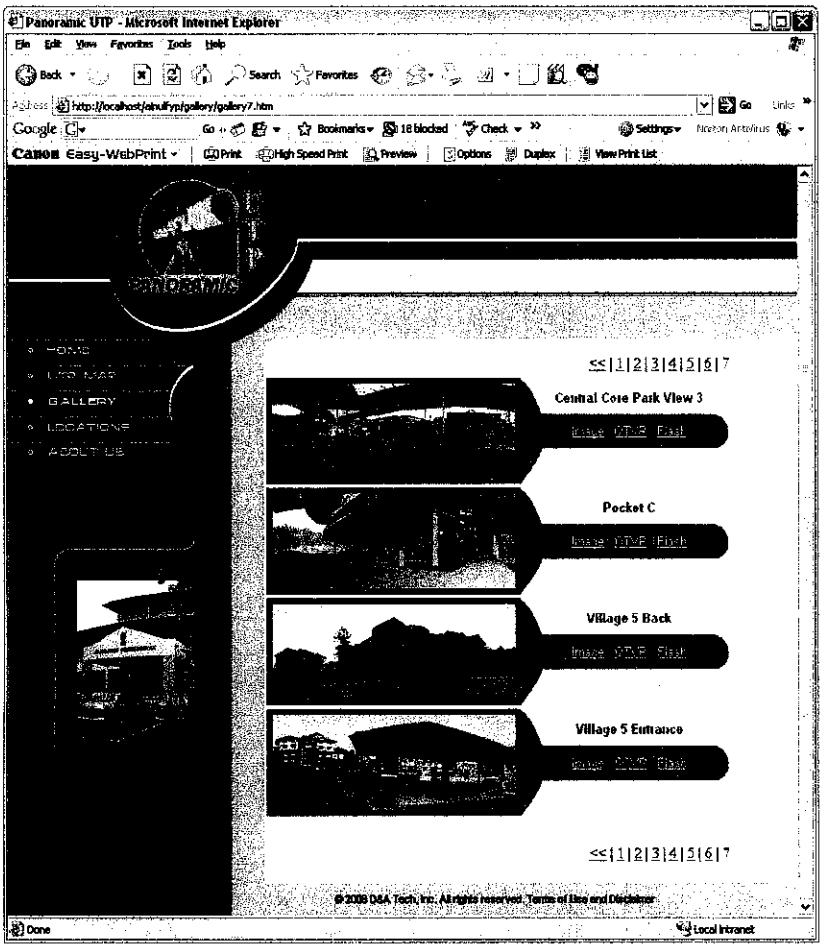
The Gallery page 5:



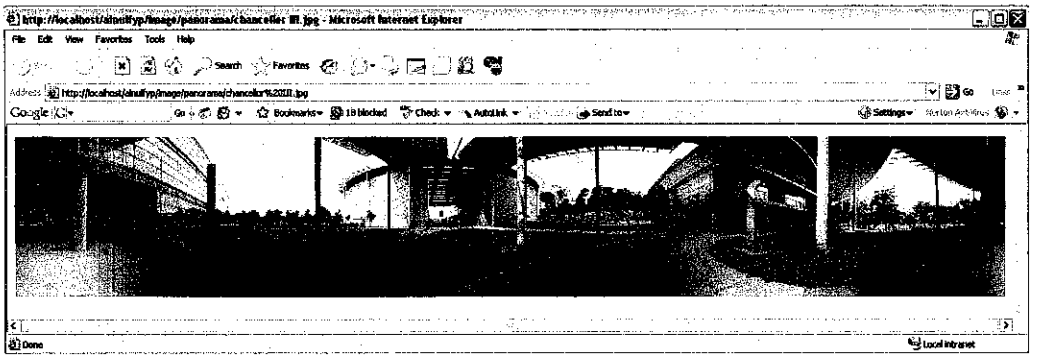
The Gallery page 6:



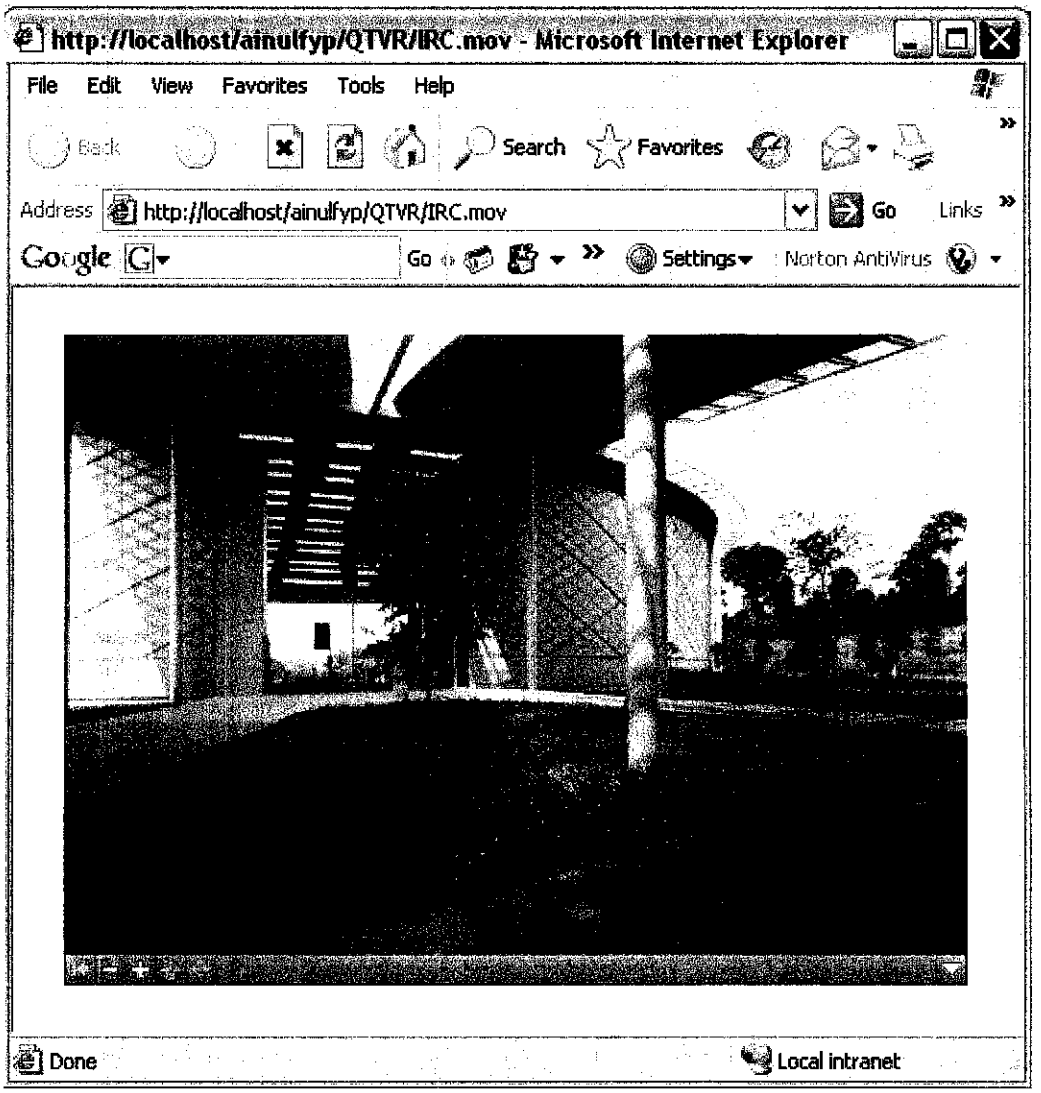
The Gallery page 7:



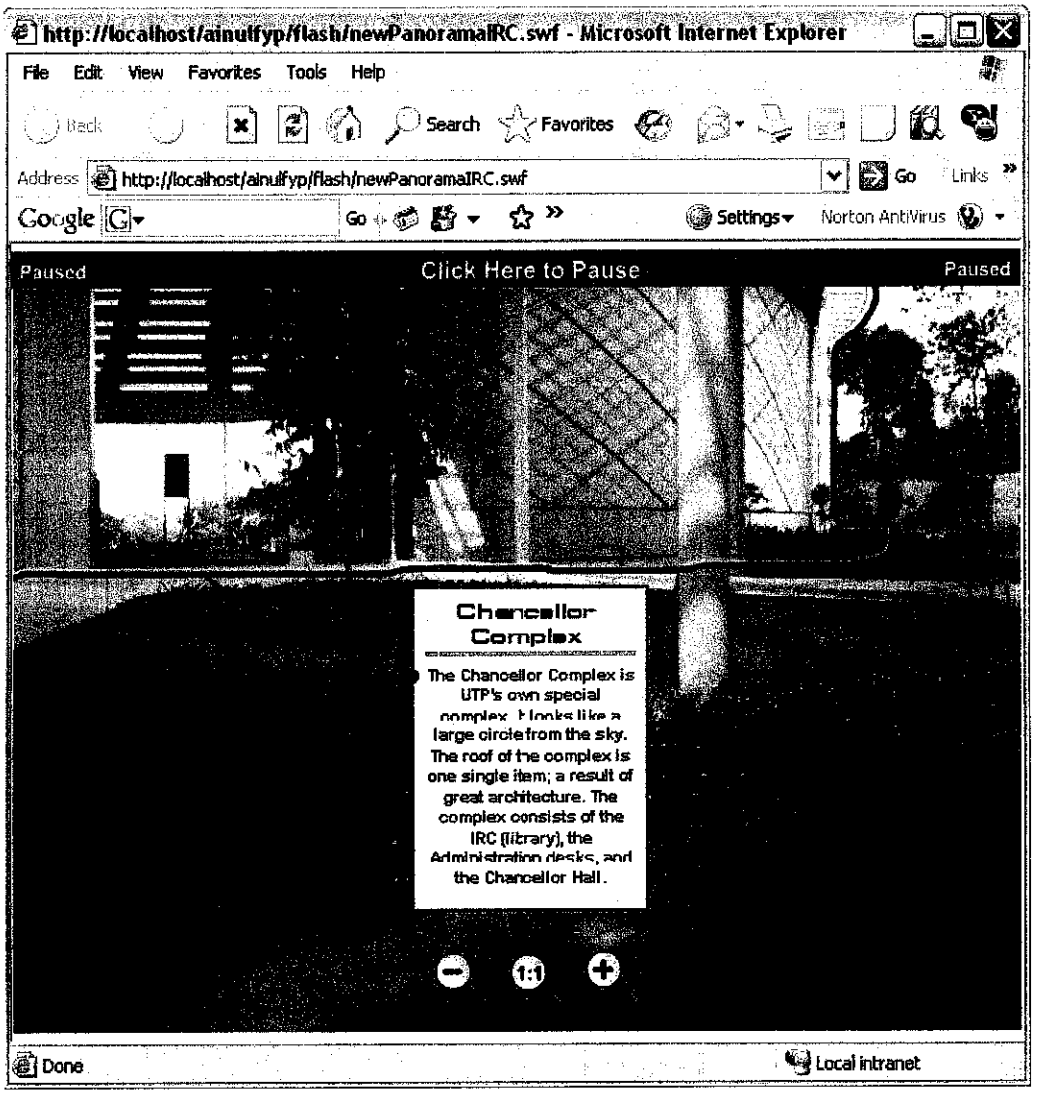
The Image view (JPEG):



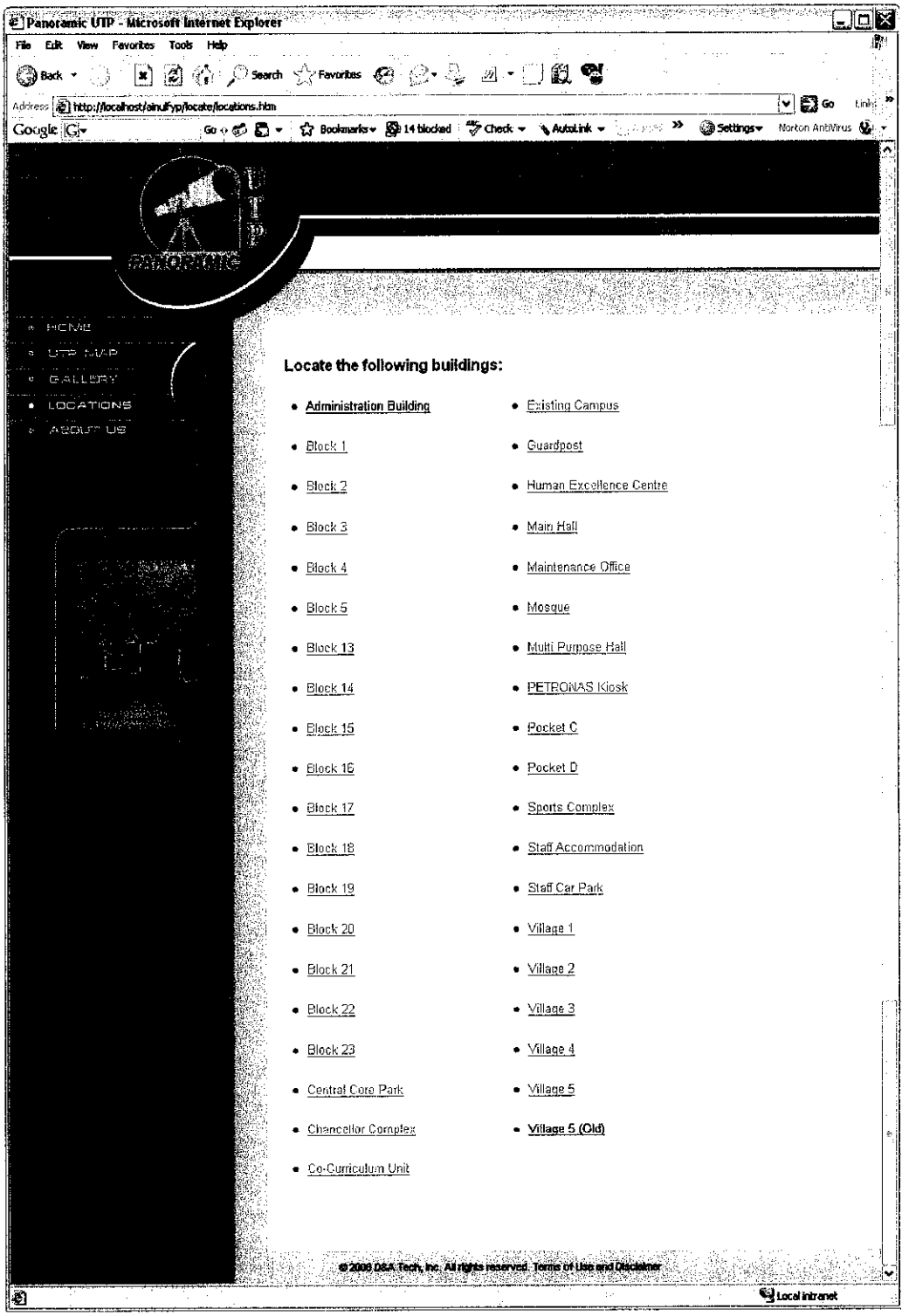
The QuickTime Movie view (MOV):



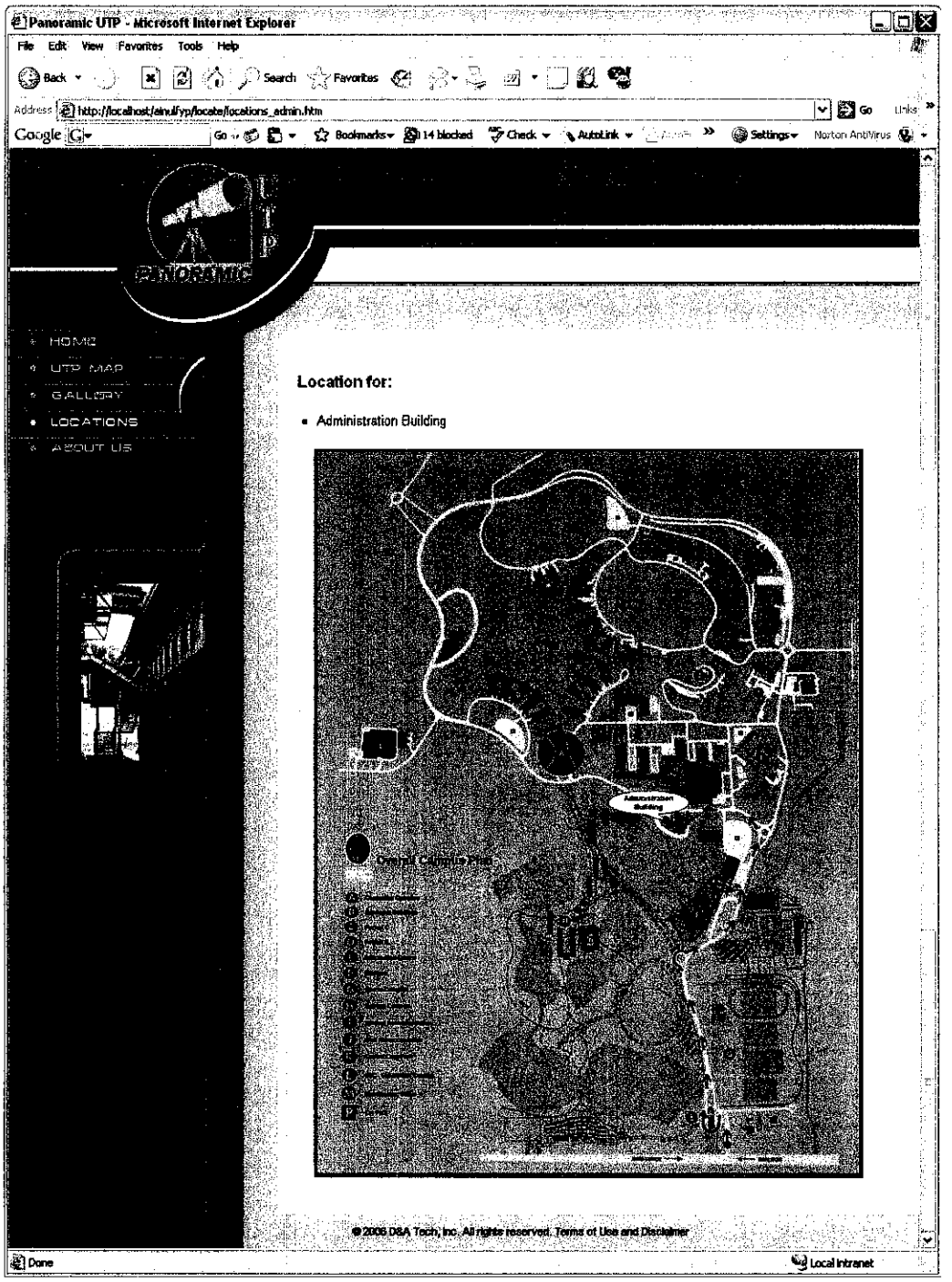
The Flash Movie view (SWF):



The Locations page:



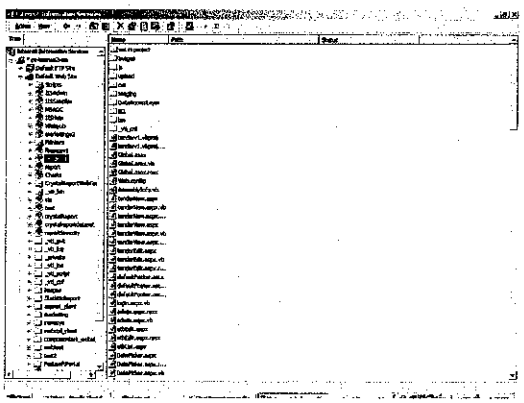
The Locations Direction page (example):



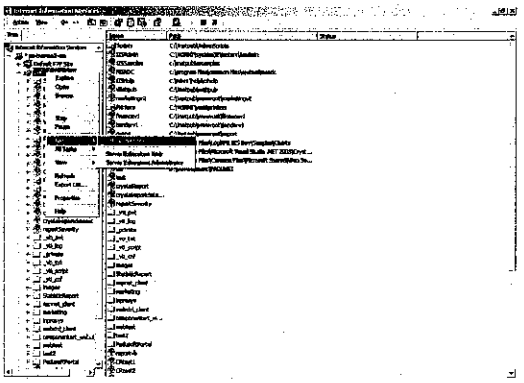
The About Us page:

Appendix B: Internet Information Services (IIS) 5.0 Walkthrough

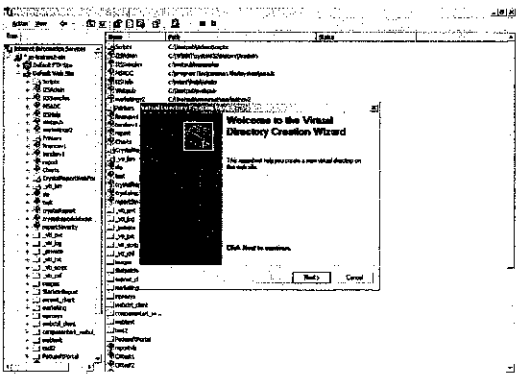
Panoramic UTP website is run using Internet Information Services (IIS) 5.0 as the Web server. The following are a brief walkthrough of some screenshots and views in the Internet Services Manager for IIS:



Panoramic UTP is run as a directory named ainulfyp. The directory that displays the website Home page is http://localhost/ainulfyp/index.htm



To create the virtual directory, right click on Default Web Site. Select New >> Virtual Directory



A popup window with the header Welcome to the Virtual Directory Creation Wizard will appear. Follow the step-by-step instruction to create a new directory on the Web server.

Appendix C: Macromedia Flash MX Walkthrough

The figure above shows the work area in Macromedia Flash MX. This software is used to create the Flash Panorama movie for the project website.

In order to create interactive-ness within the Flash Panorama, some scripting is required. The following is the ActionScripts used for this project.

Coding for the preloader scene (loading page):

```
OnePercent = this.getBytesTotal()/100;
begTime = getTimer()/1000;
asize = getBytesTotal();
fscommand("showmenu", false);
fscommand("allowscale", false);

tellTarget("Progress Bar"){
      with ("Progress Bar") {
            n=(getTimer())/1000-this.begTime;
            bps=Math.round(this.getBytesLoaded()/n);
            tr=(this.asize-this.getBytesLoaded())/bps;
```

```
            trround=Math.floor(tr);
            trf=Math.round((tr-trround)*100);
            trem=Math.floor(tr)+trf/100;
      }
      gotoAndStop(Math.round(this.getBytesLoaded()/_parent.One
      Percent));
}
if (this.getBytesLoaded()>=this.getBytesTotal()) {
      gotoAndPlay (4);
}

gotoAndPlay ("CheckLoaded");

nextScene();
play();
```

Coding for free movement of the panorama page:

```
zoom_direction = none;
zoom = 100;
stop();
Mouse.hide();
_root.help1._visible=false;
_root.help2._visible=false;
_root.help3._visible=false;
```

Coding for slide object movie clip (for the sliding of the image):

```
// ------------------------------------------
// Make duplicate of picture
// ------------------------------------------
// tmi=total duplicates (2)
// dup=new movie duplicates
// image=original movie
// ------------------------------------------
m = 0;
tmi = 2;
while (Number(m)<Number((tmi*2)-1)) {
      m = Number(m)+1;
```

```
        dup = "image" add m;
        // Depth of this layer and depth of picture layer CANT
be the same. So in this layer I add 1 to the depth to make
sure of that.
        duplicateMovieClip("image", dup, Number(m)+1);
        setProperty(dup, _x, Number(getProperty(dup, _x)) +
Number (m*getProperty(dup, _width)));
}
```

Coding for drag control (mouse drags):

```
// ------------------------------------------
// mouse drags this item
// ------------------------------------------
startDrag("", true);
// ------------------------------------------
// must be set manually:
// ------------------------------------------
movieheight = 480;
moviewidth = 640;
// ------------------------------------------
// variables
// ------------------------------------------
w = getProperty("../picture", _width);
h = getProperty("../picture", _height);
// ------------------------------------------
// Drag Speed is INVERSE: ie: setting to a higher number will
SLOW down the speed...
speed = 80;
// ------------------------------------------
// begin drag calculations
// ------------------------------------------
xPos = getProperty("", _x);
yPos = getProperty("", _y);
// ------------------------------------------
// Center the Drag Effect
// ------------------------------------------
xPos = xPos-(moviewidth/2);
yPos = yPos-(movieheight/2);
// ------------------------------------------
```

```
// slide <--x-->
// ----------------------------------------
setProperty("../picture", _x, getProperty("../picture", _x)-
(xPos/speed));
if (Number(getProperty("../picture", _x))<Number(-(w/2))) {
      setProperty("../picture", _x, 0.01);
} else if (Number(getProperty("../picture", _x))>0) {
      setProperty("../picture", _x, -w/2);
}
// ----------------------------------------
// slide   y
// ----------------------------------------
setProperty("../picture", _y, getProperty("../picture", _y)-
(yPos/speed));
// ----------------------------------------
//limit y to movie height
// ----------------------------------------
pic_y = getProperty("../picture", _y);
if (Number(pic_y)>0) {
      setProperty("../picture", _y, 0);
}
if (Number(pic_y)<Number((movieheight-h))) {
      setProperty("../picture", _y, (movieheight-h));
}

gotoAndPlay(_currentframe-1);
```

Coding for Preloader scene:

```
OnePercent = this.getBytesTotal()/100;
begTime = getTimer()/1000;
asize = getBytesTotal();
fscommand("showmenu", false);
fscommand("allowscale", false);

tellTarget("Progress Bar"){
with ("Progress Bar") {
n=(getTimer())/1000-this.begTime;
bps=Math.round(this.getBytesLoaded()/n);
tr=(this.asize-this.getBytesLoaded())/bps;
```

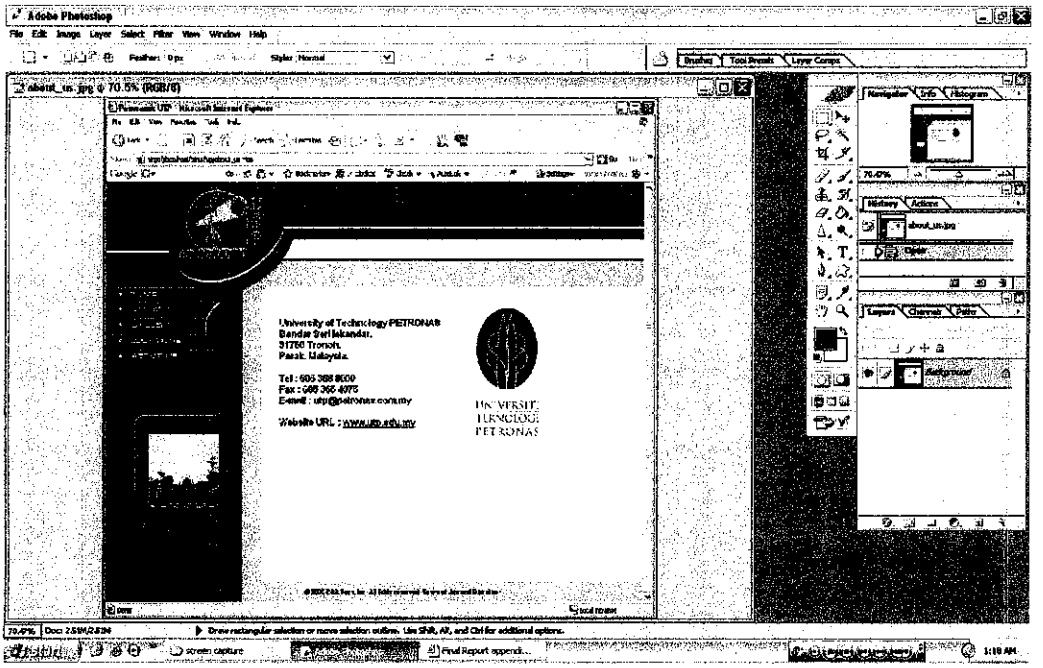
```
trround=Math.floor(tr);
trf=Math.round((tr-trround)*100);
trem=Math.floor(tr)+trf/100;
}
gotoAndStop(Math.round(this.getBytesLoaded()/_parent.OnePercen
t));
}
if (this.getBytesLoaded()>=this.getBytesTotal()) {
      gotoAndPlay (4);
}

gotoAndPlay ("CheckLoaded");

nextScene();
play();
```

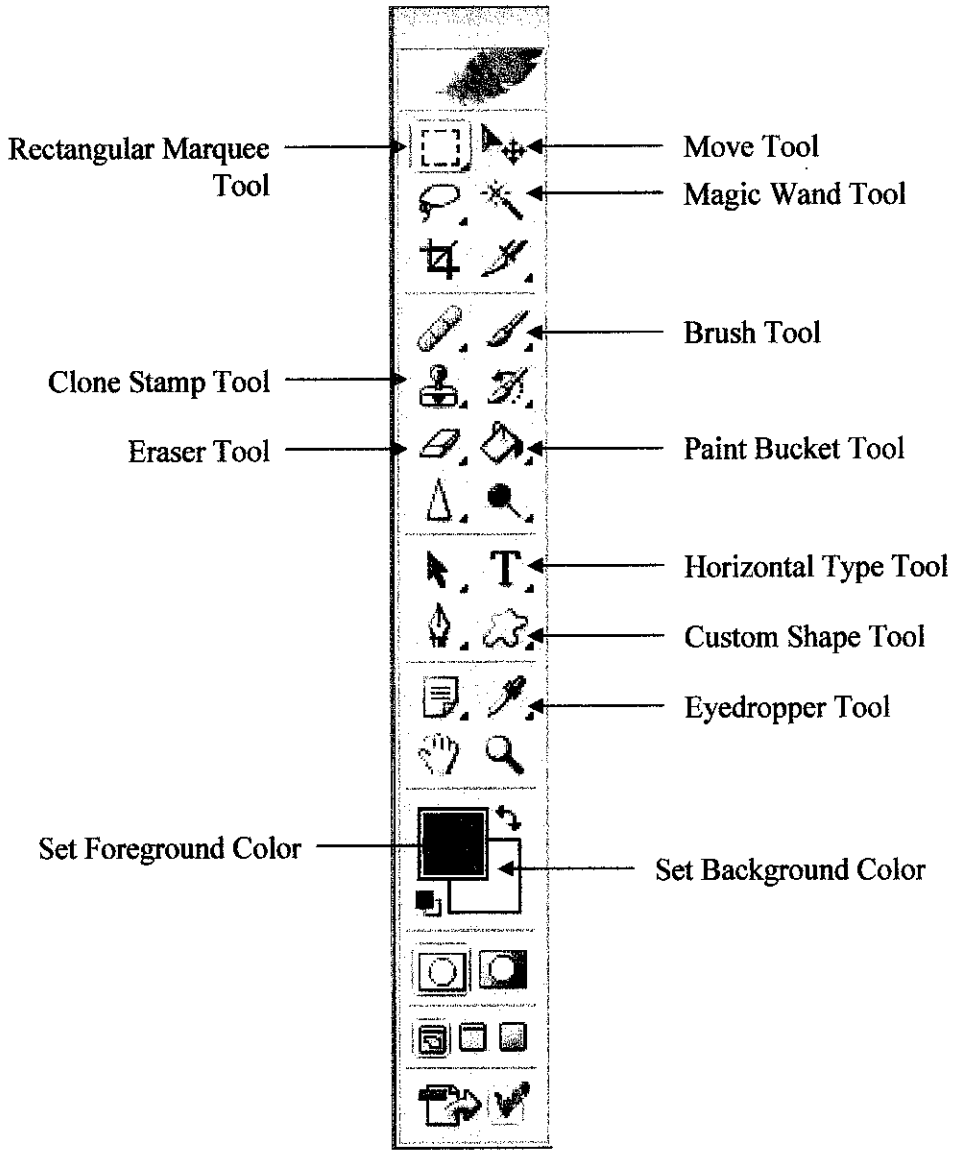
End of coding.

Appendix D: Adobe Photoshop CS Walkthrough



The figure above shows the Adobe Photoshop CS work area. This software is used a lot in this project for editing purposes. The figure below is the toolbar with the names for the most used tools.

- The marquee tools make rectangular, elliptical, single row, and single column selections.
- The Move tool moves selections, layers, and guides.
- The Magic Wand tool selects similarly colored areas.
- The Brush tool paints brush strokes.
- The Clone Stamp tool paints with a sample of an image.
- The Eraser tool erases pixels and restores parts of an image to a previously saved state.
- The Paint Bucket tool fills similarly colored areas with the foreground color.
- The type tools create type on an image.
- The Custom Shape tool makes customized shapes selected from a custom shape list.
- The Eyedropper tool samples colors in an image.

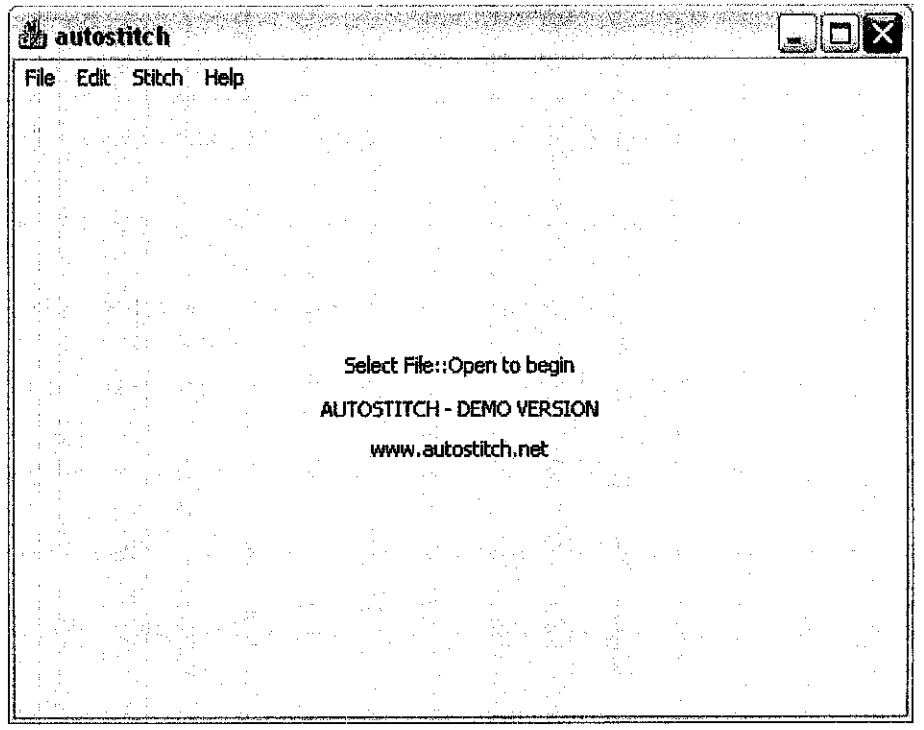

Rectangular Marquee Tool
Move Tool
Magic Wand Tool
Brush Tool
Clone Stamp Tool
Eraser Tool
Paint Bucket Tool
Horizontal Type Tool
Custom Shape Tool
Eyedropper Tool
Set Foreground Color
Set Background Color

Appendix E: AutoStitch Walkthrough

AutoStitch is the world's first fully automatic 2D image stitcher. The demo version used in this project has been created to demonstrate the basic functionality of AutoStitch. The user simply selects a set of images using the windows interface and the software automatically stitches them into a panorama.

How to use this program:

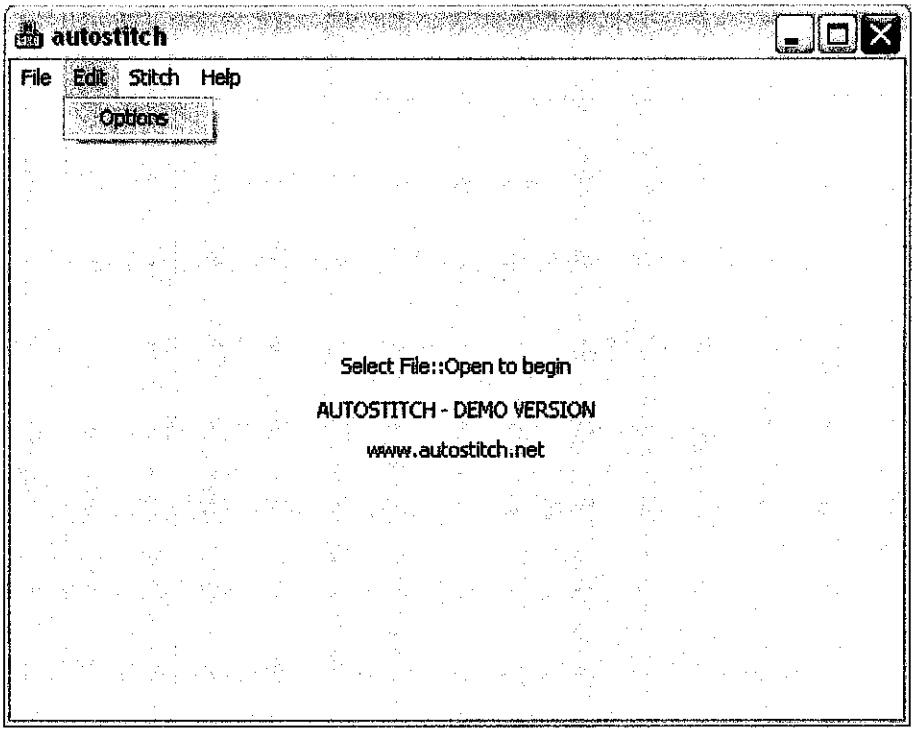
1. Run the program autostitch.exe.



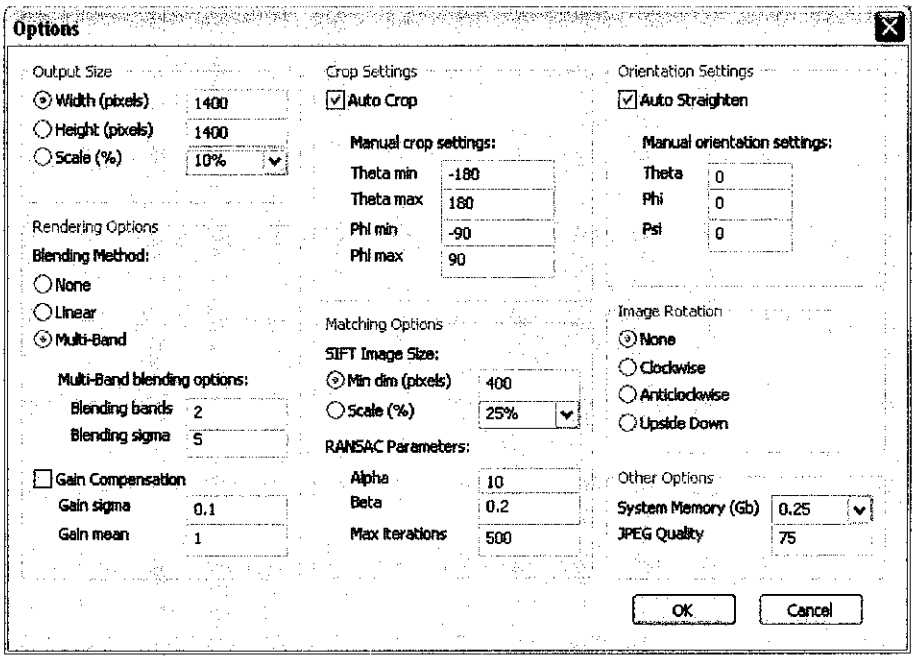
2. Select File->Open and select a set of images to be stitched. Currently, the input images must be in JPEG format.
3. The program will align the images, taking a few seconds per image.
4. The program outputs the file pano.jpg in the input directory. It also attempts to open the output panorama using the default image viewer.

If the image viewer command fails, then an error message will appear. Navigate to the directory of the input images and open the file pano.jpg to view the result.

Options:



Using Edit->Options you can set the following options:



1. *Output Size*

   You may specify the output size based on the desired output width, height or relative size compared to the input images. Be sure to check the radio button beside width, height or relative size appropriately.

2. *Blending Method*

   Select linear or multi-band blending. Multi-band blending is slower but gives better results.

3. *Gain Compensation*

   Selecting gain compensation causes AutoStitch to modify the brightness of the images so that they are consistent with each other. This causes dark images to become brighter and bright images to become darker. To amplify the effect, increase the value of gain sigma. Note that this can cause saturation. If this occurs try decreasing the gain sigma or gain mean.

4. *Crop Settings*

   You can specify the rendering range in terms of angles theta (longitude) and phi (latitude). AutoCrop selects these ranges automatically. Make sure AutoCrop is not selected if you wish to set the ranges manually.

5. *Matching Options*

   You can specify the size of the images for SIFT feature extraction and some parameters for the RANSAC algorithm here. If images fail to match, try decreasing alpha and beta, and increasing the SIFT image size. If incorrect matches are found, try increasing alpha and beta.

6. *Orientation Settings*

   AutoStraighten uses a heuristic method to straighten out wavy panoramas. The manual orientation settings allow you to specify extra rotations for the panorama e.g. to centre it.

7. *Image Rotation*

   If the input images are rotated, select the rotation of the input images here.

8. *Other Options*

   Choose a JPEG quality setting in the range 75-100. Setting the System Memory allows the program to allocate resources more efficiently. If you get an "Out of Memory" message, try decreasing the System Memory.

Appendix F: GoCubic Walkthrough

GoCubic is a simple application that converts six cube faces images into a cubic QuickTime VR movie. To input cube faces, they need to be named sequentially, such as:

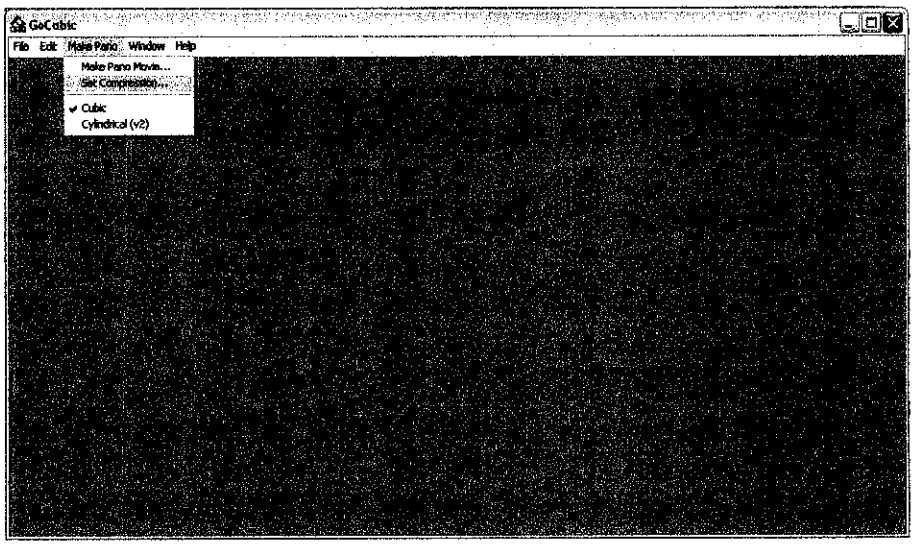
1. cubeface1.bmp
2. cubeface2.bmp
3. cubeface3.bmp
4. cubeface4.bmp
5. cubeface5.bmp
6. cubeface6.bmp

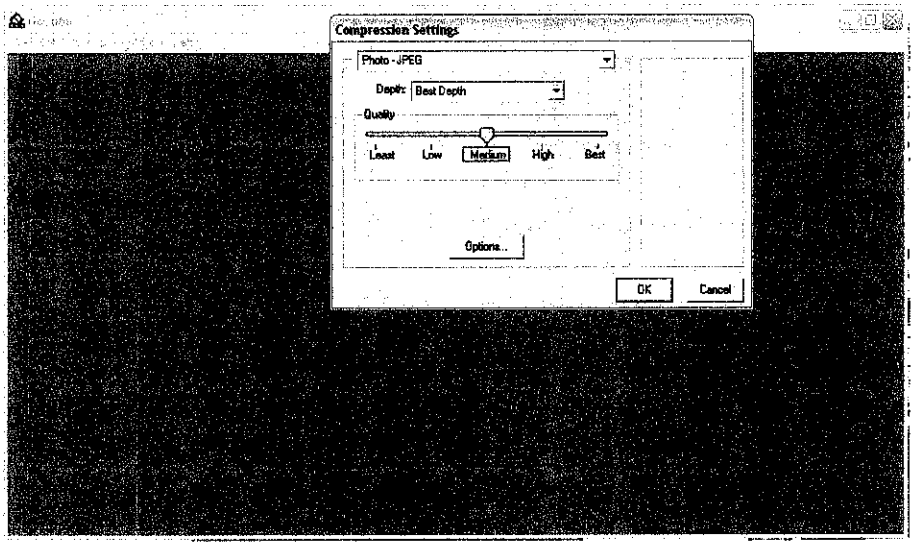
The order of the faces is Front, Right, Back, Left, Top, Bottom, with Top and Bottom oriented so they line up with Front (as if you tilted the camera).

To create a cubic QuickTime VR movie:

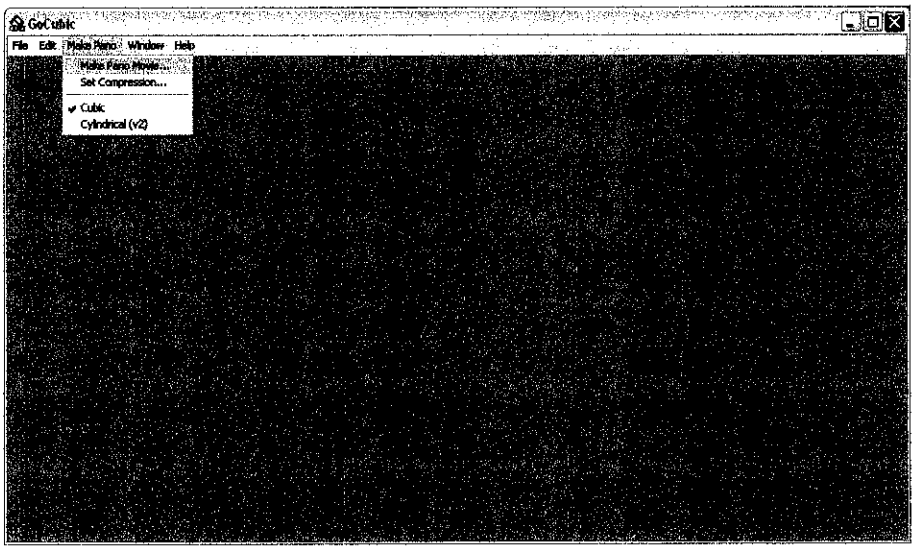
1. Launch GoCubic.exe.

2. Under Make Pano, select Set Compression to configure your output format and level of compression. (Photo-JPEG is the standard for QTVR).





3. Under Make Pano, select Make Pano Movie.



4. Browse to locate your 6 cube faces, and select the first image file from your sequence. (ex. cubeface1.bmp)
5. GoCubic will automatically interpret the remaining 5 faces.
6. Set the destination location of the output cubic QuickTime VR movie (default.mov)
7. GoCubic will display the six cube faces as it imports them, and when complete, it will display the finished movie.

GoCubic can import any image file format that QuickTime can import, but in general it is suggested that a non-compressed format such as PICT, BMP, PSD, PNG, or TIF is used for your source cube face images. Panotools is the best software for creating the cube faces from other panoramic formats. In the sample files we have included a panotools script for generating the cube faces from an equirectangular source image.

The FOV, Tilt, Pan, and viewer window size parameters are hardwired into GoCubic. The default window size is 480 x 320. Default zoom is 60 degrees; zoom range is 5 to 120 degrees. Tilt limits are +-90 degrees; there are no pan limits. Default pan/tilt is 0, 0.

FOV, Tilt, Pan, and window viewer size parameters cannot be customized in GoCubic.

To create a cylindrical panorama, select Cylindrical from the Make Pano menu and choose a cylindrical panoramic image as your source image. The source image should be in normal, horizontal orientation, not sideways as was required in earlier versions of VRMakePano. The image dimensions, both horizontal and vertical, need to be divisible by 4.

GoCubic is a modified version of Apple's VRMakePano and MakeCubicPPC utilities, compiled for Windows. Using some code kindly provided by Ken Turkowski of Apple, we were able to put together a version that takes in six cube face images and exports a cubic QTVR movie. The only added feature is a standard QuickTime image-compression dialog so you can choose your codec and compression level. The hotspot features are disabled in this version, but a fast start preview is generated automatically as part of the cubic movie.