Faculty of Computer Science & Information Technology
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WXES 3182

Interactive Interior Design

Prepared by
EE HOOI FONG
WEK 990225 (MIS)

WWES 3182 Project Report
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Under the supervision of Puan Norizan Mohd. Yasin and
moderation of Mr. Ali Fauzi Ahmad Khan

Dedicated to my dearest mother, Lian
and my beloved sister, Helen.

Contents

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Abstract

Interactive Interior Design is a website that uses Internet as a marketing tool. Interactive Interior Design is aimed to introduce the technology of interactive web site and interactive computer graphics in interior design industry to the Internet community of Malaysia.

Interactive Interior Design is divided into five main pages, About, Demos, Articles, Links, and Contact Us. The About page provides user information about interior design, the company profile, and the fee schedule. The Demos page focuses in providing 'live' video tour, Click & Change, and floor plan presentation to user interactively. The Articles and Links pages provide user information about interior design news and related web sites. The Contact Us page allows user to contact the company for further communication.

Chapter 1 is the Introduction and Chapter 2 is the Literature Review. Interactive Interior Design is developed on a Windows platform. The tools used are Microsoft FrontPage 2000, Macromedia Flash 5 and Adobe Photoshop 6 as explained in Chapter 3. Chapter 4 explained the system development methodology. Chapter 5 described the system design and Chapter 6 explained the system development and testing. Chapter 7 evaluated the system with its pros and cons.

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Chapter 1

Introduction

1.1 Introduction to Interactive Interior Design

Interactive Interior Design is a commercial web site that uses the Internet as a marketing tool. This web site will be developed interactively and informatively to inform users about what interior design is using computer and Internet technology. Through this web site, users can look for what they want, when they want, and how they want about the local (Malaysia) interior design industry. This will utilize the interactive multimedia web page technology.

1.1.1 The Traditional Method

Occasionally, if someone is interesting in doing interior design for their resident, they have to contact an interior design firm or an interior designer and have a face-to-face interaction to learn more about interior design. Sometimes, to find a suitable design for their home, people may need to interview several designing firms or designers. These face-to-face interactions may cause problems to the modern people nowadays who always rushing for time.

Traditional interior design firms market or promote their services through their marketing staff. This traditional way is non-productive because the number of people that get to know your service is very little. Aware of the growth of Internet, many local interior design firms have created their own web site to market and promote their services. The number of existing interior design web sites in Malaysia is very much fewer compare to other category of web sites. All of them were designed statically. They give information in a way that not sophisticated enough to attract user to stay on longer or revisit their web sites. The technology used in designing the web pages is behind the global information technology growth, only common Internet programming languages or technologies are used.

1.1.2 Project Definition

The Interactive Interior Design is aimed to solve the problems that are faced by the traditional method. Interactive Interior Design is a web site that provides user information about interior design industry interactively and more enjoyable. Interactive Interior Design also provide competitive advantages to the company in the market. Interactive Interior Design has five main pages, which are:

- **About**

  This page gives user information about what are interior design, the company profile, and the fee schedule.

- **Demos**

  This page allows user to learn more about interior design in an interactive way. User is able to get a video tour through this page. User is also able to create their own sample of interior design according to their personal interest in this page.

- **Articles**

  This page gives user information or articles about the latest news in interior design industry.

- **Links**

  This page provides links to other web sites related to interior design. Web sites about decorative item, furniture, wallpaper, paint, etc.

- **Contact Us**

  This page provides user the opportunity to contact the company for further inquiry or information. The telephone number, e-mail address, and address of the company will be provided.

1.2 Project Objectives

- Create an interactive interior design web site.
- Provide basic information about interior design.
- Improve the web page designing technology in Malaysia.
- Attract user to stay on longer and revisit the web site.

1.3 Project Scope

1.3.1 Interior design

Interior design specialties can be divided into two main categories, which are residential and commercial. The commercial specialty has sevens sub-specialties, which are entertainment, facilities management, government or institutional, healthcare, hospitality or restaurant, office, and retail or store planning. This project focuses on the residential interior design. Residential interior design focuses on the planning and or specifying of interior materials and products used in private residences.

1.3.2 User

Users are any users that access the web page of the Interactive Interior Design. However, the potential users are those who have the initiative to purchase the services provided.

1.4 Project Motivation

With the rapid growth of the information technology sector, many new dimensions can be opened because of computers, same as for interior design industry. With the growing number of online users, surely Internet is a potential tool to market and promoting company services. With the large number of web sites that are available in the Internet, an interactive web site is a requirement for the company to stay competitive in the market.

Research has shown that users will tend to stay in a site longer that offers them more of what they want to see. People tend to come back to sites where they know they will find new information. Interactive web site will allows user to browse at their own personal interest and makes browsing web site more enjoyable.

The Interactive Interior Design promises a different approach in presenting the interactive computer graphics of an interior design project and the interactive way to let users learn more about interior design.

1.5 Expected Outcome

The expected outcome of this project is a viewable web site of Interactive Interior Design. The web site should be able to achieve all the objectives set and there may be enhancement to be done in the future so that the web site can include more features.

1.6 Summary

This chapter explains the overview of the project definition for Interactive Interior Design. Interactive Interior Design is a web site that provides information about the interior design industry of Malaysia. The technology implemented included online video clips and animation presentation. It also defines the motivation and objectives to develop due to requirements and market needs. The scope of the interior design and the target user also covered in this section.

Chapter 2

Literature Review

The literature review stage is to gather as much information that is relevant and used the information to derive a solution for developing the project. The research done includes what is interior design, the Internet, World Wide Web (WWW), interactivity definition, the concept of multimedia, what is interactive multimedia, video on the web, 3D computer graphics, programming languages, development tools and related web sites.

2.1 What Is Interior Design

Interior design is the total creative solution for a programmed interior. It encompasses the conceptual planning, aesthetic and technical solutions applied to achieve the desired result. By "programmed interior" is meant a specific intended purpose or use of the built environment.

Interior design concerns itself with more than just the visual or ambient enhancement of an interior space, it seeks to optimize and harmonize the uses to which the built environment will be put. Thus, in the words of the U.S. Bureau of Labor Statistics, it is "practical, aesthetic and conducive to intended purposes, such as raising productivity, selling merchandise, or improving life style."

Many factors come into play in formulating the design solution. There is the space itself-its dimensions and construction-with its potential and its limitations. There is how the space will be used-for work or leisure, entertainment or worship, healing or learning. There is the meaning of the space, what it signifies, be it power, authority, security, wisdom, achievement, playfulness or serenity. There are practical considerations, like ease of access, amount of light, acoustics, seating and places to store or set things down. There are health and safety considerations, attention to special needs, and more.

The elements of design range from the visual (color, lighting, form) to the tactile (surface, shape, texture) to the auditory (noise, echo). The designer must have an aesthetic, practical and technical appreciation for these elements. He or she must understand how people use and respond to these elements, not just individually but as the elements interact with one another.

Designers must also be knowledgeable about the many types and characteristics of furnishings, accessories and ornaments used in creating interiors. Furniture, lighting, carpeting and floor covering, paint and wall covering, glass, wrought metal, fixtures, art and artifacts are just some of the many items and materials designers select from. In addition, they must be familiar with the various styles and history of styles of design, art and architecture.

2.2 Internet

According to the technical paper for Internet Standard [24], the RFC 1310, Internet is defined as a loosely organized international collaboration of autonomous, interconnected network that supports host-to-host communications through voluntary adherence to open protocols and procedures. The Internet originated by the US Department of Defense and it was called the ARPANET. The ARPANET was then designed to support military research and network a function that enables networks to continue its function even though one or more computers system is eliminated due to attacks from enemy.

The Internet actually means:

- Information Source

  The interconnectivity of computers allows a lot of information available. Many web sites are written to enable the free flow of information to users all over the world.

- Communications

  Communications through a computer is able and many ideas can be exchanged using this method. The Internet also allows easy communications between people all over the world, as long as they are connected.

- Community

  The people that are behind this information are those who created it. The Internet allows the ease to create web sites that enable users to exchange more information.

Unlike online services, which one centrally controlled, the Internet is decentralized by design. Each Internet compute, called a host, is independent. Its operators can choose which Internet services to use and which local services to make available to the global Internet community. Remarkably, this anarchy by design works exceedingly well.

In the Internet community, many services are available such as the World Wide Web (WWW), USENET, FTP, Telnet, and Gopher. Among these services, the most popular service is the WWW.

2.3 WWW (World Wide Web)

The WWW (World Wide Web) allows computer user to locate and view multimedia-based documents on almost any subject. Even though the Internet was developed more than three decades ago, the introduction of the WWW was a relatively recent event.

The Internet and the WWW will surely be listed among the most important and profound creations of humankind. In the past, most computer applications ran on "stand-alone" computers. Today's applications can be written to communicate among the world's hundreds of millions of computers. The Internet mixes computing and communications technologies. It makes human's work easier. It makes information instantly and conveniently accessible worldwide. It makes it possible for individuals and small businesses to get worldwide exposure. It is changing the nature of the way business is done. People can search for the best prices on virtually any product or service. Special-interest communities can stay in touch with one another. Researchers can be made instantly aware of the latest breakthroughs worldwide.

2.4 Interactivity Definition

Interactivity is the property of any medium that responds dynamically to user control. Interactivity reduces the time of information retrieval. This is because the longer the arrival of information increased the level of curiosity and leads to user dissatisfaction. Interactivity will help in shorter the time between the request and the respond, the more satisfying the process, the greater the likelihood the information will be retained.

Whatever the guise of computer, computer-driven versions of traditional media are collectively called interactive media. Audio, video or animation that linked to the text, are often called multimedia.

Type of interactive:

1. Look things up for more information
2. Navigate (example: "Please turn to page...")
3. Link words to other words
4. Remember the previous section and able to return to the section
5. Play audio, video, and animation
6. Organize and present information according to a nonlinear structure

Computers greatly enhance the power of interactivity because computers give us the ability to interact with text, images, audio, and video in ways that improve the functionality of paper. Interactivity offers efficient access, storage, and constructively adds functionality with multimedia elements.

2.5 The Concept of Multimedia

In the technologically advanced computing world today, data communication becomes an issue, which cannot be overlooked. Ted Nelson, the author of the book "The Hypertext" has coined the term 'hypertext', which refers to the linking of associated data for easy access or 'hypermedia' when any type of media form can be linked.

Media forms are voice, video, text, animations etc and the simultaneous use of data in different media forms is called multimedia. Digital video and audio media are the most demanding for the new media that are being adapted to the repertoire of computing and communications system.

The term multimedia computing commonly refers to the use of multimedia data types in computer applications and system, and multimedia communications denotes communications system, which support the real-time transmission of continuous media.

Multimedia communication can be viewed as consisting of linguistic and graphical acts that, appropriately coordinated can perform some communication goals such as describing an object, narrating a sequence of events or explaining how a complex process functions.

Multimedia is the process of integrating the various types of media such as full motion picture video, pictures, sound recordings, and text information or format or one package that can be assessed by the user in a variety of ways.

Ways in which user use multimedia for different type of application ranges from training system, corporate presentation programs, interactive information kiosks to retail CD-ROM. The multimedia package for this project will be presented in the form of web page.

2.6 What Is Interactive Multimedia

Interactive multimedia is a system that allows users to interact and at the same time learn with the information being presented as well as control what order and how it will be presented. In this way users are able to use the system at their own pace and based on their own personal interest.

Interactive Interior Design Web Site is bearing this characteristic. User can surf the web site whenever convenient. This include the information of interest that can be retrieved at any time as long as the user is logon to the Internet which voids the user to

start from the beginning at the information being presented. Hence, this interactivity makes interactive web site a powerful and fun technology thus surfing Internet becomes simply enjoyable.

2.7 Video On the Web

With the introduction of new technologies, the World Wide Web is now not limited with textual HTML pages and still graphics. Nowadays, sound, graphics and animation can be provided in a web page. However, there are many difficulties met for these to work. The main part for video to work effectively in a web page is the bandwidth of the Internet. Video clips on the Internet need to be small because downloading these files can take a long time, ranging from several minutes to hours. Providing the video online occasionally involve streaming. Streaming on the Internet would need to involve fast and accurate transmission.

One of the solutions to increase the speed of downloading time is video compression. Video compression must not be done excessively to avoid unnatural artifacts such as blocking. There are few formats of video compression and four of them is chosen to be researched.

2.7.1 AVI (Audio Video Interleave Format)

AVI stands for Audio Video Interleave. AVI is defined by Microsoft and is one of the most common audio/video data file format on a personal computer. AVI is a special case of RIFF (Resource Interchange File Format). This format was first developed to play videos in the Windows environment. The development of AVI format has led to the development of a vast variety of players, editors, and video captures in the format. One of the advantages of this format is the level of support that is available.

The extension foran AVI file is *filename.avi*. Athough AVI is aimed mainly on the Windows environment, players do exist on many other platforms including the Macintosh. AVI has a wide range of video qualities and can exist in 256 millions of color encoding as well as support sound or 5 kHz mono to CD quality sound. AVI can deliver video at ratios as low as 0.3 MB/sec. The quality of the AVI format actually depends on the preferences of the user.

However, AVI files are huge in size. The higher the quality needed, the bigger the size of the file. AVI files need to be encoded and decoded correctly or the graphics displayed will not be smooth. Because of the AVI has a lot of supportability, AVI can be converted into many other types of formats. This shows that AVI is quite flexible.

To allow streaming to be done across the Internet, Microsoft introduced the ASF format (formerly known as Active Stream Format, now known as Advanced Streaming Format). AVI can be easily converted to this file format. Then the ASF format can be used for streaming. One of the tools that can do this conversion is the Microsoft Netshow 2.0. ASF files can then be compressed using many different schemes.

The AVI files do have minimum requirements on the hardware in order to make the players run it properly. For an Intel based personal computer, a 386/33 processor and at least 4 MB of RAM is needed to maximize the performance of AVI, a video accelerator is preferred. Microsoft Windows has built in players that can play AVI files. Many development environments also have these players built in. For example, Microsoft Visual Basic has the Active Movie Control component that can be used to run AVI files.

As for video development, two main programs that can be used to creating and editing AVI files are the Premiere by Adobe and Digital Video Producer.

2.7.2 MPEG (Moving Pictures Expert Group Format)

MPEG (Moving Pictures Expert Group) is a new standard for streaming digital information. MPEG format is designed to be streamed over the Internet. MPEG format can be compressed. MPEG streaming is high in quality and it can be played as if the file is run locally on the hard drive, unlike most formats that actually need all frames to be downloaded. MPEG supports a number of different layers and levels, depending on such factors as how many channels are transmitted (including audio) and the transmission speed of the medium the information is traveling across. The video information is compressed in a typical manner and then finally, the 'bit stream' is encoded so that it can be read and decoded a few frames at a time. Decoders utilize an algorithm, which uses previous frames and upcoming frames to encode the current frame. This process requires a lot of complex computations but it gives MPEG an edge over the older formats.

The file extension for a MPEG file is *filename.mpg* or *filename.mpeg* or *filename.mpv*. The pros about MPEG ishat practically all major platforms have decoders available. Encoders are also available, but are less developed. The quality achieved of a MPEG file is good relatively compared to the size of file. Since streaming is already possible, provided bandwidth and players are available. The cons of MPEG format is that the process of encoding and decoding MPEG uses a lots of CPU work and system resources. Since MPEG audio is not part of the video format, some decoders that do not support synchronization do not support audio.

MPEG format does not have much conversion capabilities. Only the Sparkle player in the Macintosh platform changes MPEG to QT and vice-versa to maximize the performance of MPEG, a built in MPEG compression and decompression is used so that the CPU load is taken off. There are many viewers available in the market that plays movie in MPEG format. A lots of users prefer the Vmpeg software or the Xing Technology encoders.

MPEG has a family of standards, which is used for coding audio-visual information. They are the MPEG – 1, MPEG – 2, MPEG – 4, and MPEG – 7.

- **MPEG – 1**

  This format is used mainly for storage and retrieval of moving pictures and associated audio on storage media. MPEG – 1 defines a hybrid DCT/DPCM coding scheme. With motion compensation similar to the H.261 and CCIR Rec. 723 coding standards.

- **MPEG – 2**

  This format is a standard for Digital Television. The coding scheme used in MPEG – 2 is generic and similar to the one of MPEG – 1, however further refinements and special consideration of interlaced sources. More functionality such as "scalability" is introduced.

- **MPEG – 4**

  This format is the standard for multimedia applications. The idea was to standardize algorithms and tools for coding and flexible representation of audio-visual data to meet the challenges of future multimedia applications.

- **MPEG – 7**

  The MPEG – 7 is a content representation of information search. This format is still under development.

2.7.3 QT (QuickTime Movie Format)

QuickTime Movie format is a digital format developed and supported primarily by Apple computers. It was one of the very first digital video formats for the personal computer and it is widely available. There is little difference between QT format and the AVI format. Both are quite similar in terms of strategies used or compression and decompression of video information. As for popularity, QT is more popular because there were many pioneers in digital video that started out with this format. QT movie format is not limited to the Macintosh and practically viewable on any platform.

The file extension is *filename.movie* or *filename.qt*. The QT format has excellent movie quality that has millions of color per screen and the sound is of CD quality. In a Macintosh, the QT format can be edited easily because the system supports it directly. QT format has excellent compression capabilities. The format is flexible in a sense that compression is available between sound and video quality to reduce the file size. Same as the AVI, QT has a large number of supports in editing, viewing, and video capture.

For the quality achieved, QT files need to be huge. The cons on the QT format is that decompression process takes in the support from software drivers to the installation. Installation of QT player in a Windows environment will require a number of drivers for the system. QT is one of the major formats that can be converted to other formats available. In addition, sound and graphics can be converted to and from QT using appropriate software. Some of the main players available or playing the QT format are the QuickTime for Windows and the QuickTime Plug-in or Netscape Navigator.

2.7.4 Real Media Format

Real Media format is developed by Real Networks. Real Networks develops software products and services that are designed to enable user of personal computer and other electronic devices to send and receive audio, video, and other multimedia services using the web. Real Networks provides the Real Player that is used for both streaming videos and audios over the Internet. The Real Audio is used mainly to receive and play music that is available on many cannels provided over the Internet such as the Hot FM in Germany and the CBC Radio One in the United State.

Real Media allows viewing the file as it arrived at the user's computer, eliminating the need to download the file completely before viewing. Real Media format is especially useful for computer with slow Internet connections, such as a 28.8 modem. Video playback is slower (3 – 6 frames per second) and may be affected by Internet traffic. The file extension is *filename.rm*. The pros of the Real Media format is that this format has a high compression ratio, making the video files for a long duration can be compressed into a relatively small file. The quality needed can also be compromised according to preferences. The cons of this format is that it is poor in quality and does not deliver information accurately. This format can run on the Macintosh or the Windows platform using suitable players from each platform.

The available players for this format are players that are developed by Real Networks, which is the RealPlayer version X. As for movie development, Real Networks has developed the Real Producer to edit and create Real Media files.

Below is a table of comparison for the format of videos that has been researched. Analysis is done on each video file.

Format	Name	File ext.	Pros	Cons	Players	Platforms
MPEG	Moving Pictures Expert Group	*.mpeg	It is high in quality and in streamed version.	Needs a lot of system resources.	Xing Technology	Windows, Macintosh ,and more.
AVI	Audio Video Interleave	*.avi	High quality and has a wide range of quality.	The file produced is big.	Windows Media Player	Most major platforms.
QT Movie	QuickTime Format	*.qt, *.mov, *.movie	High quality and has extensive support.	Needs drivers installed.	QuickTime Player	Macintosh ,Windows
Real Media	Real Media Format	*.rm	High compression and is a very popular streaming format.	Poor quality.	Real Player and Real Producer	Windows, Macintosh

Table 2.1 Comparison for Formats of Video

2.8 3D Computer Graphics

2.8.1 Representation

This is (roughly) how an object is built up:

1. In 3D Graphics, an object is first defined by its edges (points) in a three-dimensional x-y-z space.
2. When those points a are linked together by lines we get a wire frame rendering of an object.
3. After the frame has been created, a surface or skin is applied to the object. The surface can have many qualities: color, texture, shininess, reflectivity, etc.
4. Finally, objects either are lit or emit light. Most objects have been lit by a light source and must be shaded. Shading is the most computer intensive task.

All surfaces can be represented as a set of polygons (that are perfectly flat). Complex Polygons are always split up into triangles by the rendering machine.

Polygons have only one side, the so-called ``normal" or outside. Therefore, in VRML even flat objects (such as a sheet of paper) are always represented (as very flat) cubes. A cube is composed of 12 polygons (2 triangles for each side) with their ``normals" outside.

2.8.2 Position and Orientation

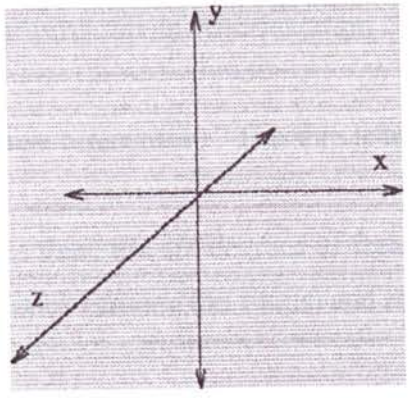
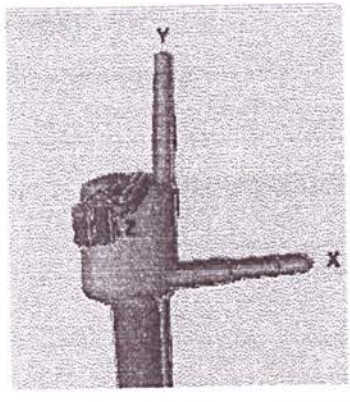


Figure 2.1 The 3 Axis of 3-D Graphics

Positions in space are given in x-y-z coordinates:

- Width (x axis) or left (-) / right (+)
- Height (y axis) or down (-) / up (+)
- Depth (z axis) or far (-) / close (+)

Try to remember the image in this figure:



Orientation of an object is defined by ``yaw", ``pitch" and ``roll" (Imagine what a ship can do):

- Yaw is left-right orientation. Imagine turning your head or your body around to look at something. ``The ship can't hold its track."
- Pitch is backwards-forwards up/down orientation. ``The ship goes straight into big waves."
- Roll is left-right up/down orientation. ``The ship is hit on the side by big waves."

Therefore, in 3-D graphics there are six degrees of freedom: three positions (x, y, z) plus yaw (around the y axis), pitch (around the x axis) and roll (around the z axis)

2.8.3 Lights

There are different sorts of lights and by definition VRML browsers have some ambient light source:

1. Point Lights
    a. Full point lights
    b. Parallel point lights

2. Directional Lights have:
    a. A location (x-y-z axis)
    b. An orientation (yaw-pitch-roll)

Spotlights have an umbra (i.e. a focus expressed in terms of width and how it widens).

2.9 VRML (Virtual Reality Modeling Language)

The Virtual Reality Modeling Language (VRML) can been seen as a 3-D visual extension of the WWW. People can navigate through 3-D space and click on objects representing URLs (including other VRML worlds). Often, VRML is pronounced like ``Vermal", not ``V-R-M-L".

As Mark Pesce [Pesce, 1995, p. 16] points out, the WWW had two fundamental dimensions: connectivity (the http protocol) and interface (i.e. the rendering of content, especially HTML and embedded URLS). VRML inserts itself seamlessly in the Web's connectivity. VRML browsers can access other VRML files via an URL. They can access any other format that then is passed to another application (e.g. an HTML browser or a HTML window). On the other hand, HTML browsers can be configured to fire up VRML helper applications (or plug-ins). HTTP servers, finally, can be configured to tell the client that a VRML (*.wrl) document is transferred.

Different VRML browsers have a different user interface (e.g. for navigation and object examination). They also render things a bit differently. Most will also give user a ``quality" choice (e.g. faster rendering and lower quality vs. slower rendering but better quality. Just assume that the user can move himself though 3D space by moving a camera through the space (and therefore what he sees on the display is what sees ``his" camera).

2.9.1 Producing VRML

There are three (major) ways for producing VRML:

1. Code VRML by hand using VRML assisting editor like emacs.
2. Use a VRML supporting Modeler. There are two types of needed tools:
    a. An object creation tool

b. A space (or ``walk thru") creation tool such as Cosmos' (ex-Paragraph's) Home Space Builder (the non-profit versions are cheap) or Virtus' Walkthrough Pro.

3. Use a Filter to transform other 3D Formats into VRML.

2.9.2 Browsers and how to use them

Which browser?

Navigation:

VRML browsers do not have all the same functionalities and they do not have the same interface. The most common navigation means are:

1. Walk (6 degrees of freedom)
2. ``Plane" Walk: restricted walk in in x-y or x-y-z axis, heads up/down in y-z axis, etc.
3. Flight: start/stop flying and accelerate/decelerate.
4. ``Point at" (or ``Seek"). Jumping to an object or selecting on with a harpoon and get closer in several steps
5. ``Examine'' mode is special. It can be used to examine (rotate and zoom) either the whole scene or a selected object (or both). An example is Web space's Examine Mode/ Rotation Globe.

Browsers ideally should have a ``map view" Builder, i.e. show the user where he is on a map (2D) or within wire-frame map (3D) of the whole scene.

2.9.3 Help I am Lost

Do not worry, most VRML scenes can bring you back to the entry point. Search for something like: ``Restore Viewpoint", ``Entry View" etc. under ``View(s)" menus. Else, reload the page and next time, do not walk too fast!

2.9.4 Quality (Speed) of Viewing

Quality of rendering and speed has to with the way in which objects are rendered. ``Wire frame" rendering is very fast, Phong Shading can be quite slow depending on the complexity of the object.

1. Wire frame (fastest)
2. Solid (Flat?) Shading: The whole object gets the same shading depending on its angle (fast).
3. Smooth (Gouraud) Shading (slower): Each polygon is shaded differently
4. Phong Shading (very slow): Polygons corners are shaded too.
5. Ray Tracing (impossibly slow on usual end-user's machines): Every point has different shading.

Note that some browsers (e.g. VrWave) allow you to specify the display type both for viewing (camera stopped) and moving (you move or turn objects around).

2.10 3D Studio MAX

3D Studio MAX is a very complex program that has been packaged in a powerful and elegant, but easy-to-use interface. 3D Studio MAX 3 provides an improved workflow over previous versions of MAX. Below are the things that have changed from earlier versions of MAX.

- Object-oriented behavior

  Because of 3DS MAX being an object-oriented program, only operations that are valid for the selected object are active. Other operations become inactive or hidden in the interface.

- Parametric objects

  Because parametric objects provide considerable modeling and animation options, user will want to preserve an object's parametric definition as long as possible (except for polygonal modelers). Operations that discard parameters include attaching objects using one of the Edit modifiers, collapsing an object's modifier stack, and exporting objects to a different file format.

- Modifiers versus space warps

  Identical effects can be implemented as both modifiers and space warps. Modifiers are directly applied to the object and do not change as the object moves around the scene. Space warps, on the other hand, exist as independent objects to which other objects are bound. The effect of a warp changes as a bound object moves through a scene. Use modifiers to apply an effect directly to an object. Use space warps to simulate environmental effects or external forces.

- Changing object parameters versus transforming objects

  Change object parameters whenever user want make a modeling change or a change that will be picked up by any modifiers. Transform an object when the transform effect is the last change user want to apply, or when the change is being used to affect the location of the object in scene.

- Material mapping

  When assigning a material with maps as part of its definition, mapping coordinates must be applied. MAX objects with a Generate Mapping Coordinates parameter will automatically turn on at rendering time if they are off. All other objects must have a UVW Map modifier applied.

The overall workflow of MAX can be broken down into the following categories:

1. Object creation
2. Object transforms
3. Modifying objects
4. Viewing the scene
5. Materials
6. Animating objects
7. Rendering the scene or animation
8. Adding special effects

- Object creation

  At this stage, user can use any of the wide variety of tools available in MAX to create the objects they want in the scene. These can range from primitives, to mesh models, to patches, to NURBS, to particle systems, and a whole lot more. After the object has been created, user can opt to either transform or modify the object.

- Object transforms

  Transforming an object is simply the process of moving, rotating, or scaling the object in 3D space.

- Modifying objects

  Modifying an object, on the other hand, involves adding one or more "modifiers" to he object to create different effects and change the object into a different form. Other modifiers include utility type modifiers such as UVW Mapping, which is required to control the placement of mapped materials on the object.

- Viewing the scene

  Once most or all of the objects for the scene have been created and correctly transformed and modified them, user need to create a camera through which they can view the scene. Camera in MAX is very similar to real-worlds cameras in that they have lens lengths and create true perspective views of the scene. The second part of viewing the scene includes adding lighting to the scene so that user can properly illuminate the objects.

- Materials

  After setting up the cameras and lights, user creates materials in the Material Editor and applies them to objects in the scene. Through the MAX Materials Editor, user can load prebuilt materials or create their own through a huge variety of material as types, shaders, and maps. For the creation of still images, the workflow is just about done, except for rendering. Nevertheless, for animating objects, there are at least two more steps.

- Animating objects

  MAX provides a variety of methods to animate objects or even just the parameters of objects. To help with the editing of animations, MAX provides a TrackView window that enables user to edit animation keys over a timeline and fine-tune the animations.

- Rendering the scene or animation and adding special effects

  After creating animation, the last thing user might add to their scene is special rendering effects such as lens effects. Common examples of lens effects include lens flares, glows, blurring, and depth of field. Other types of effects include color correction, brightness, contrast, and even film grain. These effects are generally

included at the end of the process to add the necessary details to bring realism to the scene.

Once all the steps mentioned above have completed, all that is left to do is render the animation and save it to either a digital (quicktime or AVI) or an analog (VHS, Betacam SP) format. MAX provides a network of machines to process animations more quickly.

2.11 HTML (HyperText Markup Language)

HTML is a Standard Generalized Markup Language (SGML), Document Type Definition (DTD). An SGML document has three parts. The first part defines the character set to be used and tells which characters in that set distinguishes text from markup tags. Markup tags specify how the viewer application, or browser, should present the text to the user. The second part of an SGML document specifies the document type and states which markup tags are legal. The third part of an SGML document, called the document instance, contains the actual text and markup tags.
Most HTML browsers assume a common definition about the character set used, and about which characters distinguish text from markup tags. They also generally agree about a core set of legal markup tags. They then diverge on which additional new markup tags to permit.

HyperText A hypertext link is a special word or phrase in a Web page that "points" to another Web page. When user clicks on one of these links, the browser transports them immediately to the other Web page. Because these hypertext links are really the distinguishing feature of the World Wide Web, Web pages are often known as hypertext documents. So HTML has the word "HyperText" in it because it is use to create these hypertext documents.

Markup is "detailed stylistic instructions typed into a text document that is to be published on the World Wide Web." That's HTML in a nutshell. It has a few simple codes for detailing things like making text bold or italic, creating bulleted lists, inserting graphics, and, of course, defining hypertext links. User needs just type these codes into the appropriate places in an ordinary text document and the World Wide Web automatically displays the page the way they want. In fact, the Web browser software handles all the hard stuff.

Language HTML has nothing to do with computer programming. Rather, HTML is a "language" in the sense that it has a small collection of two- and three-letter combinations and words that user use to specify styles such as bold and italic.

2.12 Microsoft FrontPage

Successful web pages are often huge undertakings. They need constant attention, maintenance and updating. They can also attract more attention if they are visually appealing. Many tools have appeared on the market to help the aspiring Web developer.

Many companies have written Web design software for nonprogrammers, making it easier for a wider range of people to establish a presence on the WWW. This software is also useful for programmers. However, to build complex web sites, these graphics-based editing programs should only serve as aids. They often disrupt indentation and insert unnecessary tags, making it difficult to code manually when necessary. They are no substitute for in-depth knowledge of HTML, but are quite useful for speeding up tasks such as coding large tables.

Microsoft FrontPage is the most popular of the graphics-based HTML editors. Microsoft FrontPage is a versatile tool worth a familiar interface similar to that of Microsoft Word. The short amount of time it takes to learn FrontPage is well worth the amount of effort it saves. It can insert text and font changes, and it can also create more complex HTML, such as for creating tables, forms, frames and much more. FrontPage is a WYSIWYG (What You See Is What You Get) display. Unlike editors that simply display HTML code, FrontPage renders HTML elements exactly as a browser would.

2.13 Scripting Languages

Scripting is another term for macro or batch file, a script is a list of commands that can be executed without user iteration. A script language is a simple programming language with which scripts can be written.

Client-side scripting is used mostly for the process of validation, interactivity, and enhancing the web page with ActiveX controls, DHTML, and applets. Validation is important for reducing the number of trips made to the server and to reduce the amount of work that the server has to perform. Client-side scripting is browser dependent, which means that the scripts must be supported by the browser or scripting host.

As for server-side scripts, since they reside in the server, programmers have better flexibility in generating codes especially codes that need to access the database. This is important because if scripting codes in the client-side will allow user to see the programming codes and algorithm, thus exposing the program to security threats.

Dynamic HTML is quite open in terms of the scripting languages that it supports. Future Web browser designers could use whatever scripting language is popular at that time and still reap all the benefits of Dynamic HTML.

Internet Explorer, however, includes two scripting languages that can be used with Dynamic HTML: JavaScript and VBScript. Netscape, on the other hand, only supports JavaScript. Therefore, for Netscape, the choice is easy to make.

There are many arguments for and against each scripting language. The commercial version of Visual Basic (the parent language of VBScript), for instance, is one of the best-selling programming environments of all time, and vast multitudes of programmers use it every day. Therefore, a huge pool of talent is best served by having a scripting version of Visual Basic available to them.

JavaScript, on the other hand, is currently the de facto scripting language of the Web because it is included in Netscape Navigator 2.0 and higher and IE 3.0. Whereas more programmers know Visual Basic, more Web programmers know JavaScript. Moreover, VBScript is currently available only in IE.
Because VBScript is only available in IE and Web developers want to support the broadest number of browsers, JavaScript is used much more often.

2.14 Survey Done on Other Sites

There were not that many sites on interior design industry on the Internet. The number of foreigner web sites is larger compare to Malaysian web sites. Even the technology used on foreigner web sites is very much greater than local web site. The foreigner web sites are designed more dynamically compare to local web sites. Nevertheless, the use of 3D computer graphics technology for neither foreigner nor local was not popular and common.

The survey had been done on a few sites and only two of these sites will be analyzed because of their features that are very much similar to the requirements. These sites are discussed below:

Site 1

Site Name	: Marc Newson
URL	: http://www.marc-newson.com
Description	: This foreigner web site provides information about interior design according to category.
Important Features	: Implemented Macromedia Flash and Java Applet technologies.
Weakness	: Needs special plug-in and loading time for animation effects.
Tools Used	: Macromedia Flash, Java Applet - Animation

Analysis

From the survey done on this site, the Marc Newson site is the best site and the most suitable site to be referenced for the development of Interactive Interior Design. The site is designed interactively and impressively. Although the information provided is not detail enough. As for the scope of residential interior design, this site was not the best to be referred to due to it only provides commercial interior design.

Site 2

Site Name	: Malaysian Living
URL	: http://www.malaysianliving.com
Description	: A Malaysian interior design web site that provides information about local interior design industry.
Important Features	: Impressive 'look and feel' web site and detail information.
Weakness	: Lack of interactivity.
Tools Used	: ASP (Active Server Pages), CSS (Cascading Style Sheet), and JavaScript.

Analysis

From the survey done on this site, the Malaysian Living.com is the awards winner of Catcha and Cari. Among the local web sites on interior design, the Malaysian Living.com undoubtly has the better approach of web page designing. This site provides well-organized information about local interior design industry and its related news. The 'look and feel' of this site is impressive compare to other sites. This site is the best site to be referred as for the scope of residential interior design. Nevertheless, this site could not give user a 'live' presentation of what is interior design. The used of 3D computer graphics technology is none, same as to other Malaysians web sites.

2.15 Summary

This chapter explains the researches that have been done to develop the system. Research has been done on some concepts. Researches also have been done on some programming language, development tools, and existing web sites. These researches were done to get clear understanding of the related concepts. Besides that, researches were done to compare and analyzed the advantages and disadvantages of some programming languages, development tools, and existing web sites due to the requirements of the system to be developed.

To build an Interactive Interior Design, some basic and important concepts must be well defined and understood. The concepts mentioned are what is interior design, Internet, World Wide Web, interactivity definition, the concept of multimedia, what is interactive multimedia, video on the web, and 3D computer graphics.

To develop a 3D computer graphics, there are few programming languages available. VRML (Virtual Reality Modeling Language) and 3D Studio MAX are discussed in this chapter to compare which of them is more suitable to build this project.

Some Internet programming languages are needed to build an interactive and dynamic web site. Programming languages that are discussed in this chapter include the HTML (HyperText Markup Language) and scripting languages.

Survey has been done on the existing web site on the Internet. These web sites have been analyzed, but only two of them are discussed in detail. The analysis of the survey is done according to two categories, which are the foreigner web sites and the local, Malaysian web sites. Survey was done to their information content, features, and technology used.

Chapter 3

System Analysis

This chapter focuses in the aspect of analyzing the information obtained so that it can be incorporated into the system. System analysis is the process of understanding broader aspects of the system that would be required to solve problem. The overall emphasis is to gather information obtained and use this information to consider other alternatives possible before concluding the best solution for the system, the analysis is done first to obtain requirements for the system, then methodology is included at the next chapter to see how the project will be develop.

3.1 Requirements Analysis

The Requirements Engineering included a stage called the Requirements Analysis that is a process of establishing the services the system should provide and the constraints under which it must operate for the requirements analysis, the analysis is done mostly through observation of existing system and the analysis done of existing web sites. These requirements can be divided into 3, which are functional requirements, non-functional requirements, and run-time requirements.

3.1.1 Functional Requirements

Functional requirements are statements of services that the system should provide and how the system should react to particular inputs and how it should behave in particular situations. Generally, the five main functional requirements of the system are:

- Enable user to browse every page of the web site according to their personal interest.
- Enable user to keep tack of their position on the web site.
- Enable user to learn more about interior design.
- Enable user to view a video clip and multimedia presentation.
- Enable user to change the color and pattern of a room.

Below are the specific functional requirements according to the pages:

- ***Home Page***
  - Provides user a 'starting-point' to browse the web site.
  - Provides user a linkable menu of the pages in the web site.
  - Enable user to browse from one page to another page randomly according to user's personal interest.
  - Provides effective and efficiency connective between all the pages in the web site.

- ***About***
  - Provides user information about interior design in general.
  - Provides user a linkable menu of the pages in the web site.
    - Interior Design
      - Provides user information about interior design in details.
      - Allows user to learn about the concepts of interior design with well-organized information.
    - *Company Profile*
      - Provides user information about a local interior design firm
    - *Fee Schedule*
      - Provides user information about the charges of the design services.

- *Demos*
  - Provides user few examples of demos to allow user learns more about interior design practically.
  - Introduce to user the interactive computer technology of web designing.
    - *Video tour*
      - Enable user to view a video clip.
      - Provides user few video clip of rooms to choose.

- *Click & Change*
    - Enable user to select an item in a room and change the color or pattern of it.
    - Provides user few item to change of, example likes wallpaper, curtain, cover, etc.
    - Provides color, textures, and pattern templates for user to choose.
    - Enable user to view the effect of the changes immediately.

- *Floor Plan*
    - Provides multimedia presentation to user on how to create a layout plan of a room.
    - Provides user few examples of presentation.

- ***Articles***
    - Provides user linkable articles on interior design.
    - Provides user linkable articles on the latest news on interior design.

- ***Links***
    - Provides user few linkable web site related to residential interior design.
    - Provides user web site that have specialty on particular designing item.

- ***Contact Us***
    - Provides user information on a few ways to contact the designing firm.
    - Enable user to send e-mail to the designing firm via Microsoft Outlook Express.

3.1.2 Non-Functional Requirements

Non-functional requirements are requirements that define the system properties and attributes of the system and the constraints under which the system functions.

- Effectiveness

  The system must allow user to access the system in a way that is congruent with their personal interest.

- Efficiency

  The system must be able to function in such a way that the respond time will be fast.

- User Friendliness

  User considerations by providing appropriate and useful information in an interactive way.

- Consistency

  The format for all the pages in the system is standardized.

3.1.3 Run-Time Requirements

The run-time requirements are requirements that have to do with the hardware and software needs that must be fulfilled in order to maximize the performance of the system.

Development Hardware Requirements

- IBM Compatible Computer
- Intel Pentium II 400 MHz Processor
- 192 MB SDRAM Memory
- 26.4 GB of Hard Drive (Quantum Fireball)
- SIS AGP Card
- Video Capture Device (Canon Ixus 300 Digital Camera)

Development Software Requirements

- Microsoft Windows Platform
- Microsoft FrontPage 2000
- Microsoft Internet Explorer 5.0 or Netscape 4.7x
- Macromedia Flash 5
- Adobe Photoshop 6
- ArcSoft VideoImpression (Video authoring software)

User Hardware Requirements

- A Intel Pentium II-equivalent or late processor at 233 MHz or higher
- At least 64 MB of RAM
- Network connection at least 28.8 kbps through modem

User Software Requirements

- Microsoft Windows Platform
- Internet Browser

3.2 Summary

This chapter discussed the Requirements Analysis of the system. Functional requirements of each page are discussed in details. Non-functional requirements and run-time requirements also covered in this chapter. After system requirements have been identified, tools are chosen. The next chapter explain why are the tools is chosen.

Chapter 4

System Development Methodology

This chapter focuses on system development methodology to see how the project will be developed. Tools and languages for development will be discussed and the determined for the development of the project.

4.1 System Development Methodology

As part of the methodology, the software process for development is vital in making sure that the system will be able to be developed in the time frame allocated in this course. There are some methodologies to develop a system. To name a few, there are:

- Waterfall Model
- V-Shape Model
- Spiral Model
- Incremental Model

4.1.1 V-Shape Model

This model is similar to waterfall model and the only different is that each test phase matches each development phase: requirements with system testing, high-level design with integration testing, and detailed design with unit testing. V-shape model is an improved version of Waterfall model. V-shape model does not run into the problem that the software is impossible to be tested because system, test, integration test, and unit test are planed ahead. For example, when we plan the requirements, we also plan for system testing. Therefore, when the system is built, we have a whole set of test cases for system testing. By the way, the system does meet user requirements.

4.1.2 Spiral Model

This model is using an interactive method. The model carefully takes risks into account. The designers develop a small part of the project and evaluate the risks. If the risk is low, designers keeps developing more features. Spiral model is heavily involved in

risk management. If designer have a project with a very high risks, the designer should use spiral model. Every iteration, designer has a chance to evaluate the risks and to forecast whether he project keeps going or stops. For each iteration, similar to incremental model stage, designer can use V-shape or Waterfall. Spiral model is usually used in the large project such as financial system, wireless cellular communication management system, network management system.

4.1.3 Incremental Model

This model needs the designer to develop the software in a number of stages and is able to deliver the product early. At each phase the designer have a goal to deliver certain feature to customer. Incremental model is good for fast delivering product to the market place. Incremental model has many advantages over the other techniques. One of the advantages is that the system can be developed at several stages. Each stage has its own requirement; usually it has certain features or core of the system. Each stage can use V-shape or Waterfall model to develop the requirement for this stage. Regardless what kind of model is used in each stage, the product with certain features must be done at the end of the stage. Incremental model satisfies the requirement of fast delivery to the market place, so business people are interested in this model.

4.1.4 Waterfall Model

The waterfall model is a model that is divided into a few distinguished stages, offering visibility of each process. Figure below shows the waterfall model. The model can be divided into six stages. There are:

1. Requirements Definition

   The system's services and constraints are established so that development can be done according to the needs of users.

2. System and Software Design

   This stage establishes the overall system architecture. The system design partitions the requirements into hardware or software.

3. Prototyping

   Prototyping is a process to come up with a rapid system for the purpose to validate the use requirements.

4. Implementation and Unit Testing

   The programs or components of the system are tested individually. Unit testing involves verifying that each unit meets the specification.

5. Integration and System Testing

   The units that were tested is then integrated and tested as a whole system. After testing, the software can be delivered to users.

6. Operation and Maintenance

   This is the part when the system that is put into use will have errors in it. Maintenance involves correcting these errors, which were not discovered earlier, and improvement to the system can be done.

The stages do actually overlap and feed information to each other. The software process in not linear but actually involves a sequence of iterations of the development activities until the final system is developed.

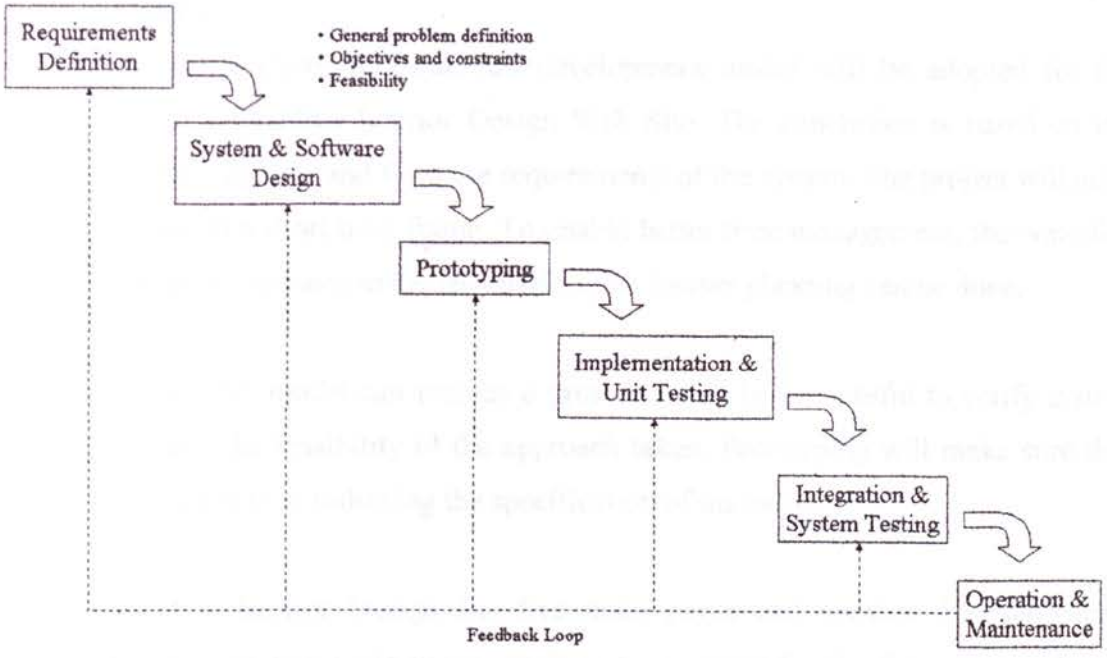


Figure 4.1 The Waterfall Model

From the analysis, the waterfall model does have its advantages and disadvantages. These factors have been compared to the requirements of the project. With the waterfall model, the processes are visible and each process has a deliverable and a milestone that marks the end of the stage. The model is flexible in a sense that iterations of the processes can be done until an adequate system is achieved. This model is also readily accepted by a lot organization. The problem with this model is that iterations of the processes make it difficult to identify checkpoints so that further planning can be done.

4.1.5 Conclusion

From the analysis, the waterfall development model will be adopted for the development of Interactive Interior Design Web Site. The conclusion is based on the observation from analysis and from the requirements of the system. The project will need to be developed in a short time frame. To enable better time management, the waterfall model will allow milestones to be delivered so that further planning can be done.

The waterfall model can include a prototype that is very useful to verify system requirements and the feasibility of the approach taken. Prototyping will make sure that development will still be following the specification of the users.

Interactive Interior Design has five main pages and another five sub-pages. Development for the five main pages needs to be separate for the first stage and only rejoin when five pages can run according to the requirements. With the Waterfall model, testing in each page can be easily done.

After all the pages have been linked, again process testing will test to see any error occur. Any requirement to improve the system will make the system to test again and check for new bugs. Again, this is one of the reasons why Waterfall model has been chosen.

4.2 Information Gathering

Information sought for this project from three resources, there are:

- Internet
- 'Bilik Dokumen' of FSKTM
- References Books

4.2.1 Internet

Now's a day, a lot of information is flooding in the cyberspace. To get the related information is easier than before. Nevertheless, due to the high capacity of related information that can be achieved on the Internet, getting the relevant information become harder. Therefore, a capable search engine is needed to solve the problem. Below is the list of search engines that have been used for information gathering:

- Ixquick (http://www.ixquick.com)
- Yahoo! (http://www.yahoo.com)
- BlueHyppo (http://www.bluehyppo.com)
- MSN Malaysia (http://www.msn.com.my)

The reasons to use search engine:

- Find out the existing web sites
- Find out the available software
- Find out the programming tools for development
- Find out the tutorials for programming languages
- Get help on the Internet from newsgroup and references

4.2.2 Bilik Dokumen

Information gathered from 'Bilik Dokumen' helped in finding the suitable methodology for system development. Documents in it also briefed the idea to develop a system.

4.2.3 Reference Books

Reference books that helped in information gathering are regards to Internet, WWW, HTML, and 3D Studio MAX.

4.3 Tools Chosen

4.3.1 Programming Language

Programming languages is the core of the system. Choosing the right language for development will allow better performance of the system.

- ***HTML (HyperText Markup Language)***

HTML is chosen because it is the programming that allows information on the Web to be displayed correctly in a browser. One big advantages of this language is that since it is written in ASCII characters, it works on multiple platforms. This means that a web page created on an IBM-compatible computer can be read and interpreted by a browser running on another platform, such as Macintosh.

An HTML tag generally consists of a beginning and end tag, both of which are placed in angle brackets. The end tag sports a slash ("/"). Example, <B>This is bold text.</B>. The text between the two tags will be displayed in bold in the browser.

Despite the long list of HTML tags for headers, paragraphs, justification, and so on, the language is relatively easy to learn, and a web page can be created by writing HTML code in an ordinary text editor. In the beginning, this is an exactly how most HTML author worked, since the WYSIWYG HTML editors available at the time generally produced incorrect HTML code. These days, many WYSIWYG HTML authoring applications that work quite reliably are available, like Microsoft FrontPage 2000 and Macromedia Dreamweaver.

HTML can do:

- Text formatting.
- Different font sizes for titles, headings, and such.
- Display Web prose as bold.
- Emphasize things with italics.
- Make text look like a typewriter produced it.
- Different font sizes for characters.
- Create a list
- Set up links to other pages
    - To another web pages in a same web site.
    - To a different location in the same web page. This is useful for humongous pages
    - To any page, anywhere on the Web.
- Insert images
- Create Table and format the content

- ***JavaScript***

JavaScript is chosen to be the client-side scripting because of both Internet Explorer and Netscape browsers support it. JavaScript is a scripting language that is written together with HTML in a web page. The JavaScript is designed for scripting tasks and only loosely based on the Java language. JavaScript is an interpreted programming language by Netscape. It is similar in many aspects with Microsoft's VBScript. JavaScript is embedded into the HTML page and is interpreted by the web browser. When incorporating JavaScript into an HTML document, the JavaScript code can appear in the <HEAD></HEAD> section and the <BODY></BODY> section. JavaScript code that appears in the <BODY></BODY> section is called inline scripting code. Inline JavaScript code is used where it is defined and cannot be called from other parts of the same web page. Microsoft later did cooperate with Netscape to further develop JavaScript. That is why both Internet Explorer and Netscape browsers support JavaScript. This makes JavaScript the default client-side scripting language.

4.3.2 Development Tools

- ***Microsoft FrontPage 2000***

Someone created every web site on the Web. At one time, someone sat down and used a program or coding language to define the text, formats and layouts every page on the Internet. Many of these pages are designed with special programs that make the web page authoring and editing process as simple as possible.

Microsoft FrontPage 2000 is a software package that provides graphics user interface (GUI) HTML tools hat adds active visual components. The best feature of FrontPage is thee development environment that allows the viewing of different designs of the HTML page. The user can actually design the page using visual components. To add functionality to the web page, scripting language can be added in the coding view the HTML page created can also be viewed directly using FrontPage. Most functions like

create and format textual and graphical elements are located on the buttons toolbar directly above the main editing area of FrontPage 2000. These controls include buttons for changing text size, color, style, font and justification; for inserting images; and for creating hyperlinks. This technique of using GUI tools quickly saves a lot of time and makes complication of adjusting the page solved. The HTML codes can be edited directly to generate the page desired.

The pages that have been created using FrontPage 2000 are viewable with any Web browser. The files created are then typically uploaded via FTP to a Web server.

4.3.3 Video Compression Format

Since that Interactive Interior Design will need to transfer data and information in an accurate manner, AVI or MPEG format both seemed to be a good choice. Although the Real Media format is very favorable streaming on the Internet, it cannot justify the poor quality of the video format. QuickTime format is not chosen because the player installed in a Windows operating system will needs the use of a few drivers, thus affecting the efficiency of the system slightly. Within AVI and MPEG format, the MPEG format is chosen because conversion from AVI to MPEG is possible and MPEG will be used as a format for the VideoImpression of ArcSoft.

4.4 Project Planning & Schedule

Before the initiation of any project, there exist a certain way of how work is to be distribute and done. A proper planning necessitates the success of a project. For this project planning, the stages of the development process are the research, system analysis, system design, system coding or development, system testing, and documentation.

The importance of a well-planned project is to meet the objectives of the project and produce the desired outcome within the stated time frame. Documentation of this project shall resume throughout the development period.

A schedule chart showing the activities of development that include six phases of development has been constricted. This schedule chart is an important element in this project as it states the standard time frame for each activity, which follows their particular time frame, will successfully meet the date of completion hence the success of the project.

Task Name	Jun 2001	Jul 2001	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	Jan 200
1. Research								
2. Learning								
3. System Analysis								
4. System Design								
5. Testing								
6. Documentation								

Table 4.1 Schedule of Project Planning

Procedure

Understanding the terminology, development methodology, application software, and programming languages are important for implementing a comprehensive web site for this project. Therefore, the first stage or the initial stage of the project is the Research. After the Research, the development platform and programming languages to be used on the project will be verified and will proceed to the next stage of learning the development tools.

The concept of pictorial descriptions and prototyping "what you see is what you get" approach is a development of the actual menus, video windows, the user interface metaphor for video, and report formats. Prototyping will be used during the design stage that provides an interactive, which means that user are able to view the interface in terms of content and form as well as the sequence of functions. The benefit of prototyping is the ability of fine-tuning at every stage of the developments.

The next stage will be the detailed application design specifications. This portion will be including the information model, the object model, and the system design after modification from the initial design suggested at prototyping stage.

After the prototyping and application design are completed, a performance analysis and design verification at this stage are required to ensure that the designed system meets the objectives and perform at the expected levels.

All the multimedia objects can be design and integrated at the information system designing stage. Documentation process will be running concurrently throughout the development process in order to fully documented the detailed for each of the stages within the project.

4.5 Summary

This chapter explains the system development methodology and the system analysis that has been done to develop this project. A few examples of system development methodology are discussed in this chapter. This chapter explains how each methodology works and compares each of their features. Analysis was done on these methodologies and a conclusion has been made which is the more suitable method to be implemented for developing this project. The Waterfall model is chosen.

This chapter also covered some sources of information gathering. The information came from the Internet, Bilik Dokumen of FSKTM, and some reference books. Project planning and schedule are also included in this chapter.

Chapter 5

System Design

System design is the stage where the requirement that was identified earlier is translated into system features and characteristics. This chapter will also involve the system architecture that will be adopted for the project.

The objectives of system design are listed below:

- Specify Logical Design Elements

  Detailed design specifications that describe the features of information system: input, output, files and database and procedures.

- Meet User Requirements

  Meet user needs stated in terms of:

  - Performing appropriate form of information
  - Presenting proper form of information
  - Providing accurate results
  - Using appropriate method of interaction
  - Providing overall reliability

- Ease Of Use
  - Favorable human engineering
  - Ergonomic design that is physically comfortable to user effectiveness and efficiency.

- Provide Software Specifications

Specific components and functions with adequate details are needed to construct application software.

5.1 System Architecture & Design

Interactive Interior Design will be using a two-tier architecture as shown in Figure 5.1. The first tier is the client and the second tier is the web server. In Interactive Interior Design, the user or client services will be provided by the web browser (Internet Explorer or Netscape) that will display the web site of the project. Web server will receive request from the user to processes and responds to the request. Web server save all the data that is need to display the web site correctly.

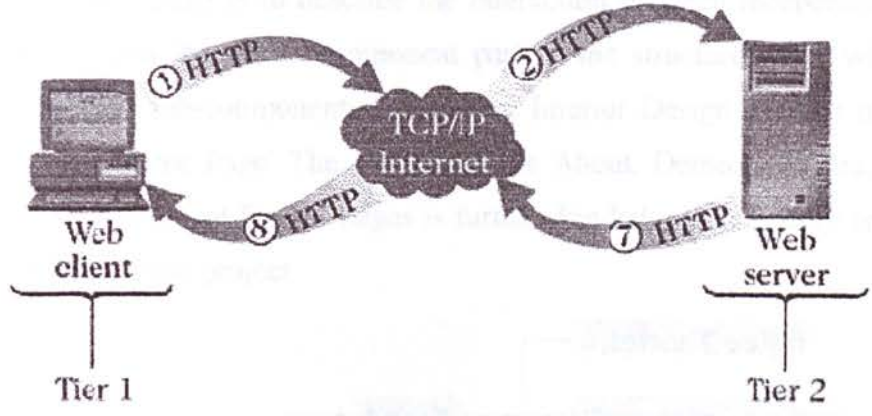


Figure 5.1 Two-tier Architecture Design of Interactive Interior Design

5.2 System Functionality Design

System functionality design is based on the system requirements stated in chapter 3. It translates the system requirements into system functionality. This design focuses on the system structure design and data flow diagrams.

5.2.1 System Structure Chart

The system structure is used to depict high-level abstraction of a specified system. The use of structure chart is to describe the interaction between independent modules. Major functions form the initial component part of the structure chart, which can be broken into detailed sub-components. Interactive Interior Design consists of five main pages besides the Home Page. The five pages are About, Demos, Articles, Links, and Contact Us. The About and Demos pages is further divided into few more pages. Figure 5.2 is the site-map of this project.

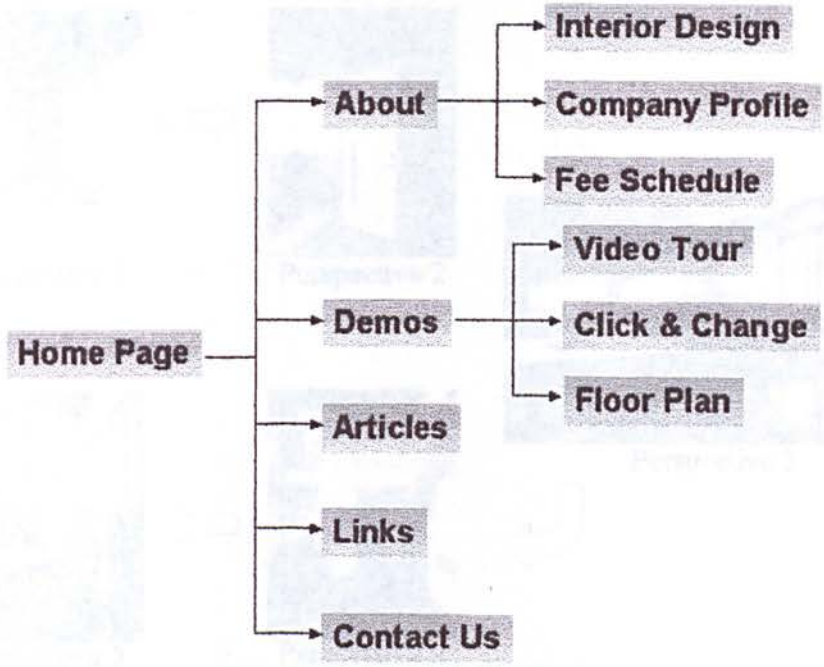


Figure 5.2 Site-map of Interactive Interior Design Web Site

Functions of each pages is described in Chapter 3. The design basically start with creating a standard interface for each page and then proceed to create interface of each page individually. After most of the pages or all the pages have been created, connection between them will be built.

This project is more concentrates on the Demos page. Therefore, more efforts were and are put into designing this page. The Demos page contains three sub-pages, which are the Video Tour, Click & Change ,and Floor Plan.

Video Tour

Occasionally, web site displays different perspective view of a room statically as shown in Figure 5.3. Video Tour implement video on web technology to create a video clip of rooms. User will be able to view a 'real-world' room video clip with all the furniture and accessories.

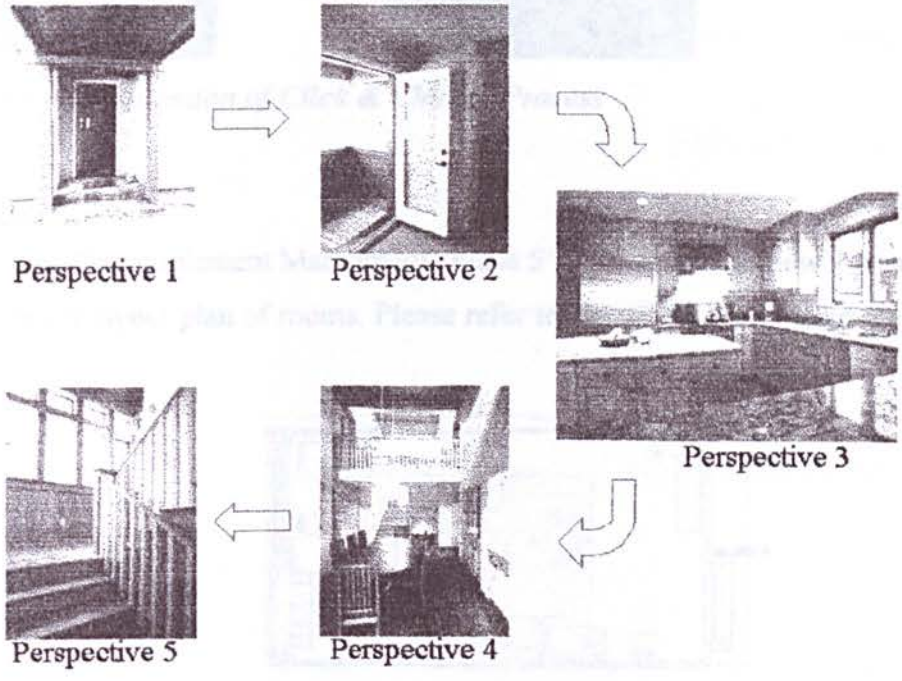


Figure 5.3 Different Perspectives View of A Room Statically

Click & Change

Click & Change implements HTML to allow user change the color or pattern of a selected item. For example, once user click on the flooring of a kitchen, template of color and pattern of the wallpaper will be loaded for user to choose an option. After the user has chosen a color or pattern, Click & Change will allows user to view the effect of that change. This process is illustrates in Figure 5.4.

Original Design of A Kitchen

After Changed Design of A Kitchen

Figure 5.4 Illustration of Click & Change Process

Floor Plan

Floor Plan implement Macromedia Flash 5 to allow user to view a presentation on how to draw a layout plan of rooms. Please refer to Figure 5.5 for an example of a layout plan.

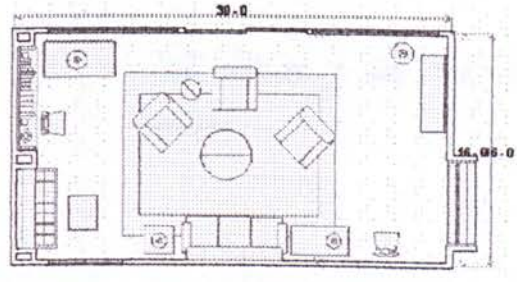
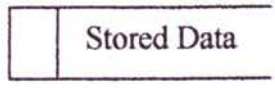
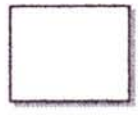


Figure 5.5 Layout Plan of a Living Room

5.2.2 Data Flow Diagram

The system analyst needs to make use of the conceptual freedom afforded by the data flow diagrams (DFD), which graphically characterize data processes and flows in a business system. A series of layered data flow diagrams may also be used to represent and analyze detailed procedures within the larger system. Through DFD, the system analyst can put together a graphical representation of data processes throughout the organization. The data flow approach emphasizes the logic underlying the system. By using combination of only four symbols, the system analyst can create a pictorial depiction of processes that will eventually provide solid system documentation.

Symbol	Description
 Data Flow	- Represent the flow of data or information from one object to another. - Arrow denoted the direction of data flow. - Each data flow is labeled with the name or details of the information represented by the data flow
 Data Store	- Hold data for a time within the system - Comprise two sections: o Identifier information o Description of the data stored
 Entity	- Any objects in the real world, for example person.

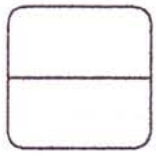
 Process	- Transform the input data to output data - Represented by rectangle shape - Comprise 2 or 3 sections: o Top section contains the identifier information o Center section contains a description of the process o Lower section contains the physical or computer program information

Table 5.1 The Four Basic Symbols Used in the Data Flow Diagram

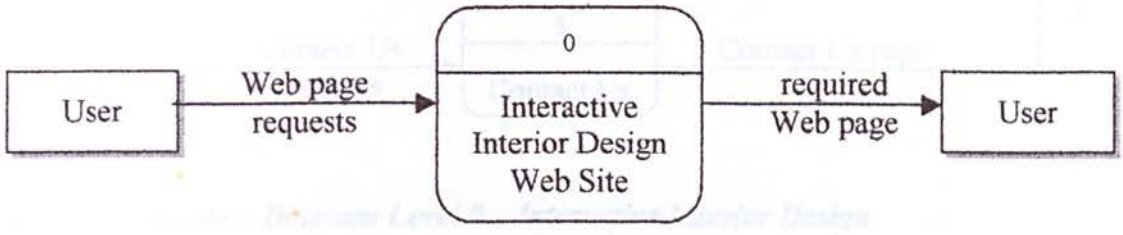


Figure 5.6 Context Data Flow Diagram

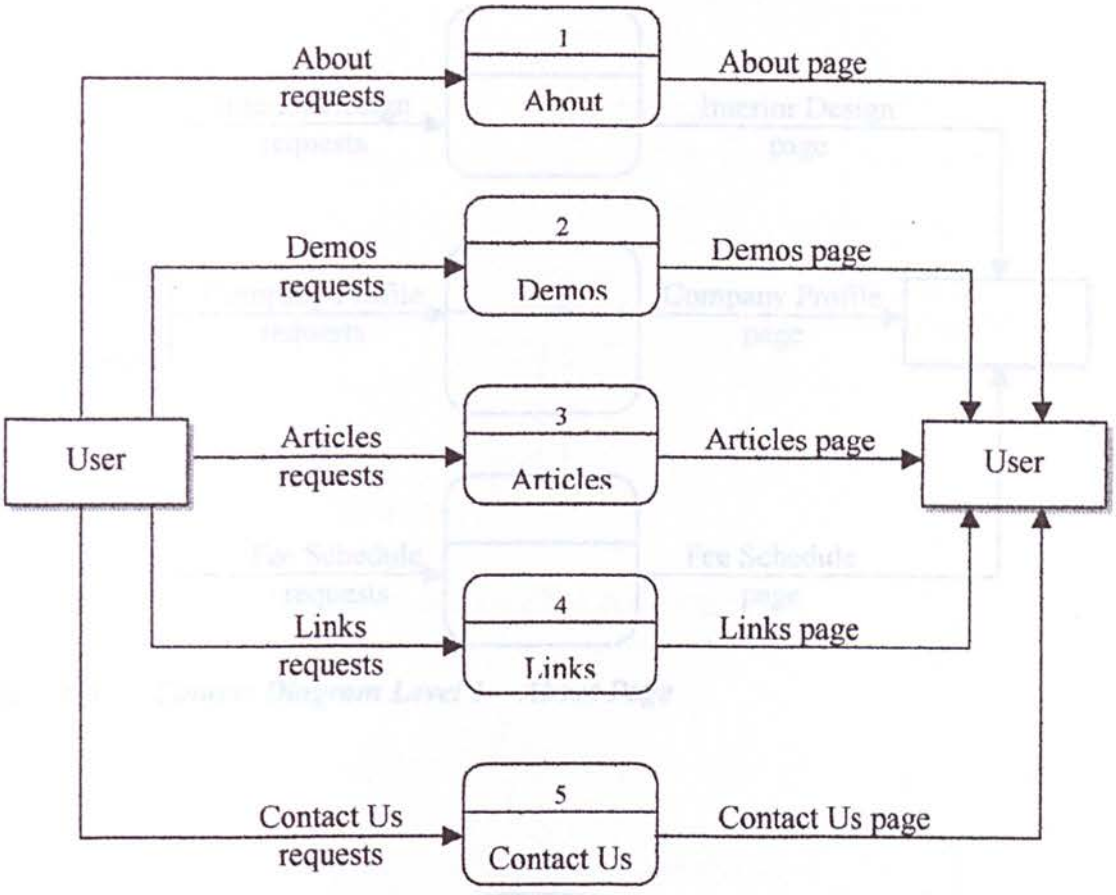


Figure 5.7 Context Diagram Level 0 – Interactive Interior Design

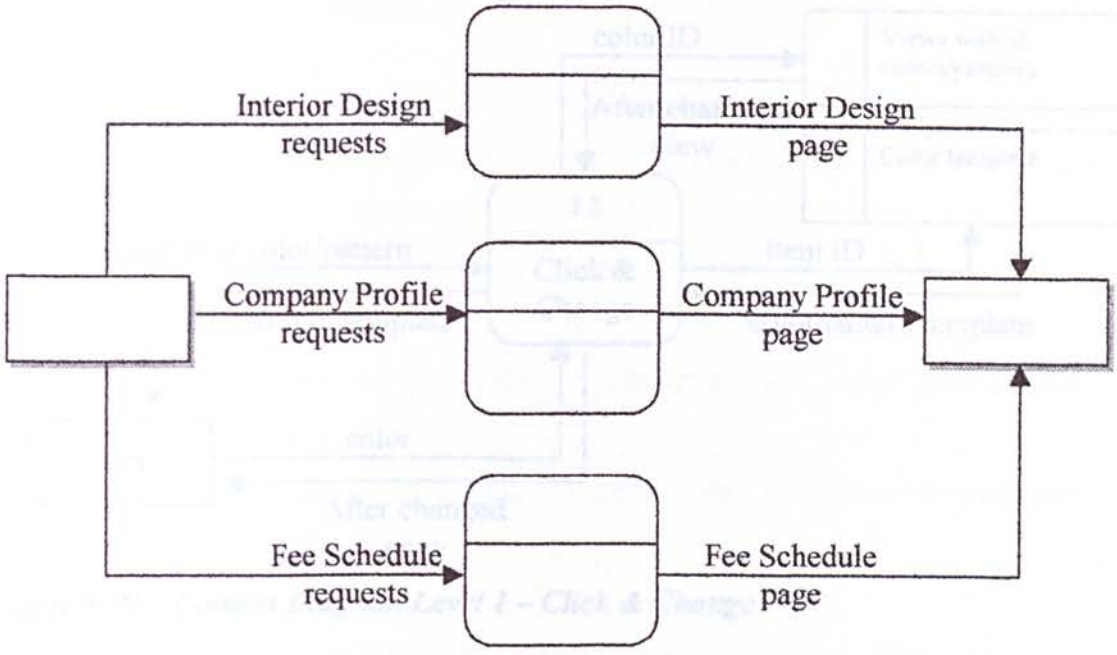


Figure 5.8 Context Diagram Level 1 – About Page

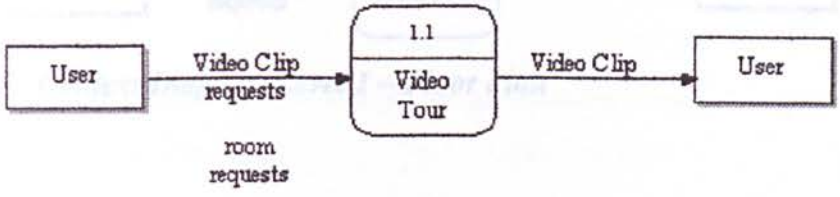


Figure 5.9 Context Diagram Level 1 – Video Tour

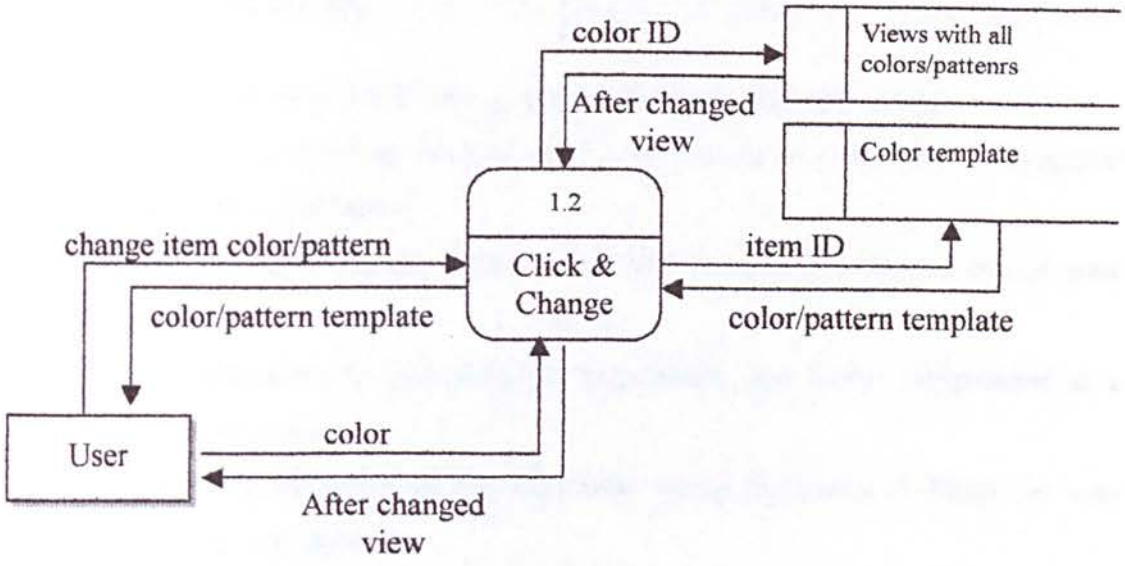


Figure 5.10 Context Diagram Level 1 – Click & Change

Figure 5.11 Context Diagram Level 1 – Floor Plan

5.3 User Interface Design

The Graphics User Interface (GUI) design must fulfill four main objectives:

- Effectiveness in allowing users to access the system in a way that is congruent with their individual needs.
- Efficiency in increasing the speed of data entry and reduce the number of error that occur.
- User considerations by providing the appropriate and useful information as a feedback to the user.
- Productivity as measured by ergonomically sound principles of design for user interface and workspaces.

There are a few principles of designing an interactive user interface. There are:

- Consistency

  The format such as command input, menu selection is similar for the whole system.

- Responsiveness

  How the user perceives the rate of communication with the system. Example, respond time on a web page.

- Recoverability

  The ability to let users correct heir mistakes if error has been recognized.

- Error Handling

  The system should be able to defend itself if user error has occurred that night cause the system to fail. These errors include the page not found error.

Figure 5.12 is the user interface of the Interactive Interior Design home page. This home page is designed simple and colorful to attract user interest on continue browsing the site. This home page is designed without the use of frames.

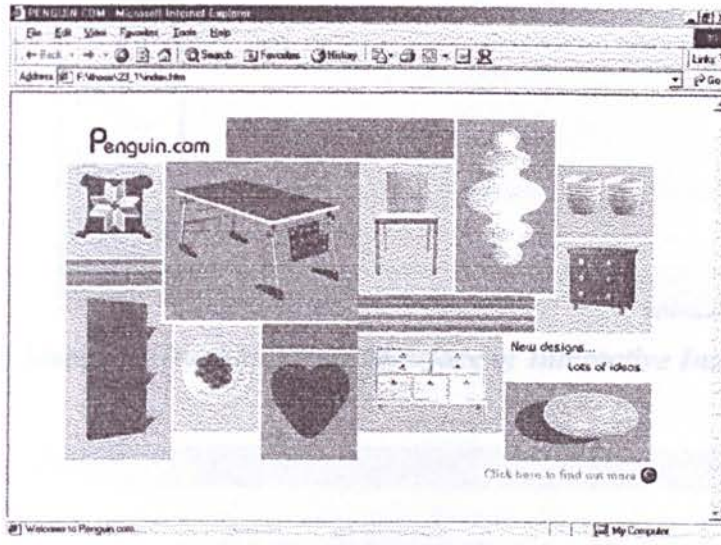


Figure 5.12 The Home Page of the Interactive Interior Design

Figure 5.13 is the standard format of all the web pages inside this site. The purpose on standardize all the web pages is to give user a consistency 'look & feel' about this site. Besides that, a standardized web page design gives user a symbolic impression about the web site. This design is using frames. There are mainly three frames included inside one page, which are the upper frame as banner, left frame as navigation menu, and the content frame.

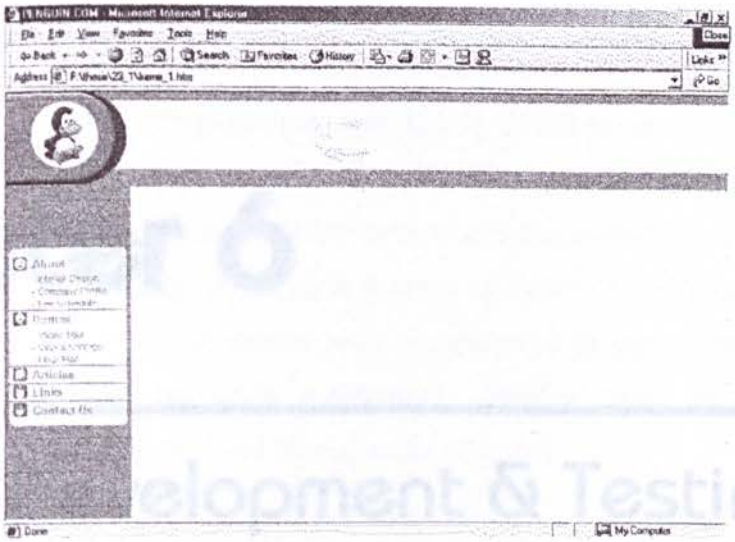


Figure 5.13 The Standard Graphical User Interface of Interactive Interior Design

5.4 Summary

System design is a process to convert the conceptual ideas from requirement specification in system analysis into more technical specification. This chapter explains the system architecture and design of this project with diagrams provided.

This chapter also explains about the system functionality design for this project in details. This section is divided into two sub-sections, which are the system structure chart and the Data Flow Diagrams.

Last but not least, this chapter discussed about the user interface design that is implemented in this project.

Chapter 6

System Development & Testing

6.1 System Development

Throughout the system development, prototyping development methodology was used to construct the graphical user interface rapidly. The type of system development that had been used is the incremental development where the system is partitioned into separated process or functionality. After each process or function had produced and is able to run, the partial function or system will be uploaded to the entire sub-system, which was made available for user assessment. Besides that, the incremental development makes implementation and testing more efficient.

6.1.1 Main Structure Construction

Microsoft FrontPage 2000 is a Window based web page development tool. During the initial stage, the main menu structure is developed as the main structure of the web page followed by each module according to the functionality.

Development of graphic and animation involved the use of image processing and development tool such as Adobe Photoshop 6.0 and animation processing and development tool such as Macromedia Flash 5.0. The first stage of the graphic development was the image scanning process, where suitable and selected graphics were scanned. Then, the graphic was compressed into smaller file size in order to save storage capacity. The development process of a video clip is not much different with the graphic development process. First, the video is captured using digital camera, where suitable scenes were captured. Then, the videos is edited and compressed using the ArcSoft VideoImpression.

6.1.2 Functional Structure Development

For each functional module, Microsoft FrontPage 2000 is an authoring tool for creating a web page and web site. FrontPage is used to create and design web applications, editing and scripting web page.

FrontPage 2000 and Office 2000 share common themes, toolbars, menus, shortcuts, and tools such as the Format Painter, HTML Help, and background spell checking.

FrontPage helps in creating and modifying web page objects by using the WYSIWYG (What You See Is What You Get) environment . In the WYSIWYG environment, objects are able to drag and drop onto the Page View to automatically insert HTML code directly in the HTML View.

6.2 System Testing

Testing involves verification and validation to ensure that the functionality available is able to meet the user needs. The existence of program defects or inadequacies is inferred from unexpected system output. Testing is carried out during the implementation phase to verify that the system behaviors, as intended by the design and after the implementation is complete. The later testing phase is to check conformance with requirements and assess the reliability of the system.

Verification involves checking the system to conforms the specification. While validation involves checking the system to meet the expectation of the user. Prototyping, one of the requirements of validation techniques was used in the verification and validation process, which included the static and dynamic techniques of system checking and analysis.

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The static techniques or tests used for design included the review of requirements documentation and design diagrams. While the static test for the program including the review of source code, program inspections and analysis. Dynamic techniques or tests involve exercising an implementation and prototyping.

Testing the hypothesis involve tracing the program source code manually. The interactive debugging tool used to trace the error is the Microsoft FrontPage 2000.

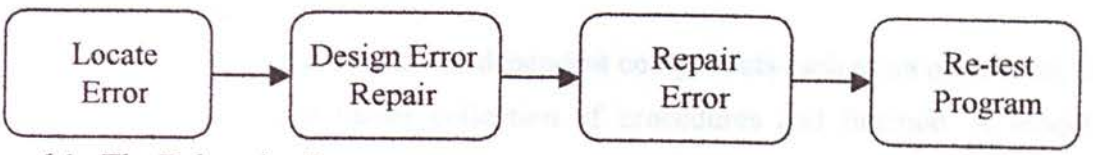


Figure 6.1 The Debugging Process

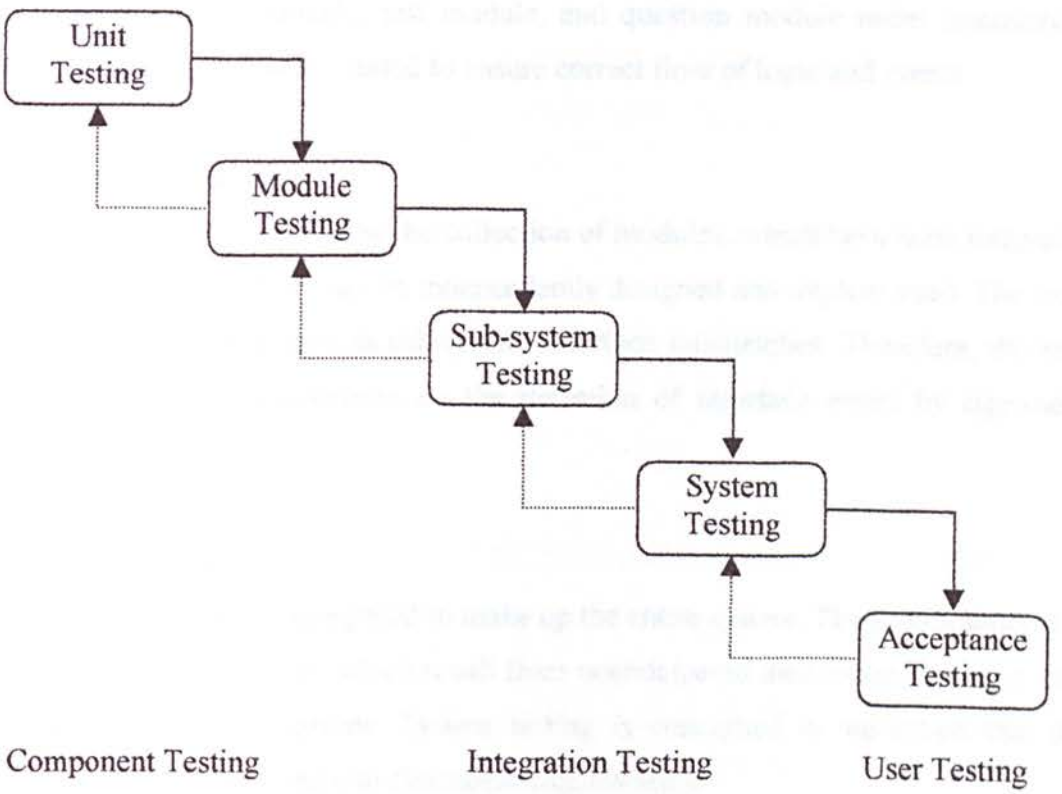


Figure 6.2 The Testing Process Flowchart

6.2.1 Unit Testing

Individual components are tested to ensure that they operate correctly. Each component is tested independently, without any integration with other component. All function on each button is examine to ensure it performs the entitle output such as hyperlink to the right destination, call the right function to execute, and display the correct massage.

6.2.2 Module Testing

Module testing is a collection of dependent components such as an oject class, an abstract data type or some looser collection of procedures and function. A module encapsulates related components in order to be tested without other system modules such as view module, result module, test module, and question module under interactivity online test sub-system, that are tested to ensure correct flow of logic and events.

6.2.3 Sub-system Testing

This phase involves testing the collection of modules, which have been integrated into sub-system. Sub-system may be independently designed and implemented. The most common problem, which arise is sub-system interface mismatches. Therefore, the sub-system test process is concentrate on the detection of interface errors by rigorously exercising the interface.

6.2.4 System Testing

The sub-system are integrated to make up the entire system. The testing process is concerned with finding errors, which result from unanticipated interactions between sub-systems and system components. System testing is concerned in validation that the system meets it functional and non-functional requirements.

6.2.5 Acceptance Testing

This is the final stage in the testing process before the system is accepted for operational use. The system is tested with real data. Acceptance testing may reveal errors and omissions in the system requirements definition because the real data is different from the test data. Acceptance testing may also reveal requirements problems where the system's facilities do not meet the user's needs or the system performance is unacceptable.

6.3 Problems & Solutions

6.3.1 Multimedia Elements

Problem

To create an interactive web site about interior design, a number of multimedia objects is needed. However, the source available is very few especially the animation about interior design elements

Solution

Solution to the problem, static graphic is scanned or download from any suitable resources. then, these graphics are edited using Adobe Photoshop 6.0 or Macromedia Flash 5.0 to produce the animation needed by the web site.

6.3.2 Lack of guidance and resources on web- based interior design application programming

Problem

As a beginner, interior design application in World Wide Web (WWW) is not an easy job although WWW is much rewarding. This is a major problem as the concept of web-based application interior design is somehow different from the daily seen stand-alone

application programming. For example, the Floor Plan module is lack of interactivity because user cannot drag and drop to draw a floor plan of their selves.

Solution

As a result, an exhaustive effort was done on searching the basic understanding and skills that are necessary to meet the development requirements. Reading up on the concept of interactivity and multimedia programming and surfing the Internet for information were among some of the efforts taken to overcome this problem. Most of the knowledge was gained by referring to relevant academic materials. This is followed by some practical exercises.

6.3.3 Movie Files

Problem

The original file mode for the online video is in form of AVI movie with the extension of .avi, which are too big to be included in the web site. The large movie file will affect the response time of the web site when loading the movie from the server to the user.

Solution

To overcome this problem, a streaming program is used to stream the original movie mode into .mpeg mode.

6.3.4 Storage Capacity

Problem

The multimedia elements that are included in the Interactive Interior Design required a large storage capacity. The main elements that consumed a large amount of space are the movie files, Macromedia Flash presentation files, and graphics files with .jpeg extension.

Solution

Compression techniques are used to reduce the storage capacity needed by the multimedia elements. Movie file with .avi extension is compressed into .mpeg file extension using ArcSoft VideoImpression. Macromedia Flash file with .swf extension is compressed into Windows projector file with .exe extension using Flash. As for graphics files with .jpeg extension which do not need high color resolution are compressed into .gif files using Adobe Photoshop.

6.4 Summary

This chapter looked into how the specified requirements and designs are developed by going through system coding and debugging. The major tasks in this phase are structure construction, testing, and debugging.

Therefore, this chapter explains the system development process with main structure construction and functional structure development. This section briefly describes the techniques used to test the web site components individually and as they are integrated together to from the whole web site.

This chapter also outlines some major obstacles faced while developing this project. Solutions were also given to the shortcomings encountered. It ends with a look at the final results of the project.

Chapter 7

System Evaluation & Conclusion

7.1 Strengths

7.1.1 Online Instructor

The Demos module of the web site allows user to lean more in depth about interior design. Users are given opportunity to learn more about color matching and are guided step-by-step to draw a floor plan of rooms. This has drawn an attention to user and helps them in getting more understanding the interior design concept online compare to text and static graphics.

7.1.2 Web Enabled

User is able to access the web site without any time and location constraints to obtain the information they need on interior design. This is because the web site is web enabled and the reach of information is very convenient. User is only required to have an online connection to access the web site.

7.1.3 Cross platform support

The major advantage of Interactive Interior Design is that it facilitates access from a great variety of browsers and client platform. User running on different computers can use any web browser, such as the Netscape Navigator (version 4.5 and above) or the Internet Explorer (version 5.5 and above) to launch connection to the web site and start browsing the web site. They do not need to bother with any specific hardware or software requirement imposed. As a result, there is always an open door for worldwide audience.

7.1.4 Ease of Use Graphical User Interface

Interactive Interior Design web site is featured with an attractive and easy to use graphical interface. Most of the operations can be done by click and point operations. There are only a few input actions required during the users' interaction. Thus, users will spend most of their time browsing the web site without much input effort.

7.1.5 Well-organized information

The interior design information that is included into this web site was been filtered and organized in a simple and compact way. The purpose on doing this is to allow user get the information they want directly from the web site and is in the shortest time. In fact, the compact information is eliminating the time of a user has to waste on browsing to what they want.

7.1.6 Multimedia Elements

Multimedia element is lot of the main strength of the interactive Interior Design web site. In order to increase the attractiveness of the web site, the web pages are consist of many multimedia elements such as, video, graphics, and animation. The multimedia elements help to enhance the learning process of interior design concept.

7.1.7 Total User Control

The users will have full control over the system, meaning they can perform any functions that are provided by the web site. Users can browse the web site if they log in and they can log off anytime they wish. If they want to close the connection, all they have to do is just to shut the browser.

7.2 Limitation

7.2.1 Lack of interactivity in Floor Plan Module

Designed Floor Plan module is lack of interactivity. The proposed Floor Plan module should be able to allow user drag and drop item onto an empty floor plan. User is allowed to placed the item onto the empty floor plan at any position they like, and is allowed to add as many item as they want. Besides that, user is allowed to delete any item that they added onto the floor plan. However, due to the time constraint and the limited resources available on this module, the Floor Plan as proposed could not de done. As a result, a multimedia presentation of Floor Plan is done.

7.3 Future Enhancement

There are probably a million ways for this project to be extended and improved. This section opens up a whole plethora of possibilities to enhance the web site. Because the web site was made in a general and open way, there are many extensions possible.

7.3.1 Interactive Floor Plan

First, the Floor Plan module is not the best way to implement it as explained in section 7.2.1. As for future enhancement proposal, the Floor Plan module should be designed in an interactive way, which means that user is allowed to draw their own floor plan and not just viewing a presentation on how to draw a floor plan. User is allowed to drag and drop, reposition, and deletes any item onto or from the floor plan.

7.3.2 A Better Implementation of Demos

Second, a confession is made that the Video Tour and Click & Change module in this project is not the best way to implement it. it works just fine, but there is a more elegant solution, which is considerably left for future enhancement.

7.4 Conclusion

In this project, knowledge of multimedia web application and interactive web site are combined to develop an online interior design web site. The development process began by studying the requirements of the project and then moved on to implementing the tools that are needed to develop this project.

Through browsing this interactive web site, the user is given opportunity to learn more in depth about interior design. By developing a multimedia web site, user is given an environment to practically try on their own on designing an interior space.

The development method used in this system is by no means complete and tend to be general. There are a number of other high level alternatives, such as using the latest technologies of Active Server Pages (ASP), Java Servers Pages JSP), and XML, which could not be carried out due to time constraints. It is proposed that more research study and project topics can be based on these new technologies to create more efficient interactive web site.

Throughout the development of the web site, a lot of valuable knowledge has been gained, particularly concerning web site programming and proper software engineering. Generally, this thesis serves as an opportunity for students to apply both theoretical and practical skills learnt into a time-budgeted project.

According to the overall results, it can be concluded that the outcome of Interactive Interior Design web site is achieved and fulfilled the project objectives as set completely.

Appendix

User Manual

Interactive Interior Design – Penguin.com

System Requirements

Hardware Requirements

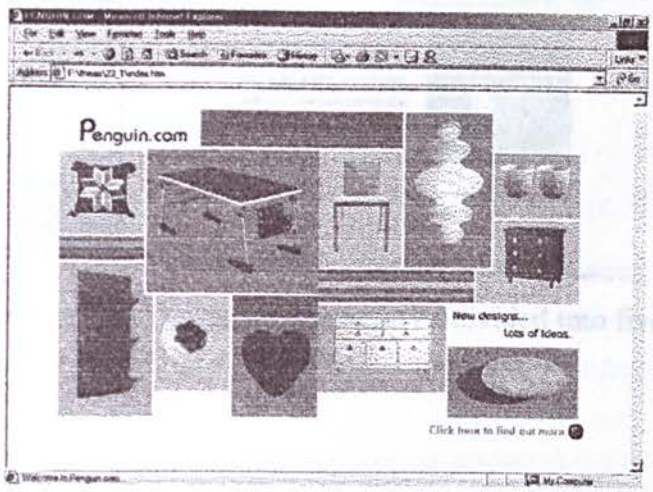
- A Intel Pentium II-equivalent or late processor at 233 MHz or higher.
- At least 64MB of RAM.
- A color monitor with a VGA card is recommended.
- 56 Kbps Modem or 10/100 Mbps Network Card.
- Keyboard.
- Mouse.

Software Requirements

- Any Compatible Operating System.
- Internet Browser

Browsing Interactive Interior Design

Interactive Interior Design web site is a multi-platform real time interior design web site, which enables users scattered in different locations to learn more in depth about the interior design industry. User can browse and try on the example provided. Below is the graphical user interface of the home page.



Click on the 'Click here to find out more' to enter the web site. Once user clicks on the 'entering point', they will be directed to this page:

Obviously, Interactive Interior Design web site can be divided into five main pages:

- About
- Demos
- Articles
- Links
- Contact Us

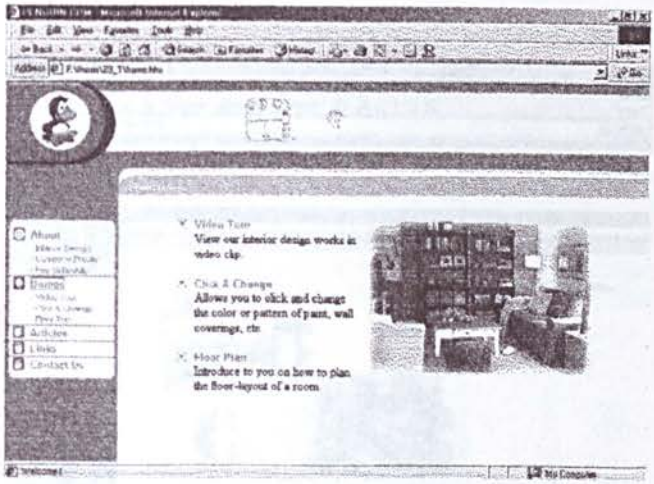
Click on any link at left menu to explore the related page.

- ***About***

This page provides user information about interior design in details, the company profile, and fee schedule.

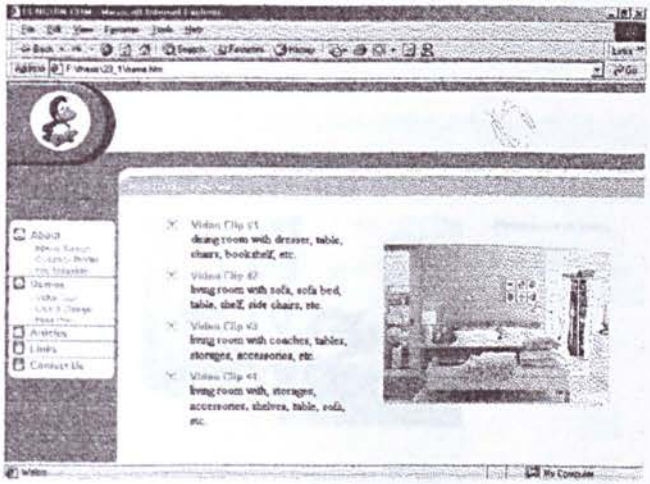
- ***Demos***

This page provides user few examples of demos to allow user practically learns more about interior design. It introduced to user the interactive computer technology of web designing. Below is the graphical user interface of the Demos page:



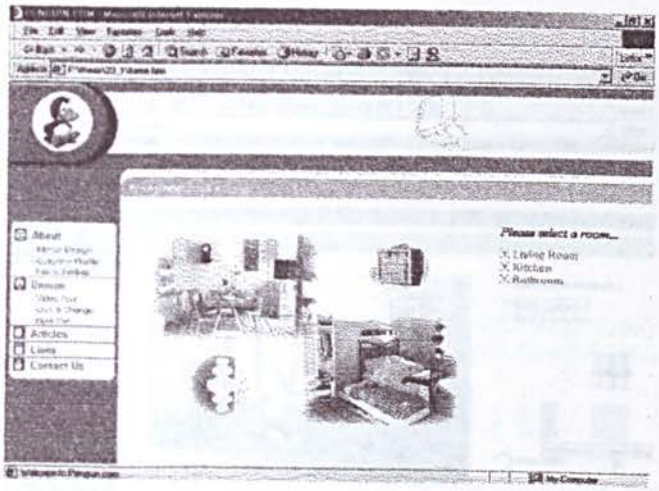
User is given three choices of demos, which are the Video Tour, Click & Change, and Floor Plan.

If user clicks on 'Video Tour', they will be directed to this below page:



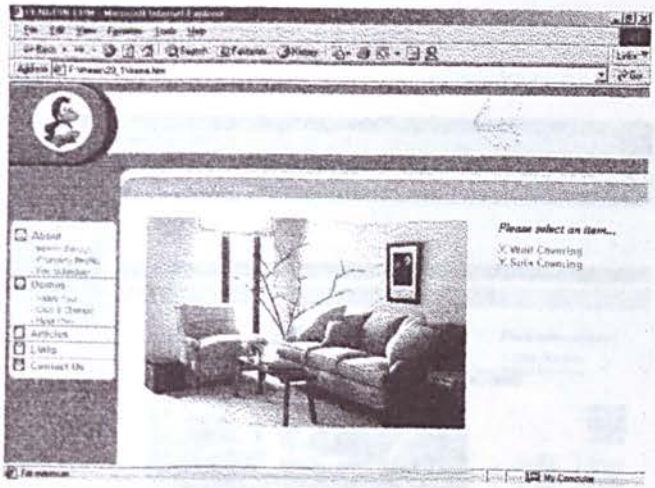
Select any video clip to view by just clicking on the video clip title. For viewing a video clip, user must have the video player installed on their personal computer. By default, all Windows operating systems have the Window Media Player, which is capable on playing the video clips in this web site.

If user clicks on the 'Click & Change', they will directed to this below page:

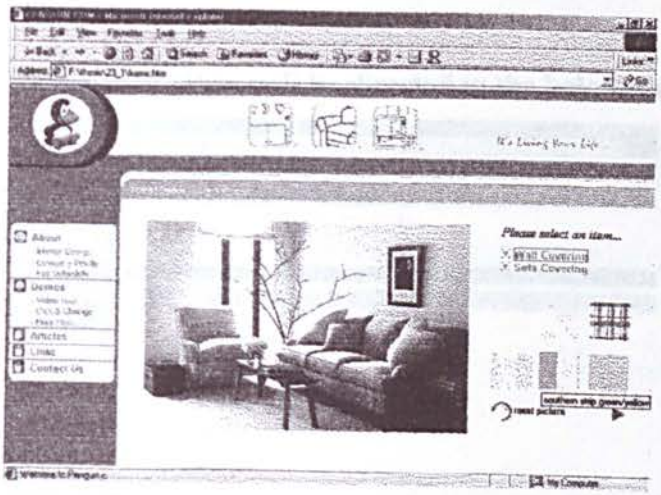


User is given three example of room to choose of. Click on the room list to choose a desired room.

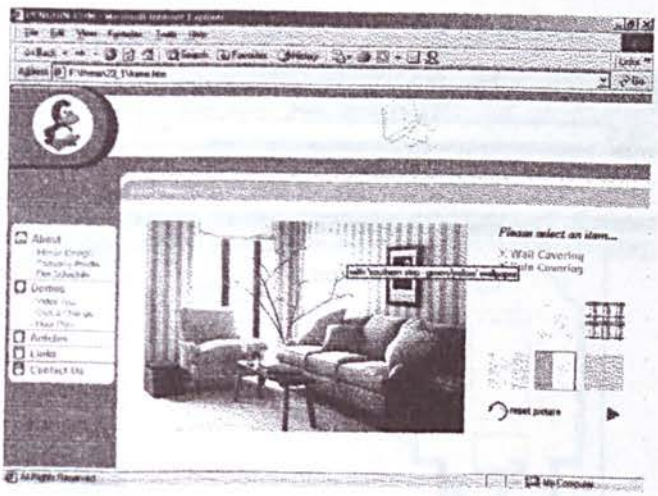
For an example, user had choose the living room, they will directed to this below page:



After user has chosen a room, they are given a list again on the item that they would like to change. Once they have selected an item, they will given choices of color and pattern as the below page:



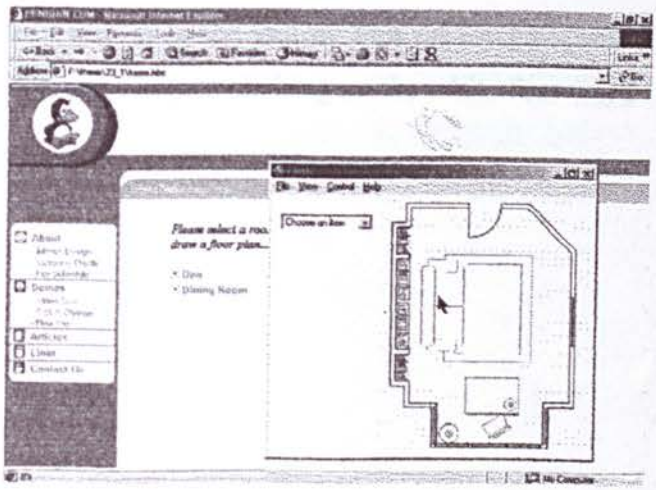
Simply clicks on the tumbnail of color and pattern to change the wall covering of the room. The name of the color or pattern will be displayed as the cursor moved onto it. Once user has clicked on a color or pattern, the effect of the changes on the selected item is pop-up to user as the below:



User can continue clicking on the color or pattern they desired to view the effect. They can even clicks to reset the pictures back to the original look. User can clicks on the 'right arrow' to seek for more choices of color and pattern.

If user clicks on the 'Floor Plan', they will be directed to the below page:

Again, user is given choice of room to select. After user has selected a room, a file download window will pops-up to ask user whether they want to run the program in its current location or save the program to disk. User can choose either and the multimedia presentation window will pops-up as shown in the figure below:



- ***Articles***

This page provides user linkable articles on the latest news of interior design.

- ***Link***

This page provides user few linkable web site related to residential interior design.

- ***Contact Us***

This page provides user information on a few ways to contact the designing firm.

Each page of the web site tells user where is their current location using a navigation bar as shown in the below figure:

The current location of user is in the yellow font on the navigation bar. User is able to return to the previous section by just clicking on the white font word.

References

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