

Virtual Walkthrough to Pocket D Building

By

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**Dissertation Report submitted in partial fulfilment of
the requirements for the
Bachelor of Technology (Hons)
(Information and Communication Technology)**

SEPTEMBER 2012

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CERTIFICATION OF APPROVAL
VIRTUAL WALKTHROUGH TO POCKET D BUILDING

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A project dissertation submitted to the
Information Technology Programme
Universiti Teknologi PETRONAS
in partial fulfilment of the requirement for the
BACHELOR OF TECHNOLOGY (Hons)
(INFORMATION AND COMMUNICATION TECHNOLOGY)

Approved by,

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UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

September 2012

CERTIFICATION OF ORIGINALITY

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

WAI YAN SOE

ABSTRACT

The main objective of this project, virtual walkthrough to Pocket D building project is to provide a 3D simulation walkthrough environment to the Pocket D building via UTP website. Looking at the current situation, the UTP website provides 2D images of the campus building. No information was provided about the usage of lecture theatres, staff offices nor cafeterias. Since the current website did not provide enough information of the Pocket D building, a simulation or walkthrough project has come to an idea to implement. This project, undertaken by the writer is to develop a virtual environment of a certain section of the university's building using non immersive VR. The section to be concentrated in this project would be the Pocket D located within the campus. The project could benefit to public on having a clearer picture what a real campus in a 3D setting. The concepts of visual feedback and interaction feedback and acoustic feedback are considered in this virtual environment. All these concepts are incorporated to create a realistic virtual environment and this is where this project is going to concentrated on.

ACKNOWLEDGEMENT

I would like to take this opportunity to express my utmost gratitude to the individual that have taken the time and effort to assist me in completing the project. First and foremost, my utmost gratitude goes to my supervisor, AP Dr. Dayang Rohaya Bt Awang Rambli. Without her guidance and patience, I would not be succeeded to complete the project. A warmth thankful to the Final Year Project Coordinator, for provide me with all the initial information required to begin the project. Last but not least, thanks to all individuals that has helped me in any way, but whose name is not mentioned here.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

“There has been increasing interest in potential social impact of new technologies and the advancement of new technologies has reached a level that eliminating the traditional separation between users and machine”. Virtual reality is relatively a new branch of technology with a broad scope which still left many unexplored areas. In the early 1960s, the concept of virtual reality was initialised by Dr. Ivan Sutherland whose started innovative graphics and engross interaction at Harvard and the University of Utah. Afterward he developed the first program to remove “hidden lines” in 3D drawings which are now very critical in producing true realistic 3D pictures.

Virtual reality is an artificial environment that is created with software and presented to the user in such a way that the user suspends belief and accepts it as a real environment. On a computer, virtual reality is primarily experienced through two of the five senses: sight and sound. The simplest form of virtual reality is a 3-D image that can be explored interactively at a personal computer, usually by manipulating keys or the mouse so that the content of the image moves in some direction or zooms in or out. More sophisticated efforts involve such approaches as wrap-around display screens, actual rooms augmented with wearable computers, and hepatics devices that let users feel the display images.

Virtual reality can be divided into:

- The simulation of a real environment for training and education.
- The development of an imagined environment for a game or interactive story.

The virtual walkthrough system would give a simple but realistic interaction with the smooth graphic design environment and information. The development of a virtual environment of Pocket D building covers lecture theatres, canteen, market and offices. Therefore, it is hoped that the result of this project, i.e the end product created, would be valuable for the university.

1.2 About UTP

Universiti Teknologi PETRONAS (UTP) was established on January 10, 1997 under the Malaysian Private Higher Educational Institution Act (1996).when PETRONAS was invited by the Malaysian government to set up a university.

The campus is built on a 400 hectare (1,000 acre) site strategically located at Bandar Seri Iskandar, Perak Darul Ridzuan, Malaysia. The University is a wholly-owned subsidiary of PETRONAS, the national oil company of Malaysia. The University community comprises of students and staff from various countries and is located in a beautifully landscaped setting, amidst the new township of Seri Iskandar. Its peaceful environment, wide open spaces and abundant lakes make these serene surroundings an ideal place to study.

UTP offers a wide range of engineering and technology programmes at undergraduate and postgraduate levels complemented with a strong focus on Research and Development. The programmes are designed with high industry relevance to provide a dynamic learning environment.

There are total of 16 buildings in the university campus and each has dedicated to the respective departments. The lecturers' offices are located to the corresponding department buildings. The UTP offices include rector's office, human resources management and admin, student support services, finance and fund management, undergraduate studies, postgraduate studies, research enterprise office, registry, information technology and media services, corporate services, residential college, information resource center, property management and maintenance, HSE and security.

1.3 Pocket-D Building

Pocket D building is situated in academic campus of Universiti Teknologi Petronas. There are two lecturer theaters in UTP academic campus, Pocket C and Pocket D. Pocket D building is located near to academic block 20 and 19. This project will focus on Pocket D building which consists of offices, lecturer theaters, canteen, photo studio, and mini-market. The Pocket D building is a 3 storey building and appearance is same with Pocket C building. The difference is Pocket D building has offices at the top floor and Pocket C does not.

More into detail, the ground floor has student support services office, alumni office, one canteen, one gallery room, one mini-market, and photo studio. The second floor has six lecturer theatres D1 to D6. At the top level, education sponsor unit (ESU) and student support services department are located. All the lecturer theatres and offices are provided with fully air-condition. Pocket D building consists of 4 staircases and 2 elevators. All the lecturer theatres have one computer and one projector.

1.4 Problem Statement

Currently, there is no virtual reality system available to view the buildings that are located in the campus area of Universiti Teknologi Petronas through internet. Therefore viewers who like to see the structural configurations of UTP buildings, they cannot get a clear visualization. Especially for the people who are from different countries, and want to know about how UTP buildings are look like, they cannot get a clear picture or vision for campus environment.

This is where virtual reality comes to mind. It is also an alternative method to introduce UTP to the general public. However, this approach is something new that may not have yet been tried before in UTP. Therefore, this project aims to help viewer or potential students especially who could not afford to come to the campus due to distance living. This project could be implemented to ease these hassles by giving an opportunity to view and experience the feeling of touring the campus in a virtual environment.

1.5 Objectives

The objectives of creating virtual walkthrough to Pocket-D are

- To create a virtual walkthrough environment for the people who have never been to Pocket-D.
- To get visualization and feeling about the real structural configuration for them.
- To provide detail information about the Pocket-D building.
- To understand more about the technology of Virtual Reality.

1.6 Scope of Study

This project includes the process of creating 3D modeling objects, the whole building and objects it has. The 3D modeling objects will be using Google SketchUp. This project is a non-immersive virtual reality. The visual aspects of the computer generated virtual environment are presented by a conventional computer monitor or desktop and then projected onto a screen. In a non-immersive VR system, the person is outside the virtual environment, looking in and seeing it as a scale model. In this project, user needs to control his or her movement within the environment by using mouse navigation. In the project user, via windows as mentioned before can walkthrough and explore the building's 3D model in real-time. The 3D model will represent the actual building environment consists of canteen, lecture theaters and staffs' offices. There are many lecture theaters at Pocket-D building and this system provides the details and sufficient information for each room of the Pocket-D building.

The target users can be divided into two groups, they are:

A. Public

Nowadays, there are a lot of virtual campus walkthrough systems providing to public. With developing of this project, it is easier for public to know the real structural design of the campus building even though they have never been to UTP campus. It is an advantage for public who are far away from UTP where they can see the design of Pocket D building that created or developed using virtual environment

through UTP website. Therefore this system will give the user a new experience to the actual scene of the Pocket D building using virtual environment.

B. UTP authorities

It is a good idea for UTP authorities in promoting their campus to public by providing the visual campus using virtual environment application. Since UTP website provides 2D images for some of the campus buildings, public can only see the layout design of campus buildings but not for the real environment. Therefore this project helps UTP authorities to promote 3D campus through UTP website in the future.

CHAPTER 2

LITERATURE REVIEW

2.1 Virtual Reality

The virtual reality is 3D modelling which can have interaction with the world such as, the ability to walkthrough the world and view it from any angle and the ability to pick up object. In addition, it allows control over objects in the world, for instance, the ability to move around or pick up and arrange or mesh the 3D objects.

The virtual walkthrough or virtual reality is a way of making simulation on environment with three dimensions of width, height, and dept and also support an interactive experience with sound, real-time motion, tactile and other forms of feedback. The product can simply be operated by manipulating keys or the mouse so that the content of the image moves in some directions or zoom in or out. Most of the images require installing a plug-in for web browser. Virtual reality can be used for

- The walkthrough project which simulates the interior design of a building or a spaceship and perhaps it is also used for the purpose of training or education.
- The graphical imaged environment for developing game projects and educational tour trips.

When discussing about good virtual reality environment, the critical concern is how it should reflect the real environment. There are some certain matters that need to be considered such as having suitable texture mappings, object collision detection and appropriate lighting. Apart from these 3 aspects, there are also other things to consider such as the angles at which object are placed, reflections from mirrors or shiny objects and the frame of reference of both the virtual environment and the observer. All aspects are crucial when it comes distinguishing between a realistic and a non-realistic virtual environment.

Materials and texture mappings are applied to an object in order to make more realistic. Texture mappings is a way of making an object looks like something it can be simulate as in the real world by wrapping around the object. Normally, textures

are graphic file i.e. *.jpg or *.bmp which are created beforehand. Materials give the object colours.

Collision detection is one of the attributes that control the object from being unrealistic in the virtual environment. For instance, object collision detection is an important attribute when developing a walkthrough project. This feature will allow users to navigate around the virtual environment without bumping into objects.

Lights have to be placed at the right position or angle with right intensity and it should look as natural. According to Vince (1994), there are basically four types of lights in Virtual Environment (VE). They are an ambient light, a directed light, a point light and a spot light. An ambient light is a background light that light up all graphical objects equally regardless of their position or orientation. A directed light is placed far away but comes from a single direction which is used for the effect of daylight. A point light radiates light form one point to all directions from its own position. Last but not least, a spot light which produces a cone-like illumination.

Constructing a VR project is highly dependent on the current trends and readily available technology. Robler (1998) proposed that VR be used to create a more “real application”. However, several issues have been raised latter due to the negative side effect of using VR. Such effects are cyber sickness, eye problems, and psychological effects (addictions). According to Thompson’s High Technology Thesis, the main side effect of VR is cyber sickness which is a direct result of “confused sensory inputs”. It happen when the VR participant is seeing himself in motion and the body recognizes that this is in conflict with what it’s feeling. The symptoms of cyber sickness are nausea, dizziness, and drowsiness. In addition, there would be a lot more issues can be discussed which regarding to drawbacks and benefits of virtual reality as it advances with time.

2.1.1 Immersive VR

Immersive VR is a system which provides a natural interface for user to navigation in three-dimensional space. The user can experience sound, visualize and interact with the artificial environment. Immersive VR system allows for look-around, walk-around and fly-through capabilities in virtual environment in virtual environment. In order to use the full immersive VR system, the user needs the hardware such as glove and similar devices that allow manipulation, operation and control of virtual worlds. The virtual world is presented in full scale and relates properly to the human size. It enhances the perception of depth and the sense of space.

2.1.2 Non-immersive VR

Non-immersive system provide pseudo look-around and walkthrough capabilities in the three-dimensional environment. In other word, the virtual reality application that is not fully immersive. The viewer can navigate through virtual environment by mouse-controlled or pressing keypad. The non immersive application can be experienced on a graphic monitor, stereo glasses for stereo viewing, stereo projection system and etc.

2.1.3 Applications

Nowadays, the applications of VR become unlimited as the technologies of virtual reality evolve. Constructing a VR projects is highly dependent on the current trends and readily available technology. It has been said (K.-P. Beier) that VR will reshape the interface between people and information technology by offering new ways for the communication of information, the visualization of processes and the creative expression of ideas. The applications include real system like buildings, landscapes, underwater shipwrecks, spacecrafts, archaeological excavation sites, human anatomy, sculptures, crime scene reconstruction, and solar systems and so on.

The application of virtual reality abstract system include magnetic fields, turbulent flow structures, molecular models, mathematical systems, auditorium acoustics, stock market behaviour, population densities, information flows, and so on. These artificial environments can be animated, interactive, shared and can expose behaviour and functionality.

2.2 Virtual Reality Modeling Language

VRML is an acronym for Virtual Reality Modeling Language which implies an immersive 3D experience such as head-mounted display and 3D input devices such as 3D digital gloves. According to Rikk Carey, writer of “The Annotated VRML 2.0”, VRML provides less geometric modelling features which a true modeling language would contain but it contains numerous features that more than the scope of a modeling language. [2] Importantly, VRML is simply a 3D interchange format which describes most of the commonly used semantics found in today’s 3D applications such as hierarchical transformations, light sources, viewpoints, geometry, animation, fog, material properties, and texture mapping. One of the main goals in designing VRML was to ensure that it at least succeeded as an effective 3D file interchange format.

“VRML is a 3D analog to HTML” by Rikk Carey which means VRML serves as a simple, multiplatform language for publishing 3D web pages. [2] Nowadays, there are many 3D used web sites which provide information in three dimensionally. Some websites are best experienced in such three dimensionally as games, engineering and scientific visualizations, educational experiences, commercial and architecture. Typically, this types of web sites required intensive interaction, animation, and user participation and exploration beyond what is capable with a normal web page, text, or 2D image-based format page i.e. HTML.

VRML provides the technology that integrates two dimensions, text and multimedia into a coherent model. A coherent model provides an entirely new type of interactive application when the media are combined with script languages and internet capabilities. [1] However, there are variety of challenges that need to overcome in VRML such as 3D user interface and navigation, user training, and ubiquitous 3D graphic performance.

2.3 Virtual Walkthrough

A virtual walkthrough also known as a virtual tour is a simulation of an existing location. There are different technologies and techniques to create different types of virtual walkthroughs. The most popular method of creating virtual walkthroughs currently is stitching multiple photographs. This method requires the process of

taking multiple photographs, stitch them together using computer software and trying it all together into an interactive virtual tour. There are three popular ways of “stitching” virtual tour together such as Rectilinear Stitching, Spherical Stitching and Cubical Stitching.

Another method is to create a video-based virtual walkthrough. This process requires shooting videos using video cameras to pan and walkthrough subject properties of an existing location and then editing this together into a short presentation. The benefit of this method is that the point of view is constantly changing throughout a pan. It is generally not interactive because video eliminates viewer control of the tour. Therefore the tour is the same for all viewers and subject matter is chosen by the videographer. Capturing high-quality video requires significantly more technical skill and equipment than taking digital still pictures. Editing digital video requires proficiency with video editing software and has higher computer hardware requirements. Also, displaying video over the internet requires more bandwidth. Due to these difficulties, the task of creating video-based tours is often left to professionals. However, it usually does have play, stop, pause and chapter skip buttons to go to different sections of the tour.

Other virtual walkthroughs method is using 3-D models. It may be desirable to use 3-D modeling to produce a virtual walk-through when the subject matter has been badly damaged or does not exist, for example, an ancient castle may need to be reconstructed in 3-D to give users a detailed picture of what the building would have looked like.

2.3.1 Virtual Walkthrough applications

There are many applications for virtual walkthroughs and it is extensively used for universities, real estate industry and tourism business. Virtual tour can allow a user to view an environment whilst online. Currently a variety of industries use such technology to help market their services and products. Over the last few years, the quality, usability and accessibility of virtual tours has improved considerably with some websites allowing the user to navigate the tours by clicking on maps or integrated floor plans. For most business purposes, a virtual tour must be accessible from everywhere. The major solution is a web-based virtual tour. In addition, a rich and useful virtual tour is not just a series of panoramic pictures. A better experience

can be obtained by viewing a variety of materials such as that obtained from videos, texts, and still pictures in interactive web content.

2.3.2 Virtual Walkthrough Websites

There are many virtual tour websites which provide information in using various methods to perform virtual tours. Some websites are best experienced in three dimensions and virtual walkthrough such as university campus tour, city tour, 3d model tour, etc.

A. Satellite Image Corporation

This site provides high resolution satellite sensors and aircraft imaging data. It support of 3D modeling with detailed terrain surface elevation models assists urban planners and municipal manager to visualize the urban space in three dimension. Geographic information system (GIS), global positioning system (GPS), geodesy experts are experienced in the extraction, manipulation and supplementation of satellite image data. Satellite Image Corporation products are used in a variety of applications such strategic, tactical and operations, combats missions, route planning, training and simulations, Air sea and land navigation and etc.



Fig 2.1 3D Terrain Flythrough Scenes

B. 3Vdia

3DVIA.com, otherwise known as the 3DVIA Cloud, is an online service providing specialized 3D content hosting, interactive viewing and a suite of SaaS (Software as

a Service) applications designed to help 3D professionals to communicate, market and sell more effectively. Users can upload their 3D modelling to this website to provide virtual walkthrough for their models through website. In this website, users can tour their models as well as all the available other models. A plug in software installation is required to perform non immersive virtual walkthrough and users can choose their favourite avatar to enable first person view. Users can also communicate each other while they are in the same model.

C. Sketchfab

Sketchfab is a web service to publish interactive 3D content online in real-time without plugin. All users can upload their 3D model via this website but the upload size is distinguished between free and premium users. The advantages of this website are it supports smooth mouse navigation, less loading time, clear visualization to view 3d models.

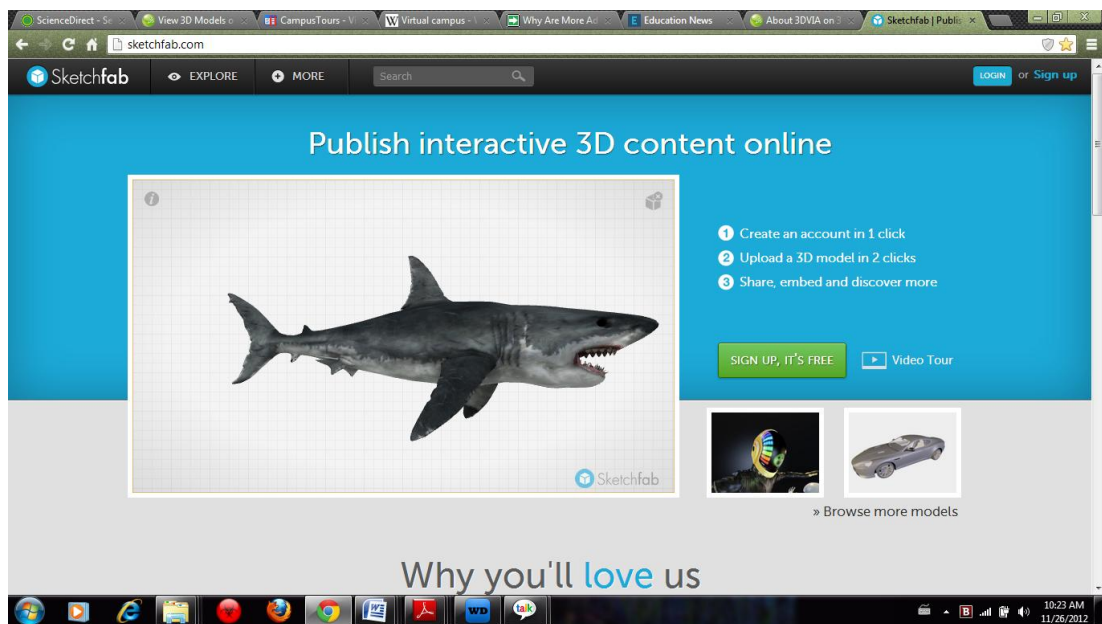


Fig 2.2 View of 3D Model via Sketchfab

CHAPTER 3

METHODOLOGY

3.1 Rapid Prototyping

In developing this project, a methodology has been chosen as guidance to complete the development. The methodology has been chosen is "Rapid Prototyping". According to this methodology the development of this project is carried out several phases such as planning, requirement analysis, design and implementation of prototype, testing or evaluate prototype (validation), and final implementation. Each function is divided into a set of specific activities.

3.1.1 Planning Phase

In planning phase, the developer defined the solution in details what to build, how to build, who will build and when it will be built. During this phase, the developer identified an appropriate project base on the developer's interesting field, Virtual Reality. After looking at the current situations and needs, the developer chose an interesting topic for the VR project. The developer also explored on the techniques that help to achieve the project and validate the technology for the project. After that the developer proposed the topic and the implementation of the project started when the developer got the approval. During this phase the developer also created the project schedule which consists of multiple tasks lists that are needed to perform in specific time.

3.1.1 Analysis Phase

During the analysis phase, there are a number of questions which need to be addressed that the design model will follow based on proper assumption. For that, this phase has been divided into two categories which are:

a. Problem Analysis

In this phase the developer analysis on the current situations and problems exist about why this project is needed to implement and the problems that could be occur while implementing the project. The developer analyzed on the current available system and found out that the current UTP main website only provides 2d images for some of the buildings in university campus and the information provides for the

campus buildings are very general and limited. There is no such system that allows users to make a virtual tour to view university campus buildings therefore people who want to know how the campus building are look like, the cannot get clear image. Based on the problems that have been found, the system improvement objectives are established.

b. Requirement Analysis

During requirement analysis, The developer analyzed on several questions for require data and information to implement this project such as what type of virtual tour is the best, what type of software should be used, how to use the chosen software, how to get information about the building selected to make model for virtual tour, etc. During this stage, the developer was able to identify the requirements to implement the project and gathered the ways to cover these requirements.

The developer performed the requirement specification which involve tremendous research though books, journals, web press, Wikipedia and consultations. From these research and studies the developer gathered information about Virtual Reality, Virtual Walkthrough and its applications.

As described in literature review, there are three popular methods to make virtual tour system. The developer chose 3D virtual tour method to use in this project as users will get better touring experiences compare to other two methods. This method consists of creating 3D model for the selected building and provides virtual walkthrough so that users will be able to perform walk around activity inside the model using mouse navigation on a computer screen. By this touring experience, users will get the better view for the real structural configuration of the building and they can move around wherever they want inside the building. This type of touring will give more satisfactions to users and it is more realistic than others as it allows users to move around the building freely like in the real environment.

After choosing the touring method to use, the developer focused on which type of software should be used in developing 3D model. There are many 3D modeling software available to create 3D models, but after looking at the Google Sketchup 3D models in Google Town Competitions, the developer was more interesting in Google SketchUp software as the created models are very realistic. Therefore the developer learned about Google SketchUp 3D modeling software and chose to use it to create

the 3D model of the building. The drawing tools and functions in Google SketchUp are also easy to learn for the beginners and the output 3D models are very realistic. The more information about Google SketchUp 3D modeling software will be stated in Tool Requirements section in this chapter.

As for the requirement of having skills in creating 3D models using Google SketchUp, the developer learned basic functions about how to create a 3D model by practicing the tutorial videos available in the internet. The following figure shows the simple 3D objects created by the developer after watching tutorial videos.



Figure 3.1 Simple 3D model created in Google SketchUp

During requirement analysis, the developer gathered the information about the selected building, Pocket D to create 3D model. The developer learned the design and appearance of the Pocket D building and the rooms it consists. The developer also took and gathered pictures of the pocket D building to make a realistic 3D model design. The following figure shows the picture of the Pocket D building.



Figure 3.2 Pocket D building

3.1.2 Design Phase

The second stage is the design stage, which emerged and using the outcome of the analysis phase. This phase is basically refers to the objectives of the project. The more specific the objectives, the more the design will be. In design stage, sketch is needed as a guideline in producing 3D model of the Pocket D building and its environment by drafting the scene graph, a map and a simple design.

In more details, the developer created the simple 3D model design for the pocket D building to reflect the shape of the actual building. Base on the simple design, the developer was able to identify the compositions of the main blocks in the building. There are four main blocks, lecture theatres consist in the building and each block has the same shape and design which is look like a theatre. Therefore the developer also made a simple design for single block.

Later in this stage, the developer created the simple models and it was expected to have fully design 3D models as an output which will guide through in development stage.

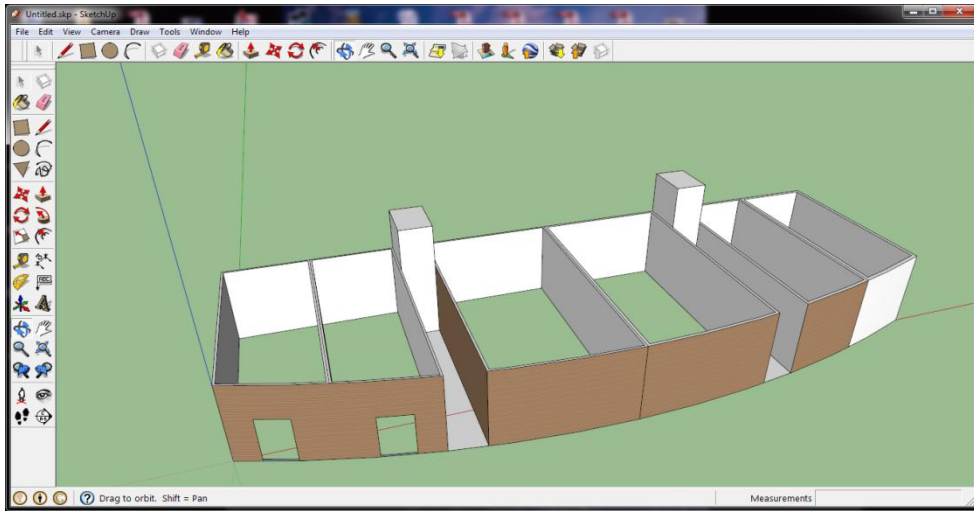


Figure 3.3 Simple design of Pocket D building

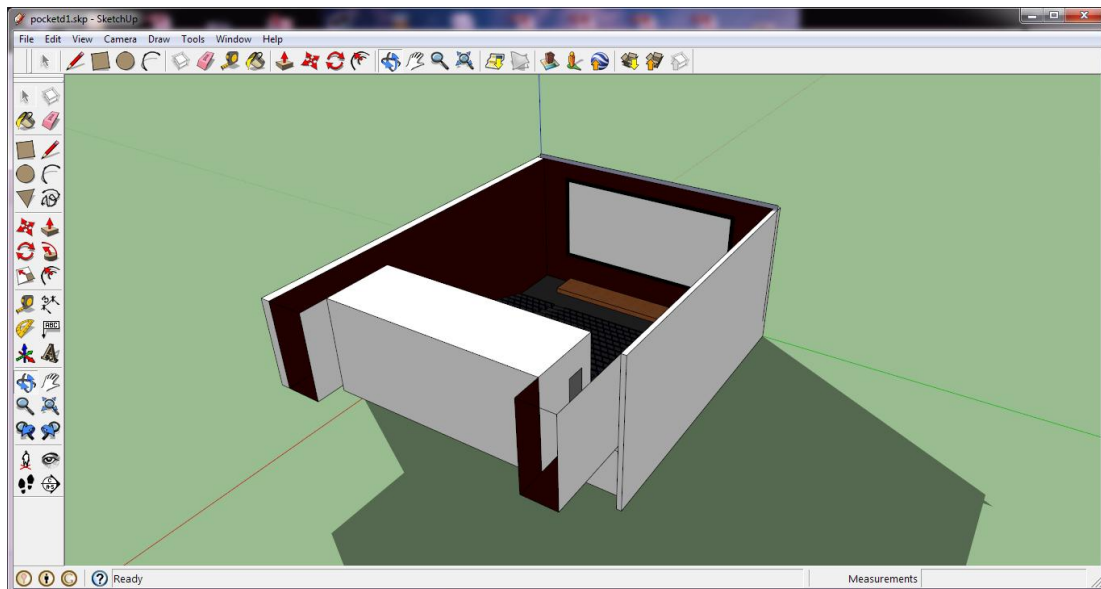


Figure 3.4 Simple design of single block

3.1.3 Implementation Phase

The third phase is implementation phase. Modeling the building and its objects is part of this important phase. Every step is very important during this phase as a mistake will affect the entire development of the project. During implementation phase, the developer focused on the detail improvements of the single block. Each block consist lecture theatres on second floor therefore the developer focused on these lecture theatres first. The rows of the seats consists in the lecture room are in

ladder shape which is step by step from top to bottom. Therefore the developer created the base of the theatre floor to get in ladder shape. After creating the floor, the developer made a model of the seat and copied the seat model to get more seats as all the theatre seats are in same design. The developer made model for the rows of seats and placed it on the floor. The developer added more objects in the lecture theatre such as projector, computer, white board, to match the facilities providing in actual lecture theatre. During creating lecture theatre, the colors and shapes of the design of each object are considered to match with real environment.

After creating a lecture theatre on the second floor of the model, the developer created a room beneath the theatre floor to get the ground floor room of the building. The details objects would be added in the ground floor rooms depend on the usage of the rooms in actual building after combining the each block. As a result a 3D model of the single block is created.

After creating single block model, the developer copied the entire block to make other blocks. The copy and paste function in Google SketchUp allowed the developer to achieve in multiplying single model to many. Therefore the developer created four other models which has same design and combined all of them to get the whole Pocket D building. During combination of the 3d model blocks, the shape of the Pocket D building was needed to follow. The Pocket D building has a curve design therefore the developer placed each block to get the curve shape. After combining each block, the design of whole pocket D building was created.

Later in developing stage, the developer added more detail objects in ground floor rooms relating to it usage. As for an example, the developer made a ground floor room to become canteen by adding related objects such as ovens, dining tables, chairs, etc. The developer also created stair cases, escalators and floors which are the components of the Pocket D building. After combining all related models in its actual design, the whole 3D model for Pocket D building was emerged.

After creating the model for Pocket D building, the developer implemented a system to make virtual walkthrough of the model via web browser. The developer used Hypercosm Teleporter plug-in application to export Google SketchUp 3D model to *.html format so that users can see the model using web browser. In need of Hypercosm application, users need to install Hypercosm viewer to enable virtual walkthrough via web browser.

During this phase, the model will be tested. This involves showing the model to people to find whether it has met the user expectation and requirement. In this case the developer showed the created model to other students. Base on these tests results, the developer made changes during implementation.

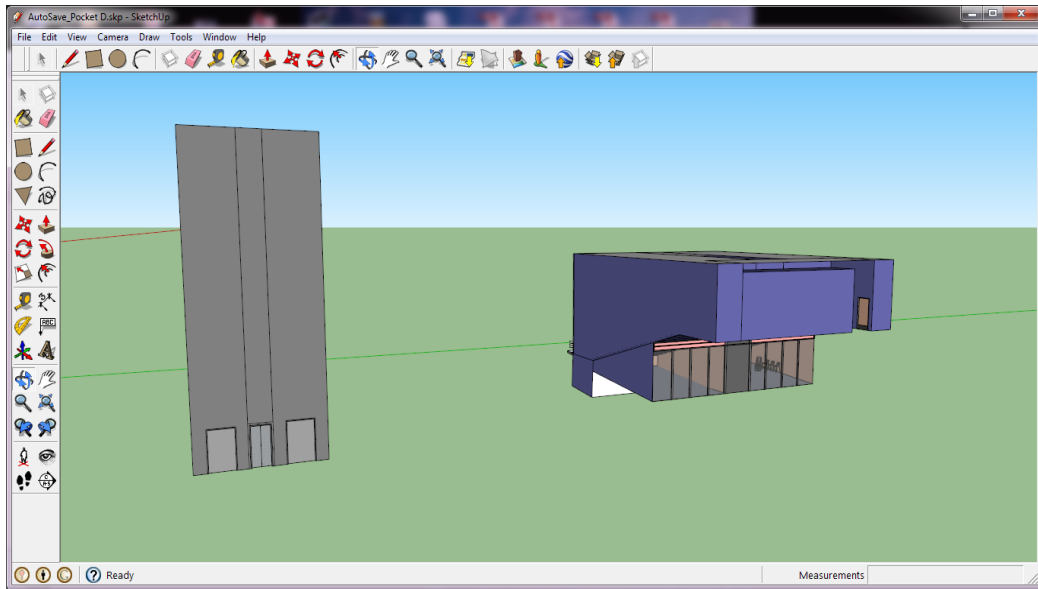


Figure 3.5 Single Block and Elevator models

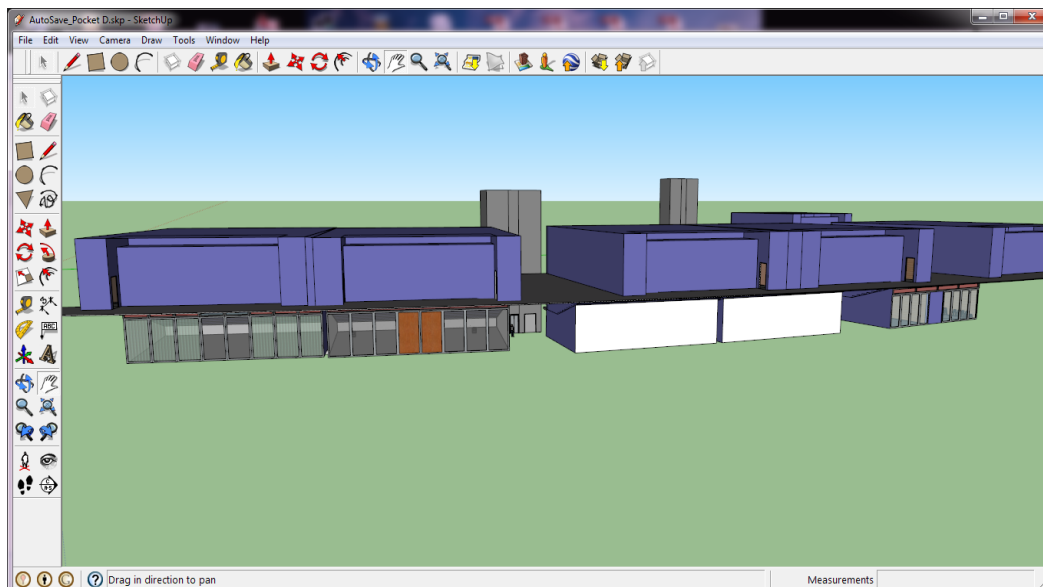


Figure 3.6 Model of Pocket D Building after Combining Each Block

3.1.4 Evaluation Phase

The phase will start off evaluating the prototype to check its effectiveness and efficiency such as how the created 3D model reflect to actual building and this project will be tested to see how it works in HTML. There are two kinds of evaluation that will be implemented which are:

a. Formative evaluation

Each implemented phase to check the effectiveness and quality of each stage. The developer showed the created 3D model to other students after creating 3D model of single block and base on their recommendation, the developer made changes in 3D model. After that the developer made another stage which is combining 3D models to get Pocket D building and show the model to other students again to get their feedbacks on current stage. Finally the better 3D model was created for this project.

b. Summative evaluation

Judges the entire product and focused on the outcomes. The developer performed system testing on virtual walkthrough via web browser by using different web browsers such as Firefox, Internet Explorer, Google Chrome, etc. After getting the feedbacks based on testing, the developer can indentify if there anything to integrate will be proceed in the final implementation stage. The developer showed the final system to other students to get their recommendations. Base on the results, the current system has few weaknesses such as lack of smoothness and showing 3D model to make walkthrough due to the weakness of Hypercosm application. The 3D model of Pocket D building is needed to add top floor of the building to get a complete building. Apart from these, users were interesting and like to get virtual walkthrough system for their university campus building.

During evaluation phase the developer was able to identify the needs for the improvements.

3.2 The Work Flow (Execution Chart) & Gantt Chart

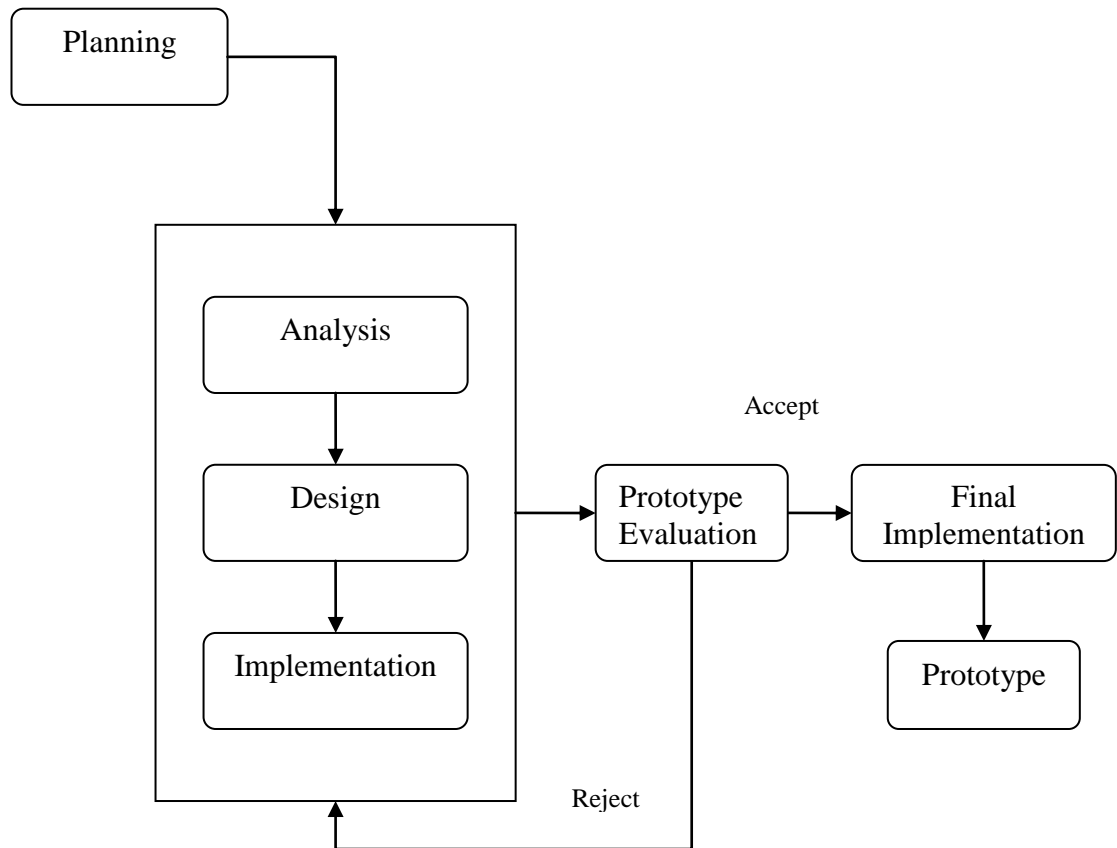


Figure 3.7 Rapid Prototyping

		Week													
No	Task Name	1	2	3	4	4	6	7	8	9	10	11	12	13	14
1	Research Work	■	■					M							
2	Analysis			■	■	■	■	I							
3	Design				■	■	■	D	■	■	■	■	■		
4	Draft Implementation							S	■	■					
4	Prototype Evaluation							E			■	■	■	■	
6	Final Implementation							M					■	■	■
7	Prototype							B							■
								R							
								E							
								A							
								K							

Figure 3.8 Gantt chart

3.3 Tools Requirment

- Google SketchUp 8 Pro

Google SketchUp is a tool that is used to create, edit and share 3D models. It is professional 3D models creating tools used in game, architectural visualization studio and many people who want to use a 3D modeling program such as game developers, civil engineers, architectures, etc, are using this product. Google sketch-up also support to locate the model of 3D building in Google Earth. Therefore users can use Google-Earth to get the location and access the virtual tour to building. The functions inside the Google SketchUp are easily to get familiar for creating 3D images. Google SketchUp provides users to upload their 3D models to Trimble 3D Warehouse website as well as they can view and download other models.

- Hypercosm Teleporter 1.8.0.2

Hypercosm Teleporter provides one-click exporting of users' 3D models from Google SketchUp Pro into interactive 3D web pages or for sending their models via email, viewable on any Windows or Macintosh computer. The export model is converted into a compact "view only" format that allows others to view the model, but not modify or change it. This allows users to share their 3D models and keep their design data private. Hypercosm applets also contain rotate, pan, and zoom controls that allow you to view a 3D model from all angles.

- Hypercosm Player 3.52

Hypercosm player software uses a standard "plug-in" mechanism to integrate with users' web browser in a similar way to other standard web based rich media types such as Apple's Quicktime or Adobe's Shockwave. Once users install this player, they can view any simulation that has been created with the Hypercosm 3D technology.

CHAPTER 4

RESULTS & DISCUSSIONS

The foremost objective of the project is to provide a virtual tour experience of Pocket D building in the official UTP website. Google SketchUp assistance in developing the model is much helpful and easy to use. 3D warehouse provides with ready-made objects, furniture and etc to use in decorating the model. However, due to time constraints and other considering factors, sample website was not able to finish and the objective aim changed to incorporate in web browser.

Hypercosm Teleporter for SketchUp, plug-in is required to export SketchUp 3D model for web browsers, developed by Hypercosm was used for smooth transition from SketchUp 3D plane to interweb. It offers two different kind of virtual tour experiences for the user. Cameras option, which can be used to view the whole model in scenes, was pre-programmed with picture sequences from the model. This type of static virtual tour is suitable for quick glance and general overview of the model. The usefulness of this option is limited depending on the how much picture sequences are provided before export. Second option, which can be used to view the model as virtual walkthrough, was combination of mouse and other functions. This dynamic true virtual tour type assists the user to experience the model in motion. However, smooth walkthrough is not achieved due to some weakness in Hypercosm viewer which would be an issue if the user is surfing with slow internet connection. Hypercosm viewer is required to view the model in web browsers.

The 3D model which contains of chairs, computers and tables, walls are created by Google SketchUp software. The lighting and view point were set up to allow viewer to walk around and see the rooms. The theatre, cafeteria, photo studio, mini mart, alumni office were created with relevant information. However the finished 3D model for Pocket D will be needed to modify and add further functions for future development.

4.1 Challenges

During the implementation of this project, the developer faced many challenges and difficulties. The most challenges were occurred while creating 3D model for this project and implementing a system to make virtual walkthrough for web browser. The developer was lack in knowledge of using Google SketchUp 3D modeling software. Therefore the developer faced challenges in creating 3D models. Creating the 3D model of the building that exists in the real environment needed to make every objects of the building to look similar by following the exact structure design of the actual building. The most challenging part was while combining the separate 3D model blocks together to get the Pocket D model. The actual Pocket D building design is in curve shape. Therefore each block was needed to rotate several times to get correct angles and positions. During this process, the developer needed to select the whole block which consists of everything in the block model, therefore it sometimes took long loading time to process and there was lack in smooth rotation. And it also made the Google SketchUp software to stop working sometimes. Therefore back up files are needed to save after each improvement.

The other challenge occurred in creating 3D model is adding floor to divide the story of the building. The floor is the component that connected each block of the building and other objects such as elevator and stairs. Therefore the developer needed to perform lots of works on edge of the floor and block to combine.

There were several difficulties occurred during implementing a virtual walkthrough system for the users which enable to view via web browser. The current application used, Hypercosm viewer has some weakness in showing 3D model and touring the model. Therefore while the model is viewed via web browser, some of the SketchUp model components are lost. The objects, glasses that used in SketchUp model are transparent but when users view it from web browser using Hypercosm viewer, it turned into white walls. Users also lost smooth walkthrough experiences during virtual tour using mouse navigation which is because the model of Pocket D building is combining with many 3d models. Hypercosm viewer only can perform smooth walkthrough on small 3D models.

The other challenge in this project is the time. The time given to create this project is limited therefore the current 3D model only covers for ground and first floor of the actual Pocket D building. The top floor of the Pocket D building which consists of

several offices are need to add in future works. The creating of simple website for virtual tour Pocket D building has not been covered yet due to the time constraints.

4.2 Screenshots

Following images are SketchUp 3D model of Pocket D from various view points and angels in Google SketchUP application. Although it is not a complete model which does not include third floor offices, it includes second floor, lecture theatres and ground floor rooms which are in place. The dimensions are kept true as much as possible to its original measurements.

As shown in the following figures, the 3D model of Pocket D building was created by combining five blocks. The structure of the building is combining two blocks together and then separated with stair cases and elevator. Therefore it looks like three separate blocks are consisting in the building even though five blocks are consisted actually. Each block has one lecture theatre on the first floor and a room at the ground floor. Most of the lecture theatres have same interior design except lecture theatre D5 and D6. As shown in the figure 4.9, the lecture theatre D5 and D6 is separated in one block while other lecture theatres are using one block for one lecture theatre. The facilities provided in each lecture theatre are the same, one computer, one projector, one white board, theatre seats, etc. Therefore the developer created one block and copied it get other blocks and combine them all.

But the ground floor rooms are different depends on their usage. More in details, the ground floor room from first block is used for student support services office, the second block's ground floor room is used for alumni office. The third block's ground floor room is used for cafeteria, the fourth block's ground floor room is used for gallery store and the last ground floor room from fifth block is used for mini market and photo studio. As shown in the figures, the developer currently created more details for the cafeteria by adding its related objects. Some of the 3D objects models decorating in the cafeteria are the models from SketchUp 3D web store such as chairs, ovens, etc.

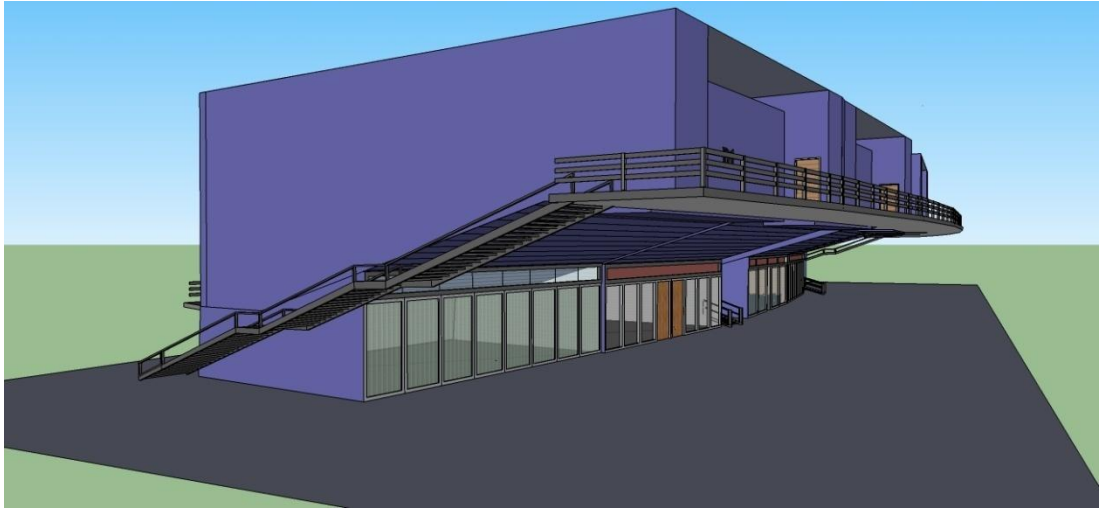


Figure 4.1 Side View



Figure 4.2 Side View



Figure 4.3 Front View

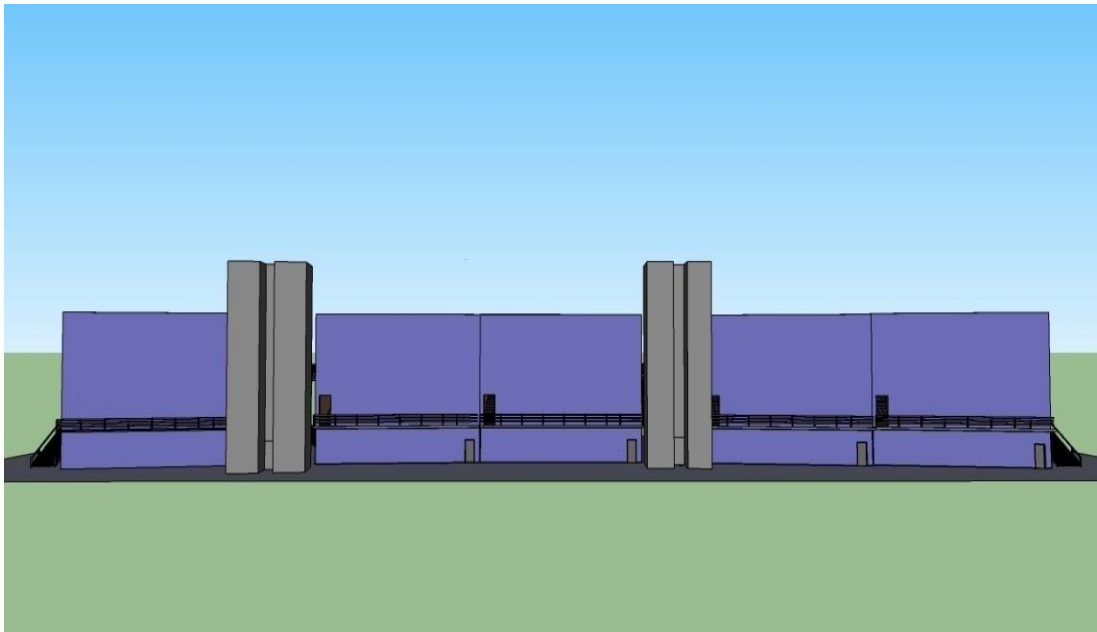


Figure 4.4 Back View

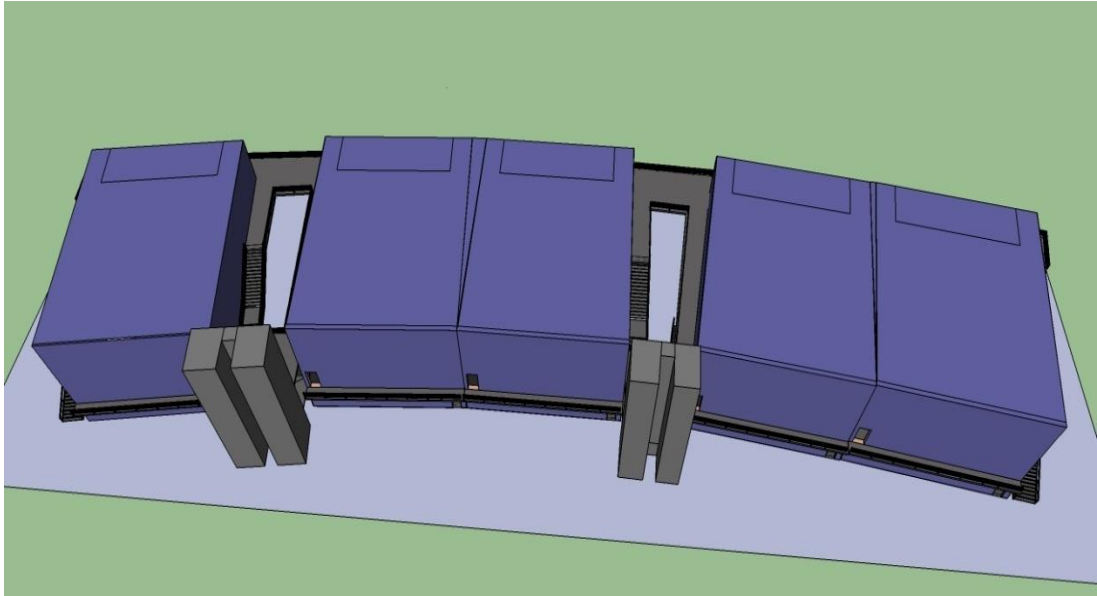


Figure 4.5 Bird Eye View

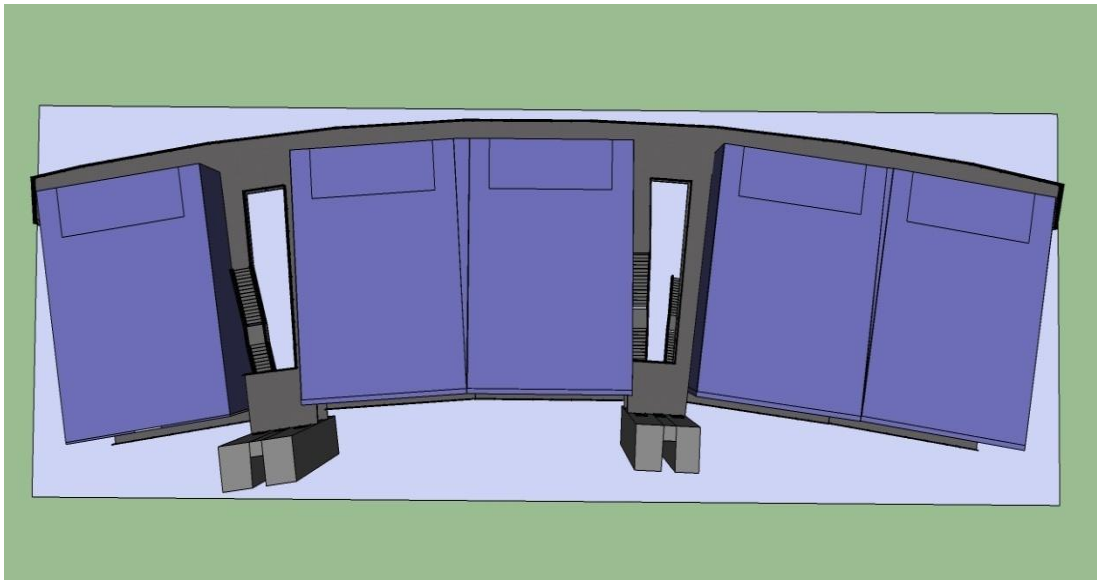


Figure 4.6 Above View



Figure 4.7 Front View of Lecture Theatre D1, D2, Student Support Services Office and Alumni Office



Figure 4.8 Front View of Lecture Theatre D3, D4, Cafeteria and Gallery Store



Figure 4.9 Side View of Lecture Theatre D5, D6, Minimarket and Photo Studio

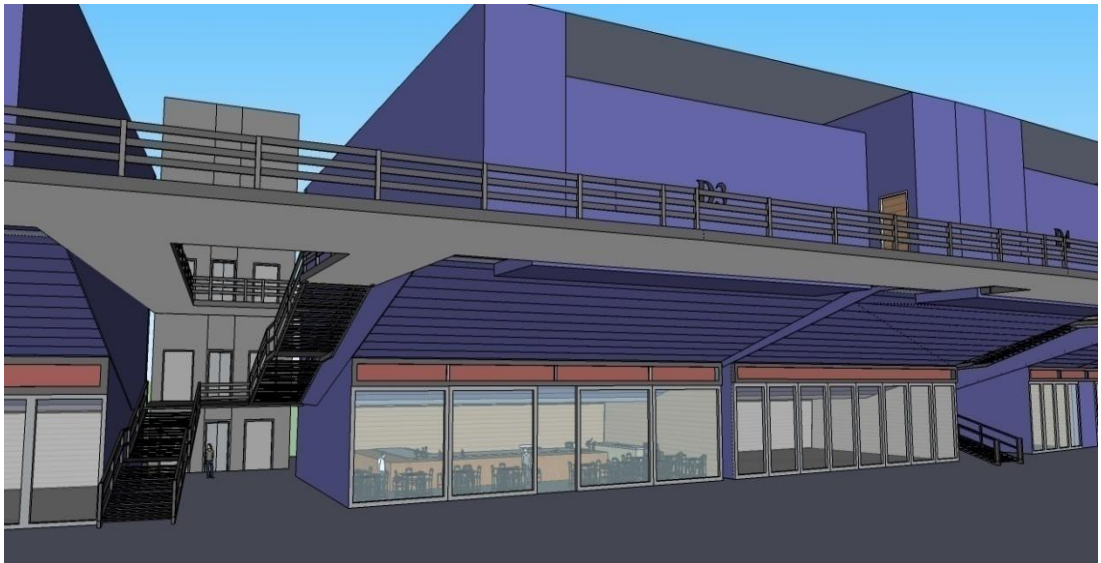


Figure 4.10 Block Cross Sectional View of Staircase and Elevator



Figure 4.11 Inside Cafeteria



Figure 4.12 Inside Cafeteria

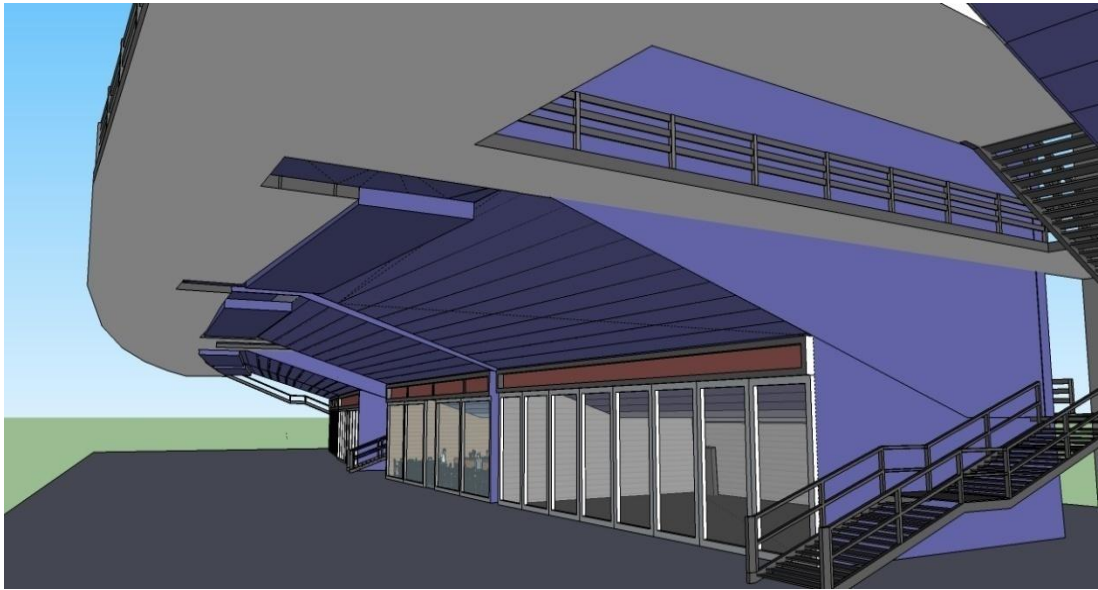


Figure 4.13 Ground floor View



Figure 4.14 Staircase

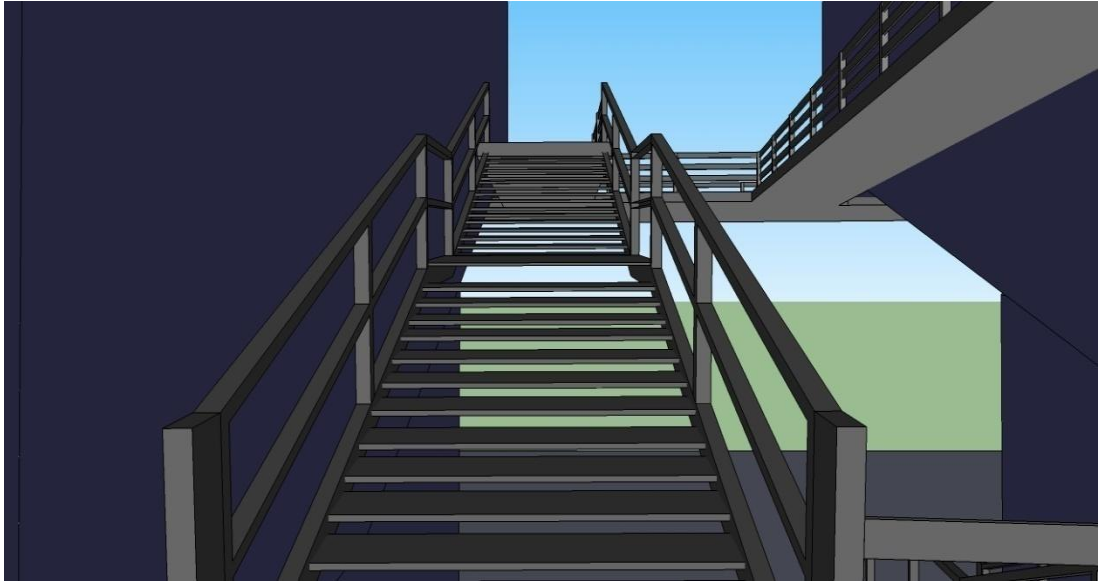


Figure 4.15 Staircase

The following figures show the inside view of lecture theatre D1 and D4. As shown in the figure, these two lecture theatres are different. The inside view of lecture theatre D3, D5, and D6 are same with lecture theatre D4. The lecture theatre D1 is the same with D2. There are differences because lecture theatre D1 and D2 is sharing one block. Therefore these two rooms are smaller compare to other lecture theatres.



Figure 4.16 View From Entrance Inside Lecture Theatre D1



Figure 4.17 View From Entrance Inside Lecture Theatre D1

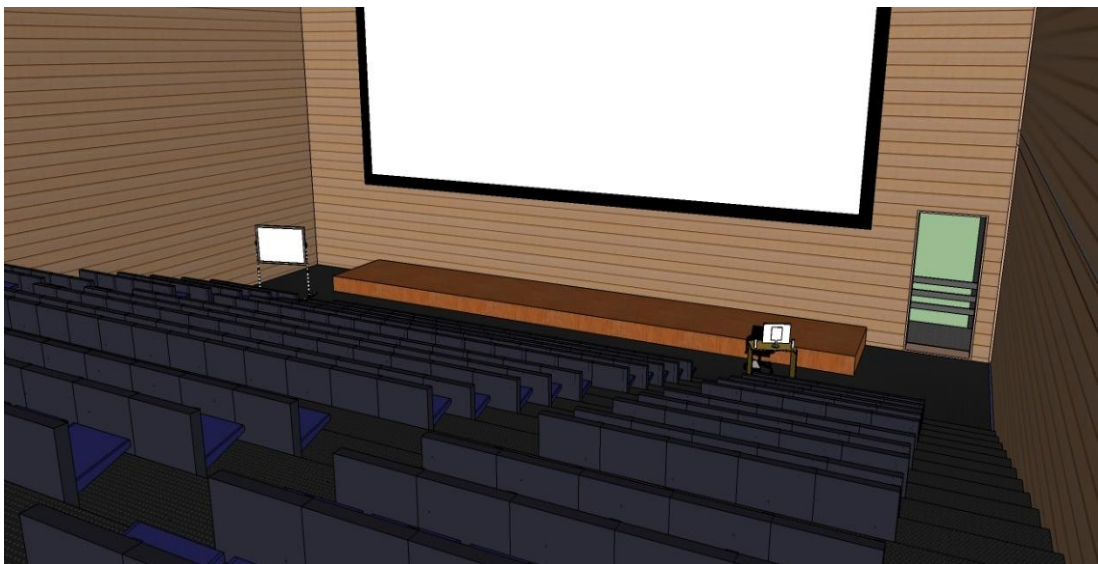


Figure 4.18 View From Entrance Inside Lecture Theatre D4

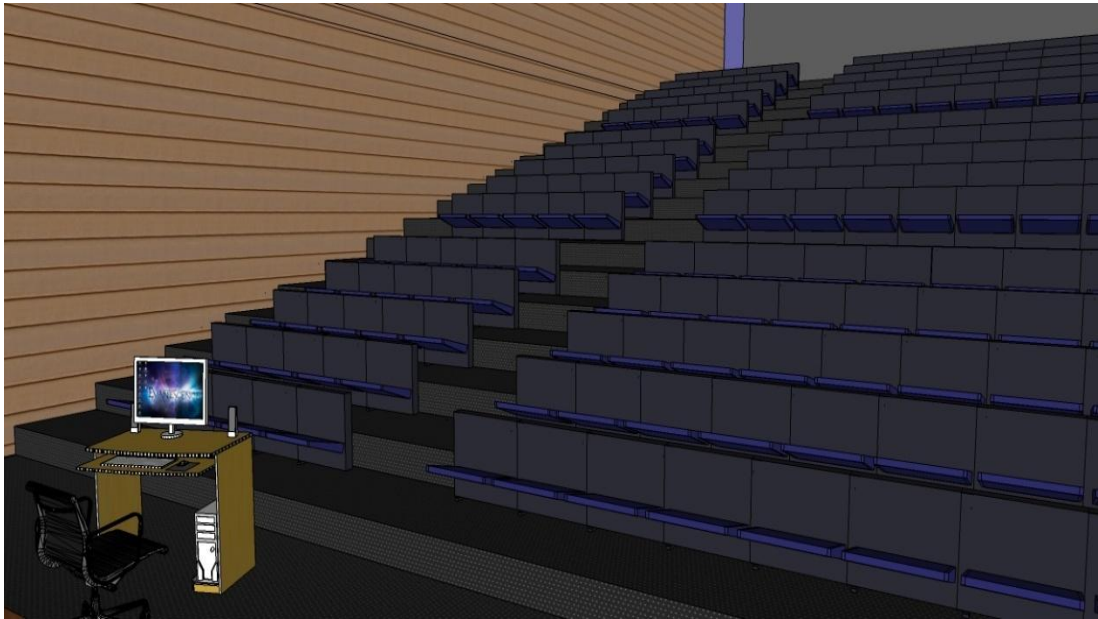


Figure 4.19 View From Front Stage Inside Lecture Theatre D4

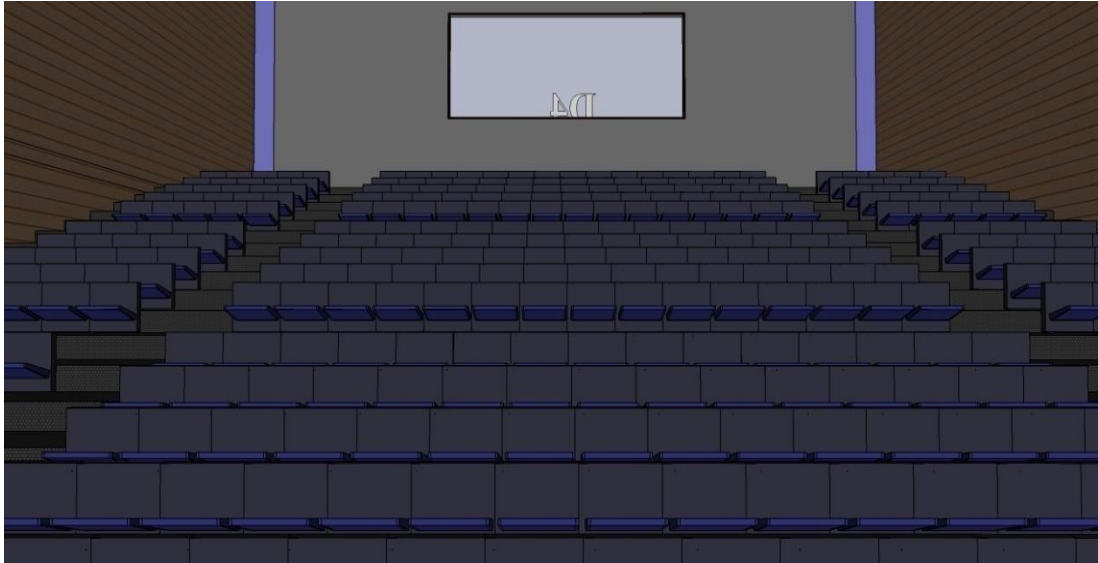


Figure 4.20 View From Front Stage Inside Lecture Theatre D4



Figure 4.21 View From Front Stage Inside Lecture Theatre D4

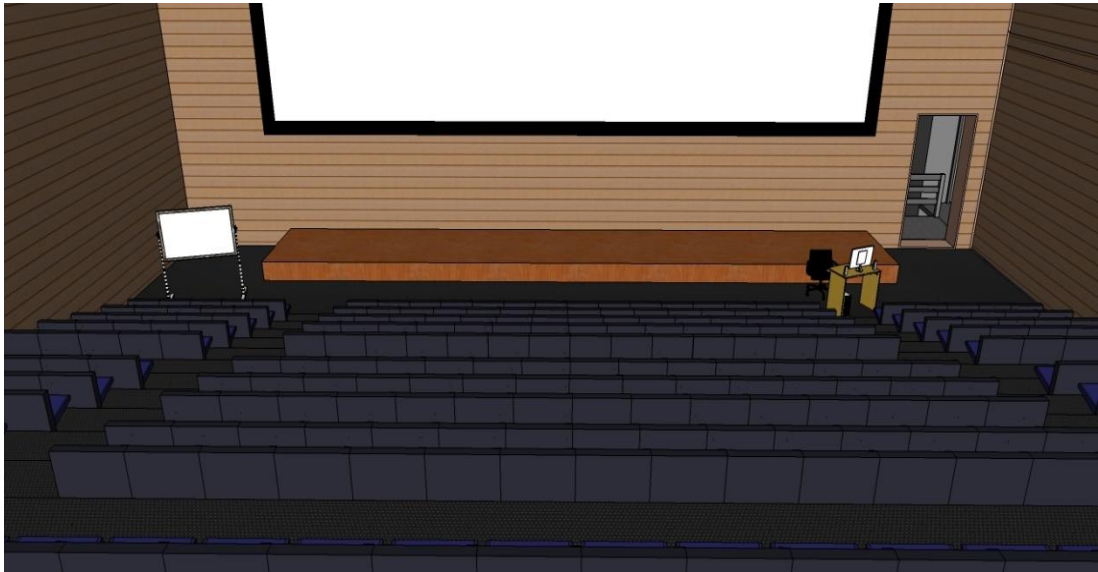


Figure 4.22 View From Control Room Inside Lecture Theatre D4

The following figures show the browser view of Pocket D building and its rooms. These screen shots are taken while viewing the Pocket D model using Internet Explorer browser. As shown in the figures, the objects that used for glasses are changed to white wall and the colours of the glasses are not same as in SketchUp model. And also the floor in lecture theatre and the ceiling inside cafeteria are change. This happens because of the weakness of Hypercosm viewer. Apart from these weakness Hypercosm viewer enable the users to view the 3D model and make virtual tour via web browsers.



Figure 4.23 Browser View (Side)

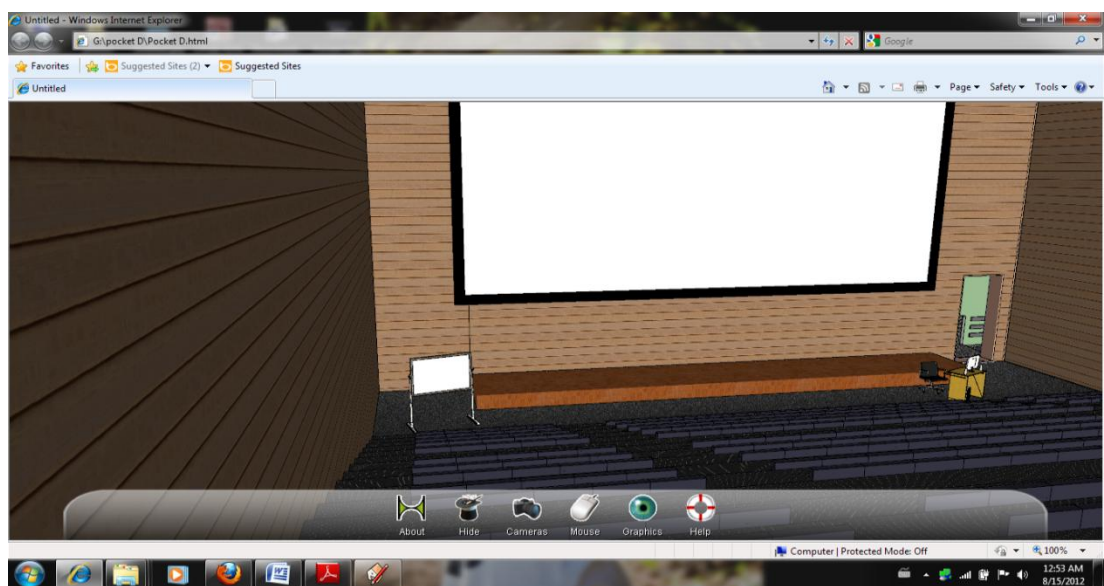


Figure 4.24 Browser View (Inside Lecture Theatre D4)

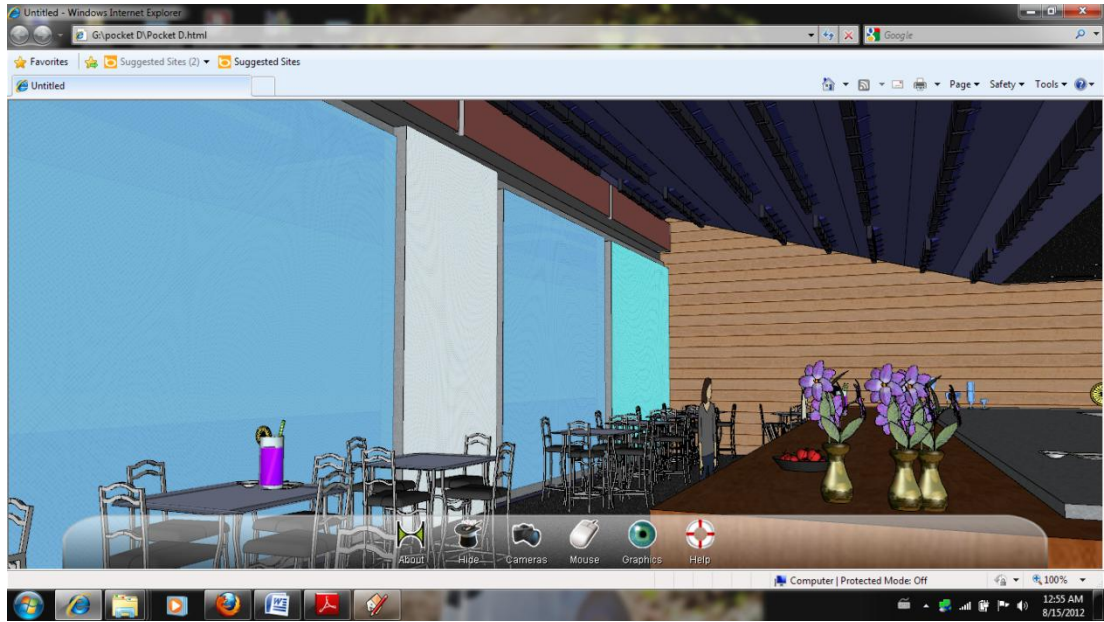


Figure 4.25 Browser View (Cafeteria)

CHAPTER 6

CONCLUSIONS & RECOMMENDATIONS

CONCLUSIONS

In conclusions, virtual tour experience is expanding and progressing concept of presenting the image in new era. It might be time consuming and need lots of working hours to develop a complete model, the results are much more than satisfactory. Virtual Walkthrough to Pocket D project is to develop a virtual tour which has not been introduced in UTP website. Google SketchUp offers easy way to make a model required for the tour. Hypercosm Teleporter and Viewer are essential for integrating the model with web browser. It comes with two different kinds of virtual tour, static and dynamic, to the users. All the objects are 3D models and acquired from 3D warehouse by Google. The main objective of the project, a model, able to show the 3D image of Pocket-D building with capabilities of virtual tour and can be accessed through webpage, is fulfilled.

RECOMMENDATIONS

Current SketchUp model lacks in smooth walkthrough which might be due to the weakness in Hypercosm viewer. It can be improved in terms of adding more information such as third floor offices and more details on ground floor rooms. Incorporating this virtual tour into UTP main website is the priority task for future development. This step would be the cornerstone of transforming the whole campus virtual experience rather than just a building. It still can be improved further as a 3D campus, presented by Google earth in 3D city, which would benefit in presenting the university as attractive, technologically advanced and sound academic environment for future bright students.

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APPENDIXES

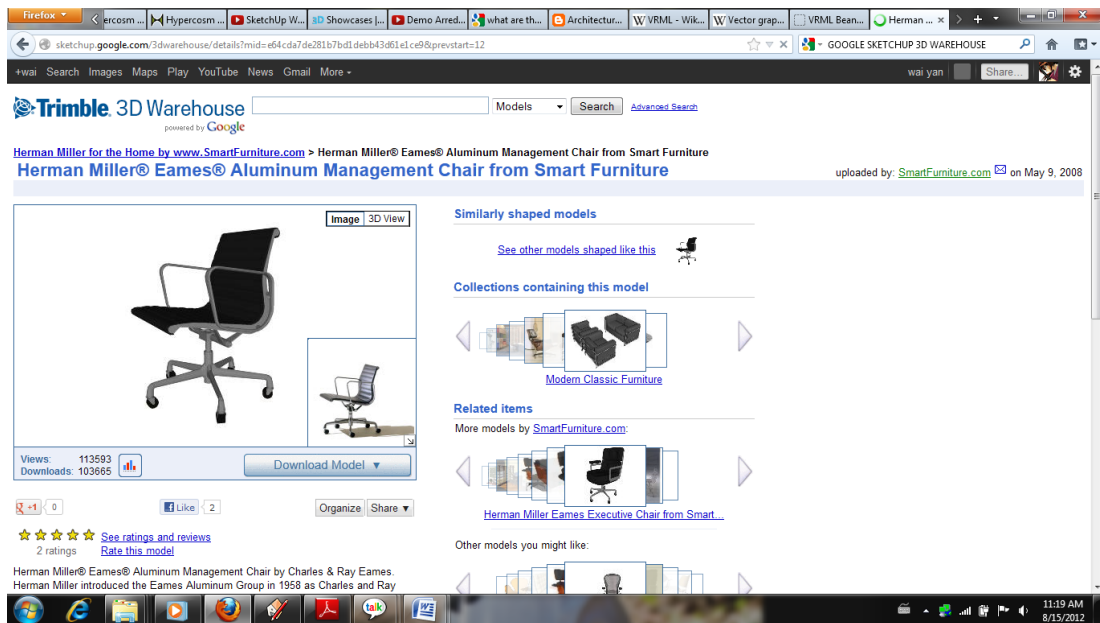


Figure A1: Google 3D Warehouse for SketchUp models



Figure A2: Hypercosm Teleporter for Google SketchUp



Figure A3: Hypercosm player