BORANG PENGESAHAN STATUS TESIS^

JUDUL: 3D VISUALIZATION FOR TSUNAMI DISASTER

SESI PENGAJIAN: 2005

Saya MEJUWINER RIMUS

    (HURUF BESAR)

mengaku membenarkan tesis (PSM/Sarjana/Doktor Falsafah) ini disimpan di Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dengan syarat-syarat kegunaan seperti berikut:

    1. Tesis adalah hakmilik Kolej Universiti Teknikal Kebangsaan Malaysia.
    2. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat
salinan untuk tujuan pengajian sahaja.
    3. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat
salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
    4. ** Sila tandakan (/)

_____	SULIT	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
_____	TERHAD	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
/	TIDAK TERHAD	

(TANDATANGAN PENULIS)   (TANDATANGAN PENYELIA)

Alamat tetap : 91, DRIVE 18, REJANG PARK,   NORAJLIN BT. MOHAMMED
SIMPOH ROAD, SIBU, 96000 SARAWAK.   Nama Penyelia
Tarikh : 23/11/2005   Tarikh : 23/11/2005

CATATAN: ** Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa.
^ Tesis dimaksudkan sebagai Laporan Projek Sarjana Muda (PSM)

3D VISUALIZATION FOR TSUNAMI DISASTER

MEJUWINER RIMUS

This report is submitted in partial fulfillment of the requirement for the Bachelor of Information and Communication Technology (Interactive Media)

FACULTY OF COMPUTER SCIENCE
KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA
2005

DECLARATION

I hereby declared that this project report entitled

3D VISUALIZATION FOR TSUNAMI DISASTER

is written by me and is my own effort and that no part has been plagiarized

without citations.

STUDENT: _____ Date: 23/11/2005
(MEJUWINER RIMUS)

SUPERVISOR: _____ Date: 23/11/05
(NORAZLIN BT. MOHAMAD)

NORAZLIN BT. MOHAMMED
Pensyarah
Fakulti Teknologi Maklumat dan Komunikasi
Kolej Universiti Teknikal Kebangsaan Malaysia
Karung Berkunci 1200
Ayer Keroh, 75450 Melaka

DEDICATION

To my beloved father Robertson Rimus

To my beloved mother, Josephine Pon Martin

To my beloved brother Donny and Raymond, Stanis, paul and Simon

Finally to my sister Catherine, Morton and Eva

Your strength and loves are incredible inspiration to me......

ACKNOWLEDGEMENT

A report such as this represents the hard work of many people. I would like to thank all of the people who helped make this report a reality. First and foremost, I would like to thank Mr. Hafiz Zakaria, a co-supervisor for his understanding work and invaluable comments and suggestions. Thanks again for his patience and professionalism in managing my requirement and to answer lots and lots of my questions. Next, I would like to thank my supervisor, Mrs Norazlin Mohamad, for her insight, skills and patience. Thanks for her assistance and cooperation in the preparation of this report. Not forgotten to my assessor, Ms Anusurya Devaraju for her commitment to this project assessment. On the personal side, I would like to thank my family, especially my beloved father and mother, for their understanding and teaching me patience and encouragement. Thanks especially to my brother, Donny who keep pushing me with a rousing cheer back into the fight. As always, thanks to my classmates and colleagues that gives a good cooperation and good views on my project. Thanks also go to my friend Normadihah, for her support and encouragement and sharing her ideas with me.

ABSTRACT

This project is about the visualization for tsunami disaster. It will be developed with the combination of 2D and 3D techniques. However, 75% of its content will be 3D visualization to visualize how tsunami occurs beneath the sea. Another 20% will consist of 2D animation to visualize the level of earthquake at different level measured in Richter scale. Finally the other 5% left will conclude a photo gallery and a few amateur footages during tsunami disaster. Most of the content is developed using 3D modeling techniques and tools especially 3D MAX studio and some plug-ins to support some visual effects. The water particle system will be the focus to consider during the development. This part will be rendered in 3D movie format. The 2D paths will be developed using Flash Professional Edition, especially to design the interfaces, creating buttons and the animation. The photo gallery will consist of the photos taken during the disaster. The development of this application will contribute to the educational purposed and to make the public know how tsunami happened by using the 3D and 2D techniques approach. The focus will be on 3D element because of the advantages of this techniques comparing to 2D techniques. It provides a few interactions with the user, whereas the user has to select an appropriate button to view their selection. The content is based on the data of the latest tsunami phenomenon that occurs last year in Sumatra. The application will be probably easier to use and will be away from the traffic problem that usually occurs on network and the problem related to resolution the size of the 3D files. It will come out with an interactive interface designed in Flash environment and have the element for a user- friendly designed.

ABSTRAK

Projek yang dibangunkan ini adalah sebuah CD yang mengandungi visual pembentukan tsunami dalam 3Dimensi. Sedikit elemen 2Dimensi turut dimasukkan untuk membantu menjelaskan tentang pembentukan tsunami. Ia juga memberikan sedikit maklumat tentang skema pembentukan, sejarah bencana alam ini dan tanda-tanda awal pembentukan tsunami serta langkah-langkah keselamatan yang perlu diambil untuk keselamatan. Selain itu, visual ini turut mengandungi sedikit koleksi gambar-gambar yang diambil semasa tsunami seperi perbezaan bentuk muka bumi sebelum pembentukan tsunami dan bentuk muka bumi selepas pembentukan tsunami serta merangkumi gambar gambar semasa tsunami pada lewat 6^{hb} Disember tahun lepas. Visual ini akan dapat memberikan gambaran dan meningkatkan pemahaman orang ramai tentang pembentukan tsunami dan punca-punca pembentukan yang mungkin sukar untuk digambarkan secara "*live*", kerana ianya berlaku di dasar lautan dan lapisan dalam bumi. Dalam penghasilan visual ini, elemen yang dikaji ialah kajian berkenaan pembentukan ombak dalam dimensi 3D. Selain itu, visual ini mengandungi butang-butang interaksi asas seperti untuk memulakan visual, memberhentikan visual, mengaktifkan bunyi serta interaksi butang untuk pergi ke antaramuka yang lain. Secara keseluruhannya, projek ini dapat dibahagikan kepada tiga bahagian utama iaitu, info berkenaan tsunami, visual pembentukan tsunami dan galeri gambar. Bahagian utama adalah visual tsunami yang memaparkan visual pembentukan tsunami yang perpunca daripada ledakan gunung berapi dasar laut dan gelinciran kerak bumi dasar laut akibat gempa bumi. Platform akhir yang digunakan untuk menggabungkan elemen-elemen multimedia dalam projek ini ialah Flash Professional 2004. Penghasilan visual dibangunkan menggunakan 3D Studio Max dan Adobe Premiere.

TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE

LIST OF TABLES

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

LIST OF ABBREVIATIONS

MPEG	Motion Pictures Experts Group
JPEG	Joint Photographic Experts Group
DNT	Digital Nature tools
BBC	British Broadcasting Corporation
3D	3 Dimensional
2D	2 Dimensional
CD-ROM	Compact Disc
CDR	Compact Disk (Rewritable)
CD	Compact Disc
MP3	Mpeg Layer 3
AVI	Audio/video interleave
GIF	Graphics Interchange Format
WAV	waveform audio
VRML	The Virtual Reality Modeling Language

CHAPTER 1

INTRODUCTION

1.1 Project Background

Tsunami 3d Visualization will contribute to the educational approach on tsunami issues. It will show the concept on the tsunami to ease people understand what is tsunami and how it erupted. It probably can be used as a reference by the public or by the earthquake or tsunami department or certain organization which has the similar approach to this issue. Currently, people are able to find out a lot of 2D tsunami visualization and animation on web. Most issues discussed are on the impact of tsunami and amatuer videos from the satellite view. The new approach proposed for this visualization is to enhange from the 2D to 3D perspectives. This project also consists of a few 2D animations and interaction with users.The main part is the 3D visualizations and the research elements cover the visual effects for water modelling and its characterictic. Specifically, the research will be on the tsunami element that tackle the tsunami wave for the oceans and other element like the movement of the tectonic plates.

It requires more researches on dynamic effects because it must be planned carefully to add realism to most of the scenes by simulating real physical reactions such as the impact of the distortion of tectonic plates.

1.2   Problem Statements

Currently, most of the tsunami visualization is developed in 2D software. It has its own limitation due to its limited angle of view users can view. However, many of the topic related to tsunami is developed in 2-Dimensional view, because it is easier to develop. The visualization becomes less attractive and interesting. The 3D techniques are very complicated but the products are far more attractive and interesting than 2D graphics. So, to come out with better graphics and visualization 3D modeling is a good idea.

Majority of the existing water/ocean model were not developed or created with 3D MAX or Maya softwares. Most of the models is developed using numerical coding in computer graphics, AQUA 3D, 3D Master, TUFLOW and AQUASEA. The various types of softwares being created to develop or model 3D water-based applications shows that it is not easy to model 3D water. It consists of quite a number of complex tasks. For this project, the ocean (water element will be modeled in 3D MAX). It required additional plug-in to support this development. The examples of 3D MAX Plug-ins are SeaScape, a plug-in that allows the creation of wave, ocean and wake effects. Atomizer expands the capabilities of MAX's particle systems, Particle Studio - Particle generation system for 3D Studio Max.

From the content aspects, less visualization developed focusing to what happened beneath the sea. Mostly shows the impacts of the waves and how it destroys the living creatures, buildings houses and the coast areas. A lot of digital graphics and

videos transferred on websites on this phenomenon. So, this project will come out with the visualization that consists of how tsunami occurs that people can't see in most of the videos on tsunami. Besides, it provides a little interaction with users, to shows the tsunami impact in different tsunami levels. The interaction buttons will be created and designed in 2 Dimensional software based in Flash.

The existing projects or systems that being published on web got their own problems. The 3D Tsunami model is very heavy and the access time to load it takes a longer time. So, to avoid this problem, it will be better to deliver the final project in a CD-ROM for a stand alone application.

1.3 Objectives

As usual, there must be the goal of doing each project. The objectives for this project are listed below:

1.3.1 To visualize the tsunami phenomenon to general on how it exactly occurs underneath the sea with 3D application

It is a good way to visualize the things that people can't see directly. For this case, people will firmly can't see how tsunami occurs deep beneath the see floor. People will hardly understand how it occurs as they can't see it. So one of the technique that is probably capable to give a better understanding for this issue is by visualized the phenomena in 3-Dimensional View. This will shows each tsunami element in clearer and more interesting graphics perspectives. In a real world, nobody can't take the video

for tsunami by going to the see floor and record how it happened or else they will definitely dead. People need to know how tsunami occurs and have a better understanding on this phenomenon because it will come anytime and will never tell when it occurs.

1.3.2 To show the differences of tsunami waves and impact in different Richter scale measurements

Richter scale is a unit to measure any earthquakes phenomenon. When the number increased (Richter scales), it means the earthquakes also stronger and got more disastrous powers. In this project, the users need to select the Richter scale class, being provided in the system. Once they select the Richter scales class, the system will display the impact (in geographical terms) in selected categories. They can view the different impacts on different Richter scale amount.

1.4 Scopes

The deliverable for this project is a stand-alone CD-ROM. There is no specific user being specified for this application. It can be used by anyone. The platform for this project will be windows based. The main part (3D visualization movie) will run within less than 5 minutes. There is no specific user being listed to use this project as it is a general knowledge on what public and general should knows. The processes involve to develop this project are researches, analyzing, storyboarding, modeling, animating, adding visual effects and rendering. There is a limitation in software used to develop this

project. The project will fully develop using 3D MAX 7.0 studio application. All of 3D objects and elements will be modeled in 3D MAX. Some simple interaction with users will be created in Flash and Swish Max environment to place certain rendered movie being created in 3D MAX. Basically this project can be divided into three main parts which are:

1.4.1 Tsunami Info

Tsunami info contains the information relates to tsunami phenomenon such as tsunami history, tsunami description and sign and tsunami early warnings. This part is fully developed using 2D elements in 2D softwares. Each part provides simple explanations for each topic discussed.

1.4.2 Tsunami Visualization

This is the main part of the project and is divided into two smaller categories. First category will explain on the volcanic eruption that causes tsunami waves. The second part will explain on underwater earthquake that generates tsunami waves within different earthquake levels based in Richter scale measurement.

1.4.2.1 Volcano Eruption

This part will describe on the volcanic eruption that causes giant tsunami waves. The 3D visualization is developed in Max and will be placed on 2D environment using Flash. Simple animation movie will run within 10 seconds to visualize the phenomenon.

1.4.2.2 Underwater Earthquake

This part contains four different animated movie clips. Main movie will visualize the tsunami forming in general. The other there movie clips consists of different underwater earthquake level that generates tsunami waves. They are specifies for three level according to minor, moderate and major earthquake levels.

1.4.3 Photo Gallery

1.4.3.1 Before and After Tsunami Disaster

This part contains of the comparison between two images that shows the images of the scenes before and after tsunami.

1.4.3.2. Tsunami Impact

Tsunami impact contains a few pictures taken during the disaster that happened last 26th December 2004. The user can view any pictures provided by clicking button next and previous. Each picture provides a simple description about the pictures.

1.4.3.3. Others

There are a few element that being categories under this part. It includes credit, the loading and the montage.

1.5. Project Significances

This visualization will probably help the public to visualize and get a proper understanding on tsunami issues in the term of geographical views. The visualization in 3 Dimensional view is a good approach as provides some realistic effects to it and more interesting. Anybody can take an advantage by viewing this visualization on tsunami disaster.

The project can be used as an education approach to visualize the concept of tsunami and getting understood on how it occurs and its impact. When people understand about tsunami, they will know never getting simply phobia once the issue is being raised because they know how it occurs and the impact of that phenomenon.

Once people understand the concept of tsunami and its impacts, this will help them to develop a self alert to this disaster. They will never want to life at the locations on which have the high potential to be collapsed by tsunami waves as they understand the capability of tsunami waves to destroy. As they know much on tsunami characters, this will help them to remind themselves of how important to get rid of this phenomenon by living at safer locations, as once says, "prevention is better than cure". This project can be applied as a simple tool to give some understanding to users about tsunami and to

realize how people themselves can prevent themselves from dying in the tsunami giant waves.

1.6. Expected Output

The expected output for this project will consist of 70% of 3D rendered movies and the 30% will be 2D rendered files, graphics, designed interface and the interaction buttons. The final project will be rendered in Flash MX 2004 (professional Edition). The final rendered file will be saved in .swf extension in Flash platform. All the 3D movies files will be imported into flash environment. Users can view the visualization in Flash designed interface. The interface will consist of a few numbers of buttons which in the users can view any of the visualization provides in different levels on Tsunami Richter Scale measurements. For each animation movie it will be displayed less than 30 seconds.

1.7. Conclusion

The Tsunami Visualization will be rendered in a 3D movie format. The main purpose for this project is to visualize how tsunami happened in term of volcanic and underwater earthquake factors. The focus will goes on the flow of the earthquakes that happened underneath the sea and how the earthquakes will cause the forming of the giant waves. The very basic concept to create the tsunami elements is by building the elements from the primitive shapes provided in 3D MAX application. When the elements fully modeled, the environment will be mapped into the movie. Finally, the suitable dynamic effects will be applied to animate the elements and to add realism to the scene. To develop this project it requires a higher RAM capacity and higher hard disk storage. The current problem issued due to this phenomenon is people doesn't get clear or understand how the earthquake occurs the disastrously tsunami waves and how tsunami happened starts from the colliding of the tectonic plates, the forming of the waves and the capability of the tsunami waves to destroy the world above the sea/the coasts. The next chapter will discuss on the literature review which will describe more on the specific element in tsunami waves. The next chapter will describe more details requirement and the environment of this project that will be specific on the 3D water or ocean modeling and animating techniques.