

BORANG PENGESAHAN STATUS TESIS*

JUDUL: THE DEVELOPMENT OF 3D ANIMATION STORY TITLE GULI
USING LIP-SYNC TECHNIQUES

SESI PENGAJIAN: 2 - 2007/2008

Saya JAMSARI BIN CHE LONG

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

1. Tesis dan projek adalah hakmilik UNIVERSITI TEKNIKAL MALAYSIA, MELAKA.
2. Perpustakaan fakulti Teknologi Maklumat dan komunikasi dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan untuk 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 di tentukan oleh organisasi/badan di mana penyelidikan dijalankan)

_____/_____/_____ TIDAK TERHAD

(TANDATANGAN PENULIS)

Alamat Tetap: 838, Permatang Tinggi C,
13200 Kepala Batas, Pulau Pinang.

Tarikh: 27/06/08

(TANDATANGAN PENYELIA)

(Muhammad Haziq Lim Bin Abdullah)

Tarikh: 27/06/08

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

**THE DEVELOPMENT OF 3D ANIMATION STORY TITLE GULI USING
LIP-SYNC TECHNIQUES**

JAMSARI BIN CHE LONG


This report is submitted in partial fulfilment of the requirements for the
Bachelor of Computer Science (Interactive Media)


**FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2008**

DECLARATION

I hereby declare that this project report entitled
**THE DEVELOPMENT OF 3D ANIMATION STORY TITLE GULI USING
LIP-SYNC TECHNIQUES**

is written by me and is my own effort and that no part has been plagiarized
without citations.

STUDENT :  Date: 27/06/08
(JAMSARI BIN CHE LONG)

SUPERVISOR :  Date: 27/06/08
(MUHAMMAD HAZIQ LIM BIN ABDULLAH)

DEDICATION

Specially dedicated to my beloved parents, my siblings and my family, who have encouraged, guide and inspired me throughout my journey of education. In addition, I would like to dedicate this special thank to my friends and my colleagues.

ACKNOWLEDGEMENTS

Alhamdulillah and praise to the Almighty Allah S.W.T for giving the opportunity for me to complete this project. Thanks also for giving me the strength and ability to finish this project.

A token of appreciation goes to my supervisor, En Muhammad Haziq Lim Bin Abdullah for giving assistance to complete this project. Through his advice and supporting, I can complete this project successfully. His guidance and motivation inspire me to finish this project.

I would also like to thank to my beloved mother, Sharifah Binti Abdul Rashid for her support and encouragement that motivates me to complete this project. Last but not least my friends who are always helping me and give their supports.

Thank you.

ABSTRACT

Guli is a short 3D animation about a *guli* tournament in Melaka. This story involves two siblings fighting each other in *guli* tournament. They live in the village with their grandfather. Currently, 3D animation is very less been developed in Malaysia. In this project, it will be focusing on lip-synchronizations technique. Lip-synchronizations technique is a process matching lip movements with voice. Lip-synchronizations match lip movements such as consonants and vowel. This project is been developed using Multimedia Production Process methodology. Testing phase must involve the user and customer, so that their requirement can be evaluate and fulfill by the developer. This animation is about Lan, the older brother in the family, fighting with his younger brother Udin in the *guli* tournament. Lan and Udin do some practices before starting their competition. Lan searches a place in the jungle to practice his skills in *guli*, where Udin practices his skills in the lawn of their house. The next day is their competition's day. They fight in front of their house. The target users of this short 3D animation are kids and teenagers aged between 7 and 21.

ABSTRAK

Guli merupakan sebuah cerita animasi pendek 3D tentang pertandingan guli di Melaka. Cerita ini mengisahkan dua adik beradik yang berlawan di antara satu sama lain di dalam pertandingan guli. Mereka berdua tinggal di sebuah kampung bersama datuk mereka. Di dalam projek ini, ia akan focus kepada pergerakan bibir karektor supaya ianya sama dengan huruf-huruf konsonan dan vokal. Proses ini di namakan *lip-synchronization*. Projek ini di bangunkan dengan menggunakan kaedah Proses Produksi Multimedia. Fasa pengujian melibatkan pengguna dan pelanggan supaya dapat mengumpul keperluan yang akan di nilai oleh pembangun. Cerita animasi ini mengisahkan Lan, saudara yang sulung di dalam keluarga, berentap besama adiknya Udin di dalam pertandingan guli. Lan mencari tempat di dalam hutan untuk berlatih kemahirannya di dalam permainan guli, di mana adiknya Udin, berlatih kemahiran bermain guli di hadapan laman rumah mereka. Hari seterusnya merupakan hari pertandingan di antara mereka berdua. Mereka berlawan di depan halaman rumah mereka. Sasaran pengguna untuk cerita animasi pendek ini adalah kanak-kanak dan remaja yang berumur di antara 7 dan 21.

TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENTS	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xi
	LIST OF FIGURES	xii
	LIST OF ABBREVIATION	xvi
CHAPTER I	INTRODUCTION	
	1.1 Project Background	1
	1.2 Problem Statement	2
	1.3 Objectives	3
	1.4 Scope	3
	1.5 Project Significance	4
	1.6 Conclusion	4

CHAPTER II LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1	Introduction	6
2.2	Domain	7
2.3	Existing Systems	9
	2.2.1 Comparison of Existing System	13
2.4	Project Methodology	15
2.5	Project Requirements	18
	2.5.1 Software Requirement	18
	2.5.2 Hardware Requirement	18
2.6	Conclusion	19

CHAPTER III ANALYSIS

3.1	Current Scenario Analysis	20
3.2	Requirement Analysis	23
	3.2.1 Project Requirements	23
	3.2.1.1 Requirement Gathering	24
	3.2.1.2 Technique	43
	3.2.2 Software Requirements	45
	3.2.3 Hardware Requirements	49
	3.2.4 Other Requirements	51
3.3	Project Schedule and Milestones	52
3.4	Conclusion	54

CHAPTER IV DESIGN

4.1	Introduction	55
4.2	Scene Sequence Diagram	55
4.3	Preliminary Design	56
	4.3.1 Storyboard Design	56

4.3.1.1 Script	89
4.3.2 Character Profile	95
4.4 Conclusion	101

CHAPTER V IMPLEMENTATION

5.1 Introduction	102
5.2 Media Creation	102
5.2.1 Production of Text	103
5.2.2 Production of Graphic	104
5.2.3 Production of Audio	117
5.2.4 Production of Animation	118
5.3 Media Integration	119
5.4 Product Configuration	120
5.4.1 Configuration Environment Setup	119
5.4.1.1 Software Configuration	120
5.4.2 Version Control Procedure	120
5.5 Implementation Status	122
5.6 Conclusion	123

CHAPTER VI TESTING AND EVALUATION

6.1 Introduction	124
6.2 Test Plan	124
6.2.1 Test User	125
6.2.2 Test Environment	125
6.2.3 Test Schedule	127
6.2.4 Test Strategy	128
6.3 Test Implementation	128
6.3.1 Test Description	128
6.3.2 Test Data	128
6.3.3 Test Result and Analysis	132

6.3.4	Analysis Testing	133
6.4	Conclusion	134

CHAPTER VII PROJECT CONCLUSION

7.1	Observation on Weakness and Strengths	136
7.1.1	Project Weaknesses	136
7.1.2	Project Strengths	137
7.2	Propositions for improvement	137
7.3	Contributions	138
7.4	Conclusion	138

REFERENCES	138
-------------------	-----

APPENDICES	139
-------------------	-----

LIST OF TABLES

TABLE	TITLE	PAGE
2.1	Comparison of Existing System	13
3.1	Project Schedule for PSM 1	52
3.2	Project Schedule for PSM 2	53
5.1	Text Production in 3D Animation Project	103
5.2	DivX (Compresion) Configuration	120
5.3	The Implementation Status	122
6.1	Table Show the Hardware Requirement in Test environment	126
6.2	Table show the Software requirement in test Environment	127
6.3	Schedule of Testing Activity	127
6.4	Alpha Test for FTMK Students	129
6.5	Beta Test for Student age 7-21 Years Old	130
6.6	Alpha Test by FTMK Students	131
6.7	Beta Test by Student age 7-21 Years Old	132
6.8	Mean, Median and Mode for FTMK Students	132
6.9	Mean, Median and Mode for Student age 7-21 Years Old	133

LIST OF FIGURES

DIAGRAM	TITLE	PAGE
Figure 2.1	Blend Shape Objects for Lip Synchronization	8
Figure 2.2	Television Series <i>Kacang</i>	10
Figure 2.3	Television Series <i>Keluang Man</i>	11
Figure 2.4	Television Series <i>Tandania</i>	12
Figure 2.5	3D Short Animation <i>Jerat</i>	13
Figure 2.6	Multimedia Production Process	15
Figure 3.1	Scene Intro	27
Figure 3.2	Scene in the Jungle	27
Figure 3.3	Scene in the Village	28
Figure 3.4	Udin	29
Figure 3.5	Head: Spherical Head	29
Figure 3.6	Type of Eyes: Big Eyes	29
Figure 3.7	Type of Nose: Pug	30
Figure 3.8	Body: Plump	30
Figure 3.9	Udin: 'A' and 'I' Mouth	31
Figure 3.10	Udin: 'C', 'D', 'G', 'K', 'N', 'R', 'S', 'T', 'H', 'Y', 'Z' Mouth Shape	31
Figure 3.11	Udin: 'E' Mouth Shape	31
Figure 3.12	Udin: 'F' and 'V' Mouth	32
Figure 3.13	Udin: 'L' Mouth Shape	32
Figure 3.14	Udin: 'M', 'B', 'P' Mouth	32
Figure 3.15	Udin: 'O' Mouth Shape	33
Figure 3.16	Udin: 'U' Mouth Shape	33

Figure 3.17	Udin: 'W', 'Q' Mouth Shape	33
Figure 3.18	Lan	34
Figure 3.19	Head: Longitudinal Head	35
Figure 3.20	Type of Eyes: Medium Eyes	35
Figure 3.21	Type of Nose: Grecian	35
Figure 3.22	Body: Thin	36
Figure 3.23	Lan: 'A' and 'I' Mouth	36
Figure 3.24	: Lan: 'C', 'D', 'G', 'K', 'N', 'R', 'S', 'T', 'H', 'Y', 'Z' Mouth Shape	37
Figure 3.25	Lan: 'E' Mouth Shape	37
Figure 3.26	Lan: 'F' and 'V' Mouth	37
Figure 3.27	Lan: 'L' Mouth Shape	38
Figure 3.28	Lan: 'M', 'B', 'P' Mouth Shape	38
Figure 3.29	Lan: 'O' Mouth Shape	38
Figure 3.30	Lan: 'U' Mouth Shape	39
Figure 3.31	Lan: 'W', 'Q' Mouth Shape	39
Figure 3.32	Atuk	40
Figure 3.33	Head: Spherical Head	41
Figure 3.34	Type of Eyes: Small Eyes	41
Figure 3.35	Type of Nose: Pug	41
Figure 3.36	Body: Thin	42
Figure 3.37	Emotion: Calm	42
Figure 3.38	Blend Shape Techniques	44
Figure 4.1	Storyboard Design 1	57
Figure 4.2	Storyboard Design 2	58
Figure 4.3	Storyboard Design 3	59
Figure 4.4	Storyboard Design 4	60
Figure 4.5	Storyboard Design 5	61
Figure 4.6	Storyboard Design 6	62
Figure 4.7	Storyboard Design 7	63
Figure 4.8	Storyboard Design 8	64
Figure 4.9	Storyboard Design 9	65
Figure 4.10	Storyboard Design 10	66
Figure 4.11	Storyboard Design 11	67

Figure 4.12	Storyboard Design 12	68
Figure 4.13	Storyboard Design 13	69
Figure 4.14	Storyboard Design 14	70
Figure 4.15	Storyboard Design 15	71
Figure 4.16	Storyboard Design 16	72
Figure 4.17	Storyboard Design 17	73
Figure 4.18	Storyboard Design 18	74
Figure 4.19	Storyboard Design 19	75
Figure 4.20	Storyboard Design 20	76
Figure 4.21	Storyboard Design 21	77
Figure 4.22	Storyboard Design 22	78
Figure 4.23	Storyboard Design 23	79
Figure 4.24	Storyboard Design 24	80
Figure 4.25	Storyboard Design 25	81
Figure 4.26	Storyboard Design 26	82
Figure 4.27	Storyboard Design 27	83
Figure 4.28	Storyboard Design 28	84
Figure 4.29	Storyboard Design 29	85
Figure 4.30	Storyboard Design 30	86
Figure 4.31	Storyboard Design 31	87
Figure 4.32	Storyboard Design 32	88
Figure 4.33	Udin Front View	95
Figure 4.34	Udin Side View	96
Figure 4.35	Udin Back View	96
Figure 4.36	Lan Front View	97
Figure 4.37	Lan Side View	98
Figure 4.38	Lan Back View	98
Figure 4.39	Atuk Front View	99
Figure 4.40	Atuk Side View	100
Figure 4.41	Atuk Back View	100
Figure 5.1	Texts Production in 3D Animation Project	103
Figure 5.2	Position of Text at the Interface video	104
Figure 5.3	Graphic Production in 3D Animation Project	104
Figure 5.4	Model Production in 3D Animation Project	105

Figure 5.5	Basic Shape of the Object	105
Figure 5.6	Detail of the Objects	106
Figure 5.7	Land Model	107
Figure 5.8	Trees Model	107
Figure 5.9	Melaka House Model	107
Figure 5.10	Motorcycle Model	108
Figure 5.11	River Model	108
Figure 5.12	Stone Model	108
Figure 5.13	Udin Character Model	109
Figure 5.14	Lan Character Model	109
Figure 5.15	Atuk Character Model	109
Figure 5.16	Texture Production in 3D Animation Project	110
Figure 5.17	UVW Mapping Process	111
Figure 5.18	Textures	111
Figure 5.19	The Object with the Texture	112
Figure 5.20	Land Texture	112
Figure 5.21	Trees Texture	113
Figure 5.22	Wood Texture	113
Figure 5.23	Motorcycle Texture	114
Figure 5.24	River Texture	114
Figure 5.25	Stone Texture	115
Figure 5.26	Udin Character Texture	115
Figure 5.27	Lan Character Texture	116
Figure 5.28	Lan Character Texture	116
Figure 5.29	Audio Production in 3D Animation Project	117
Figure 5.30	Animation Production in 3D Animation Project	118
Figure 5.31	Media Integration in 3D Animation Project	119
Figure 6.1	Mean, Median and Mode Graph for FTMK Students	133
Figure 6.2	Mean, Median and Mode Graph for Students Test	134

LIST OF ABBREVIATIONS

VCD	-	Video Compact Disk
DVD	-	Digital Video Disk
2D	-	Two dimension
3D	-	Three dimension
PAL	-	Phase Alternating Line
VR	-	Virtual Reality

CHAPTER I

INTRODUCTION

1.1 Project Background

Guli is a short 3 Dimension (3D) animation film developed by Buku 5 Production. The duration of this short 3D animation film is 6 to 8 minutes. The film represents the beauty scenery of the village in Melaka. The film contains moral value where the younger must respect the older. It also promotes traditional game in Malaysia.

The story involves three characters which are Udin, Lan and Atuk. Lan and Udin challenge each other through their own *Guli* competition. They want to prove who the master in this traditional game.

This project will be focusing on animation, lip synchronization, and plot of the story as well as the script. Besides that, this project also focusing on the rendering techniques in order to get a high quality of the movie and the techniques to save time of the rendering process.

The development process involves several software and hardware so that the product will meet the objectives in less of time with the high quality of the movie.

1.2 Problem Statements

Today, a 3 Dimension (3D) animation film is very rare being developed by film productions or animation studios. In the past, the film productions or animation studios only produce a 2 Dimension (2D) animation film instead of 3D animation film. There are 3D animation films in Malaysia, but it can be count how many there are. According to Mohd Nizam Abd Razak (2007), *GENG: The Adventure Begins* is the first 3D animation film produced by Les' Copaque with duration 90 minutes. This film is expected to release on cinema in mid of this year.

In Malaysia, 2D animations are very common being produced by local productions. 2D animations like *Usop Santorian* and *Anak-Anak Sidek* are very popular in Malaysia. However, these 2D animations are less effective to attract users to watch it. Environments or character in 2D animations are not real compared to 3D animation. According to Sharkawi Che Din (2006), 2D animation is designed on flat environment while 3D animation represents the real world. By using 3D animation, it will be more realistic and attractive to entertain the users.

There are 3D animations film has been produced in Malaysia but it is lagged compared to oversea 3D films. 3D animations like *Kacang* and *Tandania* produced by local productions are lagged compared to oversea 3D animation like *Shreak*, *Final Fantasy* and *Toy Story*. Our ability to produce high end 3D animation is still weak because we have limited skills and knowledge. According to Sharkawi Che Din (2006), our country is still lagged in the 3D animation field compare to our neighboring countries. He stated that Indonesia's achievement in this 3D animation field is better than our country.

1.3 Objective

The objectives for this project are:

- The main objective of this project is to develop a short 3D animation film length 9.15 minutes. It will focus on story that shows moral values as well as to promote Melaka by showing the surrounding environment of village in Melaka.
- To produce a short 3D animation on VCD and DVD platform with PAL video standard format and screen aspect ratio is 4:3.
- To apply the fundamental of lip synchronization techniques. Lip synchronization is a process matching lip movements with voice. Lip synchronization techniques match lip movements such as consonants and vowel. It will focus on Malay pronunciations.

1.4 Scope

The target users for this project are kids and teenagers aged between 7 to 21 years old. The duration of *Guli* is about 9.15 minutes. This project is developed to deliver in a VCD and DVD so that it can be viewed either on television or personal computer. The language used is Malay and have subtitles in English. Lip synchronization techniques will be apply to the characters which are consonants (b, c, d, f, g, h, j, k, l, m, n, p, q, r, s, t, v, w, x, y, z) and vowel (a, e, i, o, u) so that the lip movement of the characters will follow accordingly to the consonants and vowel. For broadcasting purposes, the output will be displayed in PAL video format and the screen aspect ratio is 4:3.

Other than that, this project also will be uploaded on the internet so that the users can view it from the internet. The users can view it by streaming video or they can download directly the file from the official website of this project.

1.5 Project Significance

The significance of the project is to bring a new platform in animation which is 3D animation. 3D animation is less being developed in Malaysia. The government sees that film industry can contribute to Malaysia's economy. It will also promote Malaysia to international level. Ministry of Science, Technology and Innovation (MOSTI), Datuk Seri Dr. Jamaludin Jarjis (2007), stated that the young generation in this country must explore 3D animation field because this field will give handsome profit to our country if it successful. To archive this goal, Malaysian Government has allocated RM 200 million to develop animation centers all over the country within 3 years with the assistance of Multimedia Development Corporation Sdn. Bhd. (MDeC). It is our task to develop a 3D animation with Malaysian identity so that the others country will see that Malaysia is able to produce high-end 3D animation.

Apart from that, this project promotes good values to the viewers as well as entertains the audiences with the interesting storyline about a conflict family. Good morals are very crucial to the children so that they will respect the older.

Besides that, this project will benefit the Melaka's Government because in this short 3D animation, it will show the beautiful environment of village in Melaka. The scene includes the traditional house in Melaka. This short 3D animation will promote Melaka as a tourism hub in Malaysia.

1.6 Conclusion

As the conclusion, this project is being developed with high quality with the duration 9.15 minutes and to inculcate moral values among children and adult. The film contains moral value where the younger must respect the older. This project also will focus on lip synchronization so that the animation will look real and natural.

Apart from that, this project also promotes Melaka to the international level. Melaka is well-known for its history prominence and multicultural society. The

traditional houses in Melaka are different from other traditional houses in Malaysia. Their structure designs are very unique with Melaka's identity.

For the next chapter, it is required literature review and project methodology. All the related literature will be review and make comparison of existing system to determine what the suitable method that will be used in development process. In the next chapter, it will also explain what the methodology that will be used. Besides that, in the next chapter, it will also state clearly what hardware and software that are going to be used.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

In this chapter, it will give a thorough explanation about literature review and project methodology. It is important to do a literature review and plan the methodology properly as well as determine the most suitable methodology that is going to be used to develop the project.

Literature review is a review at the existing research that is relevant to the research area that is going to carry out. All related journals, books, thesis, or other information will be gathered together according to research element that has been proposed. The existing research will be evaluated and show the relationships between different work and show how it relates to research element that has been done.

Project methodology describes what techniques, methods and tools that are going to be used in development phase. The methodology that is suitable to develop 3 Dimension (3D) animations is Multimedia Production Process. Multimedia Production Process includes several phase and they are conceptualization, pre-production, production, post-production, and documentation.

2.2 Domain

The domain of this project is 3 Dimension (3D) animations. 3D computer graphics are contrast to 2 Dimension (2D) computer graphics. 3D computer graphics represent geometric data in three-dimensional which are stored in the computer for purposes of performing calculations and rendering 2D graphics. These graphics may be use for display or 2D graphics purposes or real time purposes such as game or Virtual Reality (VR). 3D models in computer graphics are represented in three axis which are X, Y and Z.

Although 3D graphics and 2D graphics are difference, both of them rely on same algorithm where 3D computer graphics represent in wire frame and 2D computer raster graphics in final rendered display. The difference of 3D graphics and 2D graphics are uncertain because 2D graphics may use some application to achieve similar effects in 3D graphics such as lighting. 3D models are mathematical representation of three-dimensional object. 2D graphics can be generated from 3D models using techniques rendering.

There are three phases in producing 3D computer graphics. The processes are sequentially and they related each other. Three phases in producing 3D computer graphics and there are modeling, animation and rendering. 3D modeling is a process of creating a shape of an object. 3D animation processes use 3D model to move, rotate and scale in X, Y and Z axis. In these days, various methods have been used to ease animation process such as motion capture, inverse kinematics, forward kinematics and frame-by-frame.

Motion caption is a technique of digitally recording movements. Inverse kinematics using some parameters to determine the joint or chain object for particular desired pose, where forward kinematics pose end effectors to a system's pose to the position and orientation. For lip synchronization and facial expression, it will be using blend shape techniques. The lip synchronization technique is to make an animated character appear to speak involves figuring out the timings of the speech (breakdown) as well as the actual animating of the lips/mouth to match the dialogue track. Blend shape is a process where duplicate objects will be shaped according to