LiTE : A VOICE ENABLE RESTAURANT MENU

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PENGHARGAAN

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LIST OF DEFINITIONS

Computational linguistic (CL). field is to study how human language, be it written or spoken, that human use in normal discourse, can be converted into a more formal representation, to ease computer programs to manipulate it.

Stand-alone system. A system that operates independently of, or is not connected to, an electric transmission and distribution network

Speech synthesis. Speech technology that allows computer to interact with human in speech mode (Obermeier, 1989).

Speech synthesizer. Speech synthesis technology that will convert text into speech.

LIST OF ABBREVIATIONS

ASCII	American Standard Code for Interchange Information
CL	Computational Linguistic
CV	Consonant-Vowel clusters
CVC	Consonant-Vowel-Vowel clusters
FYP 1	Final Year Project 1
FYP 2	Final Year Project 2
HCI	Human Computer Interaction
JAD	Joint Application Development
LCD	Liquid Crystal Display
LiTE.	Listen to Eat (the prototype system name)
MTT	Menu That Talked
SDLC	System Development Life Cycle
RAD	Rapid Application Development
SSB	Sarawak Society for the Blinds
UNIMAS	Universiti Malaysia Sarawak
V	Vowel clusters
VB.Net	Visual Basic. Net
VC	Vowel-Consonant clusters

ABSTRAK

LiTE : MENU RESTORAN BERSUARA

Aini Fadhlin Bt. Maidin

Kertas kajian ini memaparkan aplikasi prototaip yang dibangunkan menggunakan teknologi sintesis pertuturan. Aplikasi ini yang dinamakan "Listen To Eat", atau "LiTE", adalah merupakan satu menu restoran bersuara, yang telah menggunakan teknologi sintesis ucapan daripada "Microsoft". Pembangunan LiTE adalah untuk memberikan pilihan kepada para pelanggan yang cacat penglihatan dan pelanggan-pelanggan normal untuk menempah makanan di restoran. Ciri suara disediakan untuk para pelanggan atau pengguna untuk membenarkan mereka menggunakan aplikasi dengan mendengar arahan bersuara bagi menempah makanan tanpa bantuan daripada pelayan restoran. Tujuan utama aplikasi ini dibangunkan adalah untuk mengatasi masalah-masalah yang dihadapi orang yang cacat penglihatan, terutamanya ketika hendak melakukan tempahan makanan di restoran. Proses–proses pembangunan aplikasi, penilaian pengguna dan keputusan penilaian dibincangkan dengan mendalam di dalam kertas kajian ini.

ABSTRACT

LiTE : A VOICE ENABLE RESTAURANT MENU

Aini Fadhlin Bt. Maidin

This paper presents a prototype application that is developed using speech synthesis technology. The application, called Listen to Eat, namely LiTE, is a voice enable restaurant menu, which was built on Microsoft speech synthesis technology platform. The development of LiTE is to offer alternative way of ordering restaurant menu to visually impaired customers and normal customers. The read aloud feature is provided to the customers or users to allow them using the application by listening to the voice instructions to order the restaurant menu without assistance from servers (waiters). The main intention of developing this application is to counter the problems faced by the visually impaired people, particularly when they want to order menu at the restaurant. The application's development processes, users' evaluation as well as the evaluation's result was thoroughly discussed in this paper.

CHAPTER 1

INTRODUCTION

1.0 Introduction

In recent years, world has witnessed a tremendous enhancement in technologies which have evolved greatly since the era of World War 1. The hunger for a better way of living our life has driven the experts from various fields of study to keep on carrying out researches and inventing products to accommodate the humans' needs. Their efforts in attempting to make the world a better place to live in; have permitted us using some technologies that once sounded impossible, such as wireless technology, internet etc.

One of the rising research areas comes from Computational Linguistics [CL], which is a subfield of Artificial Intelligence. The focus of this field is to study how human language, be it written or spoken, that human use in normal discourse, can be converted into a more formal representation, to ease computer programs to manipulate it (Obermeier, 1989). Nowadays, many computer applications have embedded the concept of CL, as part of the underlying processes for it is useful in processing human languages. Among the sub-area that has been given extensive attention is speech synthesis technology. Speech synthesis is a speech technology that allows computer to interact with human in speech mode (Obermeier, 1989). A computer program that has speech synthesizer technology is sometimes referred as having read aloud feature, browse aloud feature, voice-based menu etc.

The fundamental idea behind the read aloud feature is that the computer programs - using specific speech synthesizer -will read out the selected text by converting the text into speech (PC Mag.com Encyclopedia, 2008). Initially, it was used to aid the blinds to listen to written materials. However, due to its plausibility of using it for other purposes, it has been widely implemented in other applications such as to convey financial data, e-mail messages and other information via telephone for everyone (PC Mag.com Encyclopedia, 2008). Currently, there are trends of transforming selection-based menus to read aloud menus.

Even so, we barely find products in the markets that use the voice-based menus for restaurant menu. Thus, this system, called *Listen to Eat: A Voice Enabled Restaurant Menu* [LiTE] is developed as voice-based computer application. The system's objective is to present restaurant menu as a contemporary and user-friendly style menu. In no way the development of the system intended to replace the existing restaurant menu style. But, it does has the objective to help the disabled people order restaurant menu, without being guided. LiTE will utilize the existing speech synthesis technology to enable the system reads out the menus while users listen to it. Details pertaining to the system will be described further in other chapter.

1.1 Problem Statements

In restaurant business, it is very important for the restaurateurs to maintain their customers by providing good quality of foods and services. Although each restaurant has their unique identity, still there is one feature commonly shared by all restaurants, which is restaurant menu. The presentation of the restaurant menus is of prime importance for it will determine how customers perceived the restaurants, how frequent they dine at the restaurant and how good is the services (Bates, 2004). However, there are few problems occur that are interconnected with current style of restaurant menus (e.g. board menus, see figure 1.1 (a)).

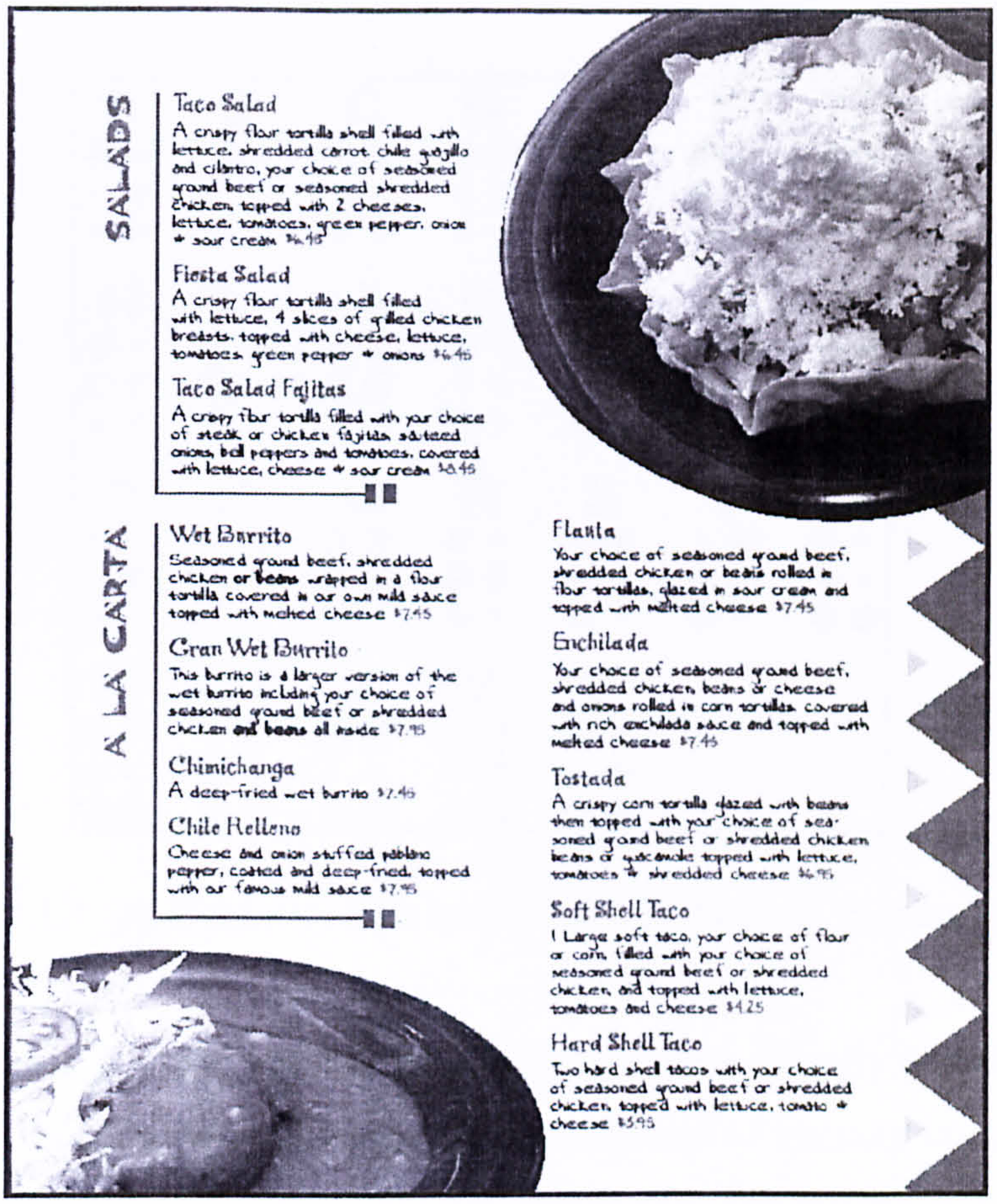

Figure 1.1 (a). Common board menus. (n.d.). Source: mexicalibattlecreek.com.

The problem statements that will be further discussed vary from the aspects of the customers to the business itself. We can sort out the problems as follows:

1.1.1 Visually impaired customers

The restaurateurs should bear in mind that, their customers vary from kids to old folks and from normal to customers with disabilities. Usually, customers with disabilities, particularly the visually impaired, need assistance to read the menu. Sometimes the waiters themselves will read them the menus. This situation is very unpleasant and stressful for the visually impaired customers as it embarrasses the customers and makes them feel more self-conscious (Strauss, 1999). Practically, this problem can be solved by creating menus with Braille system letters. Braille system letters are used widely by the blind people to read and write (Braille, 2009). Figure 1.1.1 (a) shows the Roman alphabet in Braille system.

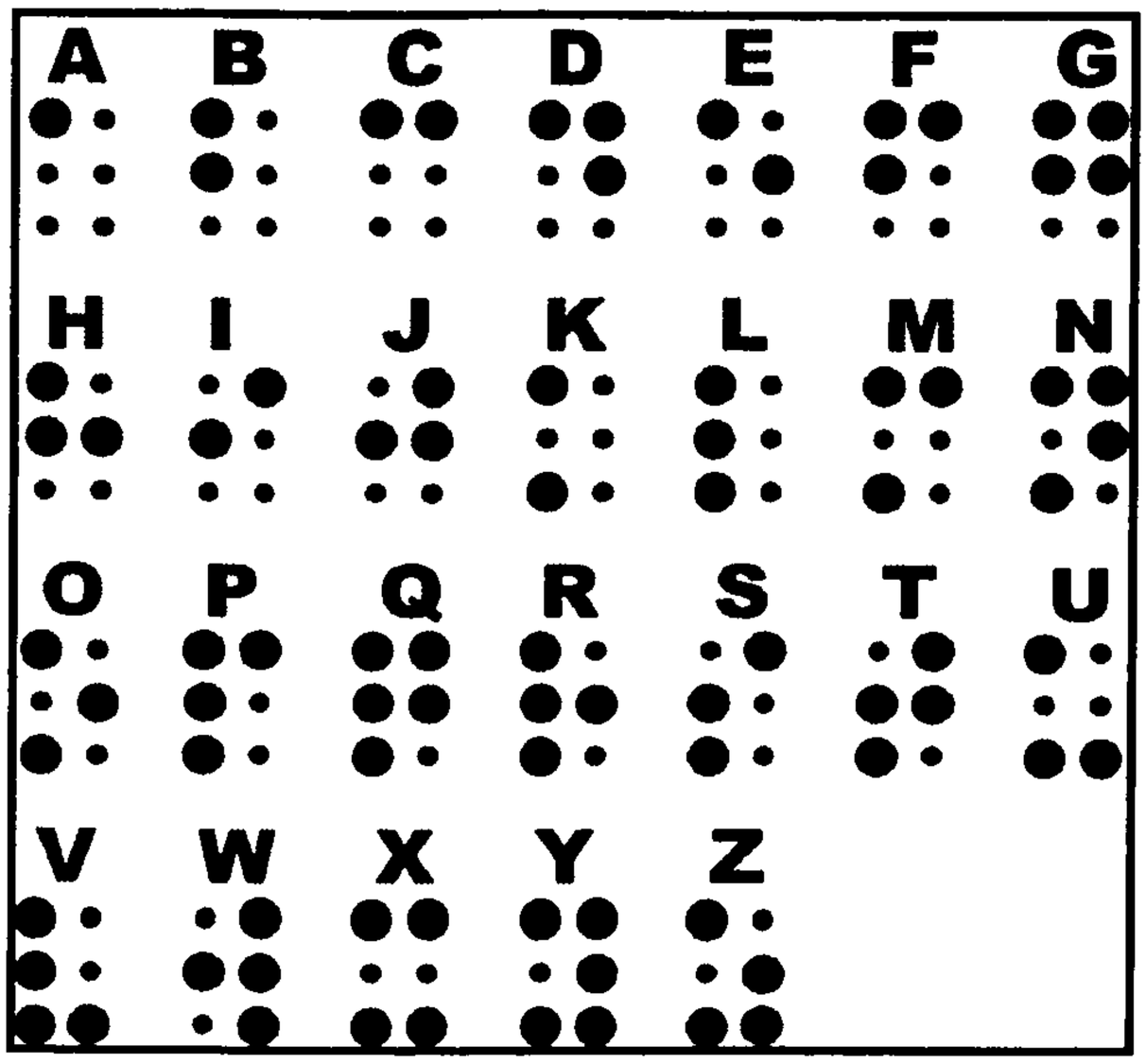

Figure 1.1.1 (a). Braille system letters. (2008). Source: Wordpress.com.

Then again, it raises another issue of whether the visually impaired customers are completely blind or they fall under other categories of visually impaired since the visual impairment types itself have distinct definitions. The Braille menu will be very helpful, if and only if the customers are blind and know how to read the Braille, which is a seldom cases in today's environment. According to news article written by Faherty in Wisconsin Braille adapted from The Arizona Republic, the numbers of Braille's literates are dropping across USA (2006). This shows that other countries might face the same circumstance too. Thus, the Braille menu might not be helpful solution for the visually impaired customers.

As for in Malaysia, the numbers of disabled people throughout the whole country is shown in the Table 1.1.1 (a).

Types of disabilities	No of disabled people
Visually impaired	14154
Hearing impaired	22728
Physically impaired	45365
Learning disabilities	49340
Other disabilities	1068
Total	132655

Table 1.1.1 (a). Statistics on number of disabled people in Malaysia (KuSeman, 2008).

The statistics are only for the disabled people who are registered with "Jabatan Kebajikan Masyarakat", let alone those who are not. It is understood that the number is more than what we are expected. Therefore, it is impossible to neglect the disabled people needs, seeing that their amounts are a lot.

1.1.2 Servers workload

When a restaurant is packed with customers, servers can become very busy. Their workload as servers mounting based on number of customers in the restaurant. Customers with disabilities, old folks or even the illiterates might request waiters to read the whole menu. Probably, if needed, customers will request them to repeat it all over again. This can be very irritating to the waiters for their workloads are tiresome (Strauss, 1999). Though it is the waiters' jobs to attend the customers, they are still just humans that cannot avoid such feeling.

1.1.3 Servers' service duration

The service duration is another crucial factor that determines customers' perception toward the restaurant. Lets` consider the situation where the restaurant is crowded with customers. When new customers are coming in, there will be a possibility where the waiters do not realize of the customers` presence. Customers will have to wait for the waiters or they might also give some cues to ask waiter to serve them. Consequently, customers will give bad impression on the waiters, which

will later influence the customers rating towards the restaurant service. Hence, it will affect the restaurant reputation.

1.1.4 Bad presentation of restaurant menu effects browsing time

There are cases where the restaurants failed to present their menus creatively. Let say, there are too many items on the restaurant menus and the items are not presented in a well manner. As a result, it will increase the browsing time. The waiters will definitely feel nuisance for having to wait for customers while browsing their restaurant menus. From the perspective of some customers, seeing the waiters standing next to their table, waiting for them to choose their meals, will put the customers in unease situation. In this case, both parties will share a discomfort condition.

1.2 Objectives

The objectives of developing LiTE prototype system are:

- To develop a system that enable the visually impaired customers to know what are on the restaurant menus without highly depending on others to read the menu items for them.
- To help in reducing the workload of the waiters from reading out the menus for the disabled people or even other customers who need assistance from the servers.
- To help in improving waiters` servicing time since they do not have to attend all customers during hectic time since customers can directly order from the prototype system
- To reduce the customers` browsing time by using suitable computer interfaces and speech synthesizer, which are more organize.

1.3 Scope

Several scopes will be covered in the system development processes. The scopes are mainly on the limitations of the system, the target users of the system and

the system's user interface design. Each of the scope will be emphasized further in Chapter 3.

Upon the completion of the system, the target users can be anyone who wants to use the prototype system to make order and the users must be able to understand English. The underlying reason of targeting them as the main users is due to the limitations of the system itself, which only suitable for English word menus' items only.

The limitation of the system is that users still need to interact with it using keys from the keyboard or mouse clicks. This is because the development of LiTE prototype system is to see how far the disabled people comfortable with this type of system. Furthermore, to use a speech recognition technique as the main interaction technique between users and the prototype system is a little bit complicated because lot of factors need to be taken into account, such as the user's voice pitch, and pronunciation.

Lastly, for prototype purpose, this system will be developed as a stand-alone system. A stand-alone system is a system that operates independently of, or is not connected to, an electric transmission and distribution network (Encyclopedia of alternative energy and sustainable living, n.d.). No servers will be used to support it since the system's database will be kept in the same workstation.

1.4 Significance of Project

"Also note that invariably when we design something that can be used by those with disabilities, we often make it better for everyone." (Donald Norman, 2008).

The development of the system will give open opportunity to the disabled people, regardless of the type of disability, to have an equal chance to enjoy a pleasure moment dine at a restaurant. Although the system has limitation, which limits the type of menu`s items it can utters (language of the menu), still it will aid the disabled people in choosing their menu courses without assistance from others to read them the menu.

Furthermore, the system will help in reducing the servers' workload for they do not have to spend much time on reading the menu items, one by one, to the visually impaired customers who requested servers to read it for them.

Moreover, with the existence of LiTE, it helps in improving the waiters' servicing time. Customers no longer have to wait for available waiters to serve them since they can opt to go to the system to listen or read the menu's items and order the meals they want.

Last of all, LiTE will help in solving bad menu's presentation in terms of its items' arrangement and the menu's layout as a whole. Through a voice enabled LiTE system, it will ease the customers in choosing their meals because menu courses will be categorized based on its types. Consequently, it will reduce the customers' browsing time as they can straight away choose the type of menu courses from LiTE.

1.5 Methodology

The methodology that was used in this project is Object-Oriented software development, which will be discussed further in Chapter 3. However, to gain a general view of the prototype system, Rapid Application Development [RAD] method is applied. RAD is also known as Rapid Prototyping Development. This method is suitable method for LiTE prototype system as compared to any other methods such System Development Life Cycle [SDLC] and Joint Application Development [JAD]. Due to the time constraint, RAD is chosen to decrease the time taken to design a prototype system like LiTE.

This method allows the system to be developed within less than four months (i.e. the duration given to develop this system) since RAD is designed to enable a software system to be completed within 90 days. RAD will be very helpful in gathering user's requirement for it uses the concept of quick prototyping style. This is very important for the development of LiTE as it is designed to be used mostly by customers in restaurant. Therefore, it is vital to know what is best for users. Through quick prototyping, client able to give immediate feedback based on the prototypes.

1.6 Project Schedule

The Final Year Project phase 1 [FYP 1] commenced on mid of July 2008 and it will end on the October 27, 2008. During this phase, the first three chapters, which consist of introduction chapter, the literature review chapter and the methodology or system analysis and design chapter were done. Although FYP 1 started on July 21, 2008, the writing part was not taken place yet. 2 weeks were taken to find the suitable topic and gather information for the Final Year Project. Therefore, chapter 1, the introduction chapter, was only written beginning 3rd week of August and finish on September 1, 2008. After that, literature reviews were done to meet the requirement of chapter 2. The chapter were written on September 6, 2008 and ended on September 20, 2008. Later, chapter 3 was continued after that date and finished before October 27, 2008. The FYP 1 report was submitted on October 27, 2008.

The Final Year Project phase 2 [FYP 2] commenced on January 2009. In FYP 2, the implementation, evaluation and discussion part took place and ended before April 13, 2009. The project report submitted on April 13, 2009.

1.7 Expected Outcome

At the end of this project, it is expected to produce a complete prototype voice enable restaurant menu system. The system should be able to cater the problems stated earlier in this chapter. The most important thing, the system should be able to perform the text-to-speech part where it able to read the text inserted in the database as the menu items.

Moreover, the users of the system should be able to use the system's read aloud feature, order the menu and print it out to give it to the cashier. As for the workers in the restaurant, they are also considered as the user that will input the menu items in the system. Thus, it is expected that they do not having problem with the system later on.

1.8 Project Report Outline

This report consists of 6 interrelated chapters as follows:

Chapter 1: Introducing the main topic of this project that is speech synthesizer and how it will be used in improving the current restaurant menu to a voice-enabled restaurant menu. There are also other discussions on the problems on the current menu, the objective of this project, the project scope, the significance of this project, methodology used, expected outcome of this project and the project schedule.

Chapter 2: Consists of related and relevant literature reviews pertaining to this project. There are literature reviews on the speech synthesizer technology, existing speech synthesize applications, current style of presenting restaurant menu and similar existing application. The information gathered during the literature reviews is of prime importance to the development of this system.

Chapter 3: Contains the requirements analysis and design, which are including user requirement specification, system requirement specification, software requirement specification and hardware requirement specification. During the analysis phase, the users of the system were identified as actors. 8 participants were chosen based on certain criterion (as stated in section 3.2.2). 2 participants were visually impaired and 6 participants were normal people.

Chapter 4: Discuss the results and analysis of the results based on evaluation performed on 8 participants.

Chapter 5: Will be discussing the results of the analysis in detailed, users' suggestion and recommendation from the evaluation.

Chapter 6: Conclusion of the whole project outcome.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In order to gain information for the LiTE prototype system, several readings were made. Information on current method of restaurant menu's presentation, similar existing system, speech synthesis, existing speech synthesis applications and Malay speech synthesizer were gathered from various sources. The explanation of each reviews are as follows.

2.1 Current method of presenting restaurant menu

In restaurant business, restaurant menu plays role as the means of communication between the chefs and the customers in the restaurant. The common way of presenting a restaurant menu is by listing out all the items and its associated prices. Usually, restaurants use pre-printed menus and it is rarely change throughout a year since it requires time to select the menu items and to determine the appropriate price for the each item. Customers who walk into the restaurant will be given identical menu. It has been a regular practice for restaurateurs to list the items in menu that are provided daily in their restaurants. Meanwhile, special menus that are only offered occasionally will be displayed separately from the restaurant menu such as on a banner, pamphlet, fliers, etc.

Nowadays, restaurant menus no longer presented on paper. It can be in terms of traditional hand-held menus, menu boards and even verbal menus (Menu, 2009).