



Faculty of Computer Science and Information Technology

**USER-CENTERED DESIGN FOR ELDERLY MOBILE PHONE
USERS**

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Bachelor of Computer Science with Honors
(Information Systems)
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This project is submitted in partial fulfillment of the requirements for the degree of
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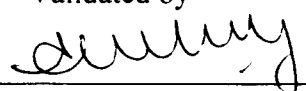
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ABSTRACT

Over the past few years, various studies have shown an increase in the usage of Short Message Service (SMS) by elderly. SMS is a fast growing segment and technology companies are taking advantage of this group of users. SMS is a great way to stay in touch with friends and family, especially old generations who rarely use other chatting applications and emails. Furthermore, SMS is cheaper if compared to making a call to others by using telecommunication services. There are many chatting applications available for people to connect with each other such as WhatsApp, LINE and WeChat. Most of the applications are developed for young or literate people and the chatting applications require Wireless Fidelity (Wi-Fi) connection to communicate among themselves. However, Wi-Fi may not be available for certain areas. Therefore, an alternative to communicate with others is through the mobile SMS application by using telecommunication services. The current SMS input keys are too small and the elderly may find it difficult to select the exact number or words they want. Speech recognition is one of the useful functionalities which can translate the human-spoken words into texts without typing and has been applied in other applications such as Google Voice Search Engine. In this project, the developer focuses on developing a user-centered design mobile application for the smartphone which can be used by the youth and elderly people.

ABSTRAK

Menurut kajian lepas yang telah dijalankan, ia menunjukkan peningkatan dalam penggunaan Perkhidmatan Pesanan Ringkas (SMS) oleh warga tua. SMS adalah salah satu teknologi yang berkembang pesat dan oleh sebab itu syarikat-syarikat teknologi ingin mengambil kesempatan dari kumpulan pengguna tersebut. SMS merupakan cara terbaik untuk mengekalkan perhubungan antara rakan-rakan dan keluarga, terutamanya generasi tua yang jarang menggunakan aplikasi perbualan dan e-mel. Tambahan pula, SMS adalah lebih murah jika dibandingkan dengan membuat panggilan kepada orang lain melalui perkhidmatan telekomunikasi. Terdapat banyak aplikasi perbualan yang sedia ada yang membolehkan orang ramai berhubung antara satu sama lain seperti WhatsApp, LINE dan WeChat. Walau bagaimanapun, kebanyakan aplikasi yang dibina adalah khusus untuk pemuda dan aplikasi perbualan juga memerlukan sambungan Wireless Fidelity (Wi-Fi) untuk berkomunikasi antara mereka. Wi-Fi mungkin tidak terdapat di kawasan-kawasan tertentu. Oleh itu, salah satu alternatif bagi orang ramai untuk berkomunikasi adalah melalui aplikasi SMS mudah alih dengan menggunakan perkhidmatan telekomunikasi. Selain itu, kekunci SMS yang sedia ada mungkin terlalu kecil dan warga tua akan berasa sukar untuk memilih nombor yang tepat atau perkataan yang diinginkan. 'Speech Recognition' adalah salah satu fungsi yang mampu menterjemahkan perkataan suara pengguna ke dalam bentuk teks tanpa perlu menaip dan telah digunakan dalam aplikasi lain seperti 'Google Voice Search Engine'. Dalam projek ini, pengarang akan memberi tumpuan kepada pembangunan reka bentuk aplikasi telefon pintar berasaskan pengguna yang boleh digunakan oleh belia dan orang tua.

CHAPTER 1: INTRODUCTION

1.0 Introduction

Nowadays, there are many mobile phones being developed to fulfill user requirements. Smart phones which run on the Android platform are getting more popular around the world. People are constantly learning new technologies and using new applications to keep up with the trend. Most of the technologies are targeted at teenagers and adult users who are able to learn and master new technology easily. In contrast, elderly people also need to adapt new environment of smartphone technology, so that they can communicate well with their family.

According to the United Nations (2013), elderly people means those who are in the age range above 60 years old. Elderly people refers to people who have slower tendency in learning new skills or facing problems in learning and responding to instructions. Elderly people are part of the group which related to information poor.

In general, most mobile phone users would keep in contact with their family. The elderly people likes to communicate with old friends and family members. Calling is one simple way to contact people but it is costly as telecommunication companies are charging every minute. Therefore sending message is another alternative to keep in touch and it is cheaper.

It is important to know the guidelines to develop an application in mobile phones for older people as they may have difficulty learning how to text on the mobile phone. By developing an application with speech-to-text would improve communication between elderly and young generation.

1.1 Problem Statement

Today, there are many mobile phones that are easy to use. Mobile phone developers would usually neglect the elderly users given that the majority of the target users are teenagers or adult users.

When using the short message services (SMS), the insert key icons are too small for the elderly which may lead to difficulty in pointing on the exact number or words they want. According to Wong (2008), elderly people have problems when they use mobile phones software interfaces and most of the elderly only use the basic task such as dialing the numbers. Elderly users would have difficulty using the mobile phone user interface (UI) as the button is not clearly visible.

For instances, many elderly people are able to speak Mandarin but they may not know how to type the Chinese character using a QWERTY keyboard as they may have forgotten the Mandarin words' phoneme. Therefore, an application that is focused at IT illiterate elderly users using a user-centered approach is needed to address the elderly people's basic requirements.

1.2 Objectives

The following are the objectives of this project:

- To review literature of the existing mobile applications done by Latiff (2013) and bring in new feature for the mobile application.
- To identify design guidelines for developing a user centered design for technology illiterate elderly community.
- To design and develop an easy use of speech-to-text application for youth and elderly.
- To improve messaging in speech-to-text functionality.
- To implement and evaluate a speech recognition system in the mobile phone.

1.3 Methodology

The project is developed using Object Oriented Analysis and Design (OOAD). OOAD is a software engineering approach that is used to interacting objects in the model of a system. Object oriented analysis is concerns with identifying the system requirements and classes as well as their relationships that make up an application. Object oriented design is used to design the classes, user interface and data access during analysis phase.

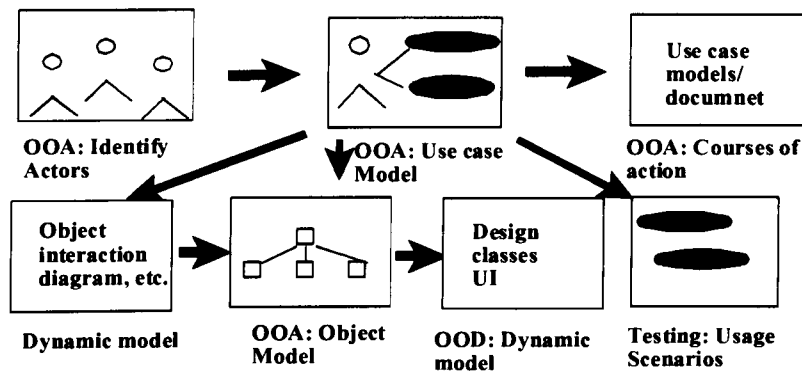


Figure 1.1: Object Oriented Analysis and Design (OOAD) Methodology (Rumbaugh, 1991)

1.4 Scope

The scope for this project includes:

1. Target audience for information application is technology illiterate elderly people above 50 years elderly who understand *English* and *Mandarin*.
2. The user centered design speech-to-text of mobile phone should be able to be used by technology illiterate elderly people.
3. Speech-to-text application enables user to send messages without use of keypad to type message in the form of original fully spelled words.
4. The target groups of the system's users are the people with a background in technology knowledge.

1.5 Significance of Project

The significant of the project is the user centered design approach information systems for mobile phone. The system design includes the user interface and speech recognition functionality that ease the elderly users and young community to contact with people through speech-to-text in the mobile phone application.

1.6 Project Schedule

This project is a one year project which is starting from Semester 1, 2013/2014 until Semester 2, 2013/2014.

1.7 Expected Outcome

The expected outcome of this project is a user-centered design mobile application, which includes a speech-to-text functionality in mobile phone for elderly and young generation to send message. A final working product is Android 4.3 application by using speech-to-text output to send the message to people. The expected outcome is the texts, by using a mobile messaging application that is able to recognize speech. User is able to make selection through the contact lists to send a message to other people.

By applying automatic speech recognition in mobile messaging application, it does fulfill the basic requirements in elderly community so that it assists them to learn easily with the user centered design mobile application. The speech-to-text application languages are available in *English* and *Mandarin*. The application includes a call functionality that is able to assist elderly in making calls through the application.

1.8 Project Outline

This project consists of five chapters which include the information about the existing user interface of mobile phone, design guidelines for technology illiterate and elderly, methodology, flow in developing the special scheme mobile phone and overall schedule.

Chapter 1: Introduction

This chapter briefly introduces about the project, problem statement, objectives, methodology used, scope, significant project, project schedule and expected outcome.

Chapter 2: Literature Review

This chapter is literature review on the related project topic. The review will examine the existing applications or systems that already been used in a real world and conclude an appropriate design for elder generation.

Chapter 3: Requirements Analysis and Design

This chapter will define the project goal and application requirement and analyze the end user's need. The information would be useful for programmer and designer to start their work. Other than that, these chapters also need to define the hardware and software requirement used to design the application or system.

Chapter 4: Implementation

In this chapter, the developer will implement the project based on the proposed design. The application or system will be implemented coding part by part. After finish write the real code, developer need to do unit testing to make sure the real code work properly.

Chapter 5: Application Testing

The target users have participated in the application testing to ensure the application built has met their requirement. The application testing done by target users includes the features in the application such as send message, receive message, speech-to-text functionality and make a call. An evaluation analysis is analyzed to summarize the survey results.

Chapter 6: Conclusion and Future Works

In this chapter, the overall project is summarized. The project achievement is discussed in this chapter too. The future works also will be suggested to improve the application or system.

1.9 Project Summary

This chapter gives a brief explanation of overview project development. The overview includes problem statements, objectives of the project, methodology use to develop the project, scope, the significant of project, project schedule and the expected outcome of the project. In conclusion, the goal of this project is to have a better user centered design in speech-to-text application in mobile phone for elderly and young generation.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

As humans, we cannot deny that the ageing process is a biological reality which has its own dynamics and is beyond human control. In society, the age of 60 or between 60 to 65 which is roughly equivalent to the retirement ages in most developed countries, is said to be the beginning of old age (Gorman, 2000).

In this chapter, the author would like to discuss on the literature review on similar apps to “User Centered Design for Elderly Mobile Phone Users”. Subtopics being discussed in this chapter are Review of Literature, Design Issues and Case Study related to existing or similar mobile application.

2.1 Review of Literature

In the new era full with communication technology, people use mobile phone to receive or make a call. Nowadays, there are various kind of mobile phone are sold in the market with different usage and functionalities. The most popular smart phone operating systems are Android and iOS nowadays which Android is open source but iOS is not an open source software. Smartphone is the most popular mobile phone as it offers user a wide variety of services such as SMS, MMS, email, camera, video, connectivity, networking and multi input. The common use of mobile service is SMS because it is cheaper if compared to calling and also act as a communication medium.

According to the statistic found in website GO-Gulf.com (2011), out of 5 billion mobile phone users in the world, 1.08 billion are smart phone users. In the pie chart below, it shows that there are 46.9% of smart phone users used Android phones rather than other platforms. The demands on Android smart phones have increased very drastically every month as well as the increase in the number of Android developers. Figure 2.1 shows the comparison between different types of smartphone platform.

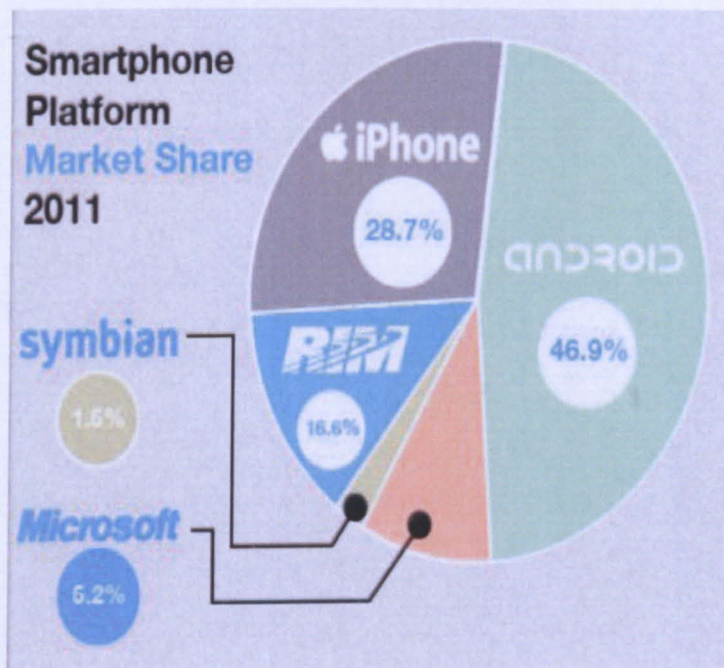


Figure 2.1: The result from a survey with smart phone platform users (GO-Gulf.com, 2011)

Based on Figure 2.1, iPhone platform is placed second after Android platform. The reason is because Apple iOS strictly locked-down and has restricted environment access towards their users. Most of the iOS applications have to pay only can use the applications. While Google's Android is an open source operating system, it provides a freedom, flexibility and more choices for the mobile phone developer and users. As a part

of Android smart phone user, user can choose to download and install any free applications they prefer, customize their phone with different type of Android smart phones templates too. Besides that, users prefer to use Android phone rather than iPhone due to the cost of mobile phone and the accessories are much cheaper.

User is able to send and receive a text message by using a mobile phone. The development of mobile application today bring user to a new way of communication services for example Go SMS, WhatsApp and Skype. All these applications provided not only enable user to send a text message but also can send an image, audio, video and files attachment. With more add on features on these fields of sending image or video, user can share their current status to their family or friends.

On contrary, older people found it is difficult for them to learn and use mobile application in smart phone due to complicated functionalities. That is why developer needs to think differently while developing an application for older people because older people have different physical disabilities. It is important to understand the user needs when build an application for them. The development of mobile application is not only making the content, size of screen and functionalities in considerations but also highly interactive user interface needs to be considered.

ML (Multi-Layered) interface is used to design the application interface to improve the learn ability. The purpose of this interface is to reduce complexity of the number of mobile option menu in contact from six options to three options only. For an example, the Full-functionalities layer includes *Call*, *Use Number*, *Send Message*, *Send Contact*, *Mark/Unmark* and *View Contact* options. When it has been reduced to three options in Reduced-functionalities layer, it consists of important options such as *Call*,

View Contact and *New Contact* as shown in Figure 2.2. This approach helps elderly users to focus only on important function (Leung et al., 2010).

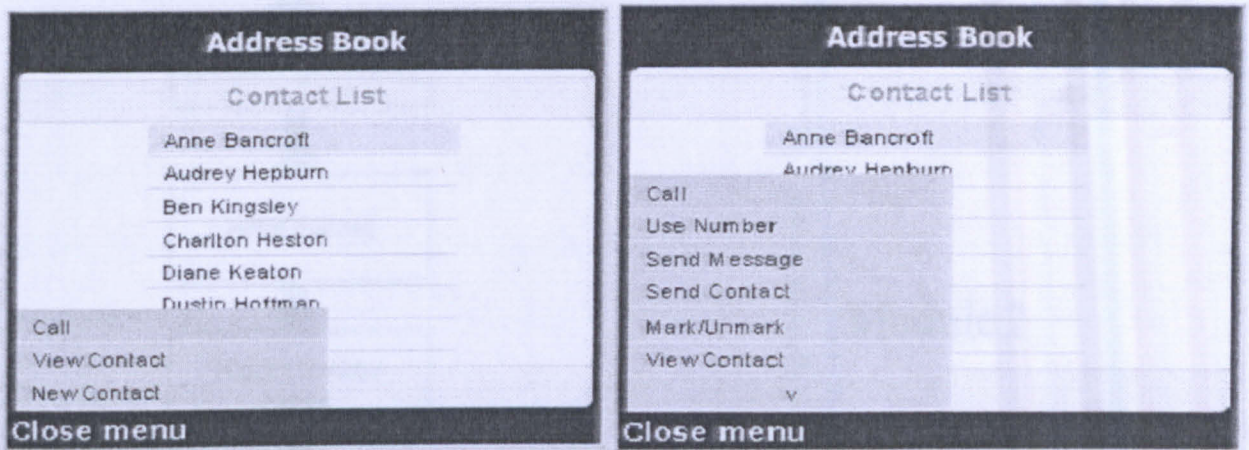


Figure 2.2: Contact List screen, with its menu open: Reduced-Functionality layer (left) and Full- Functionality layer (right).

In order to develop an mobile apps that are able to ease the interaction of elderly with others,, the best solution is to implement the speech input and output capabilities. According to Basson, Fairweather and Hanson (2001), the goal of designing a speech interface is to increase user satisfaction, productivity and convenience especially for elderly user. Speech-to-text (STT) system is converts voice message into text messages. This application is developed to assist older people who have difficulty to key in text messages by creating alternative solution using speech as the input and text as the output. The processes include in STT are speech acquisition, speech pre-processing, voice activity detection, pattern recognition and conversion of the speech-to-text (Chand, 2005). Figure 2.3 shows the development of STT approach.

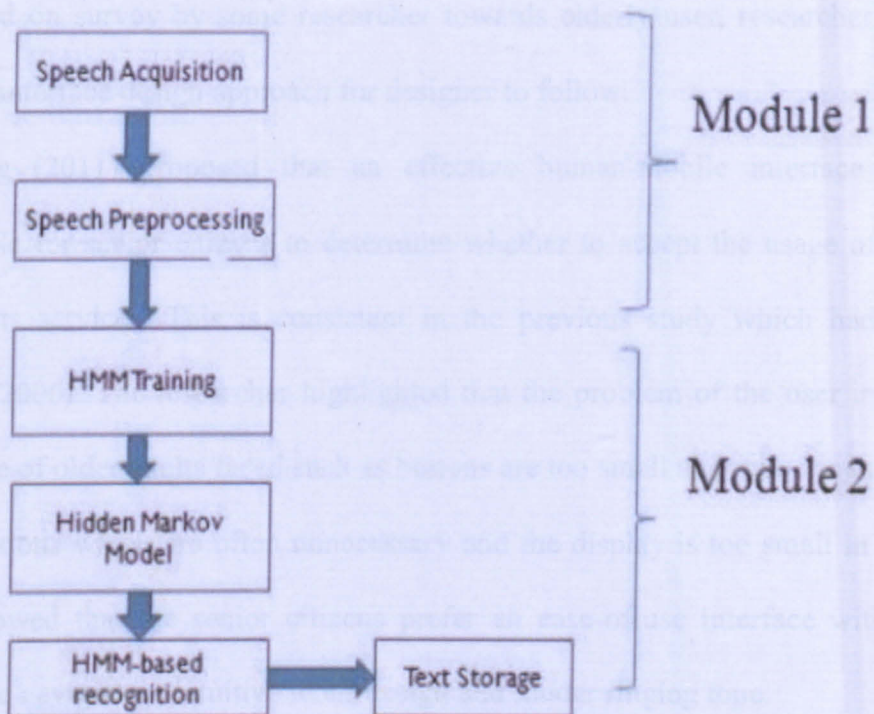


Figure 2.3: Architecture diagram of STT approach (Chand, 2005)

According to Zajicek (2003), the best solution for designer to design a system for elderly people is to prepare themselves a better understanding about the interface.

2.2 Design Issues for Older Population

Design issues are important part in developing a mobile phone application for elderly people because of their physical disabilities. Elderly has difficulties on using a mobile phone due to a small form factors, small or key confusing and small screen text (Kane, Jayant, Wobbrock & Ladner, 2009). Android mobile phone offers user with interactive design interface. The lack of design implementation for elderly in most of the Android applications has caused the elderly users to have difficulties to use the mobile