JUNAIDA BINTI YAHYA B. TECH. (HONS) BUSINESS INFORMATION SYSTEM MAY 2013

BAHASA ISYARAT MALAYSIA (BIM)

MOBILE APLLICATION

JUNAIDA BINTI YAHYA

BACHELOR OF TECHNOLOGY (HONS)

(BUSINESS INFORMATION SYSTEM)

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Bahasa Isyarat Malaysia (BIM) Mobile Application

by

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Dissertation submitted in partial fulfilment of

the requirements for the

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CERTIFICATION OF APPROVAL

Bahasa Isyarat Malaysia (BIM) Mobile Application

By

Junaida Binti Yahya

A project dissertation submitted to the
Business Information System Programme
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In partial fulfillment of the requirement for the
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(BUSINESS INFORMATION SYSTEM)

Approved by,

_____

(Name of Main Supervisor)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
May 2013

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.

_____

JUNAIDA BINTI YAHYA

ABSTRACT

Malaysian particularly is lacking the awareness to communicate with speech/hearing impaired person especially Deaf people. There was a communication gap between normal and Deaf people while communicating. However, there are also problem faced by Deaf people in their daily life where sometimes they lack their communication tools such as through books and the internet is in the fact that they are not practically available and readily-accessible in certain circumstances. Classes and translator will cost a fortune to acquire; therefore, they are a rather undesirable alternative to improve communication between Deaf people as well as aiding the learning process of Malaysian Sign Language. To overcome this issue, a mobile application is developed intended to aid users to learn and assist communication using Bahasa Isyarat Malaysia (BIM). For one, being a mobile application allows for it to be readily-accessible and available at all times. It does not require any connection to the internet which can be limited in certain places or times. The application would help normal people to translate the words they wish to communicate with Deaf people. This application also can assist Deaf people to communicate among them while they are in the community. The prototype is developed using the Netbeans IDE with Android SDK plug-ins due to the application being targeted for the current time being at the Android platform. The basic requirements of the application were based on the research conducted during this study to determine what criteria are to be studied and implemented in the application. The outcome of this project is the development of Bahasa Isyarat Malaysia (BIM) Mobile Application which is for android user. This application is in Malay which consists of eight categories for user to learn Sign Language; Numbers, Alphabets, Pronouns, Family, Questions, Feelings, Greetings and Games. User testing was conducted and there were some discussion regarding the images, navigation button, performance, contents and the application features. Although there were some weakness on the application developed, however, most of the respondents were satisfied with the application.

ACKNOWLEDGEMENT

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Throughout history, sign language has been regarded as inferior and not recognised as a proper language at all, but as a system of mime and gestures. Over the centuries many references have been made to the use of signs in communicating with Deaf people.

Darus, N., Abdullah, N., & Mutalib, A., (2012) claimed, a Deaf and hearing impaired person is someone has damage to any part of ears and hearing loss. Due to this disability, the main problem faced by the Deaf people is that they are unable to communicate verbally with other people. They are very dependent on interpreters, who help them in the communication because not everyone is able to use sign language, especially children (Darus, N.,Abdullah, N., & Mutalib, A., 2012). Unfortunately, when these people want to interact with public by using sign language, the public are unable to give good feedback because they do not know the sign language.

Many people who can hear typically think Deaf people have a huge void in their lives because they can't hear. Nothing could be further from the truth. Even though Deaf people experience life a bit differently, they have a wonderful quality of life and enjoy the same things that hearing people do (Penilla, A. R., and Taylor, A. L., 2003). Penilla, A. R, and Taylor, A. L. (2003) also claimed, getting close to a Deaf person requires a little vulnerability on both sides. Many Deaf people are just as insecure about not being understood as you are, but most of them are patient and incredibly skilled at getting their point across to you.

This study is to develop a mobile application for learning sign language which is Malaysian Sign Language. The proposed of this application is to assist normal people to communicate with Deaf people besides to create awareness towards Deaf people.

1.2 Problem Statement

In Malaysia, disabled people are marginalized because they have a gap with normal people. In addition, Malaysian is mainly lacking the awareness to communicate with disabled people especially with Deaf and hearing impaired. Malaysian Sign Language (MySL) is the official language for Deaf people, was established since 1998. However, the awareness of this MySL among normal people is quite disappointing. Majority of Malaysian are limited knowledge of MySL and neglect the useful of learning MySL which caused disrespectful to those with Deaf and hearing impaired. There are many difficulties facing by this group of people especially when they are in public. The Deaf are unable to communicate with normal people. For example, if they want to communicate with people to ask the direction while they were lost, and unfortunately, the person are unable to give the direction because he/she cannot explain to them. These would cause miscommunication between normal and Deaf people that leads to inequalities among them; in terms of opportunity, benefits and even daily needs. For equal rights and opportunity, the public must be alert of sign language to communicate to those who are less fortunate. Besides that, the use of other sources to learn Sign Language required more money such as to attend sign language class which have to pay expensive fees, to buy sign language books and sign language CDs. With all these restraint, people become more unaware about the existence of Deaf community.

1.2.1 Problem Identification

The gap between normal and Deaf people arises because of the different way of communication. It is rarely to see these community sit together and chatting each other. For Deaf community, they prefer to gather among them because they feel inferior to mix with other people. The most important issue is the communication using Sign Language whereby this Sign Language should be done properly to give the correct meaning. Moreover, the Sign Language is not easy to act without learning and need a reference to act.

1.2.2 Significance of the Project

The proposed project is to develop the first mobile application in Malay for Sign Language. The proposed project also is to create responsiveness that will ensure the normal people could have better communication channel with the Deaf people. Other than that, the proposed of the project is to give benefits to user for better communication such as for teacher or instructor to use the application as a teaching tool.

1.3 Objective and Scope of Study

1.3.1 Objective

- To develop a mobile application that will assist in communication between normal and Deaf people by using Bahasa Isyarat Malaysia (BIM) Mobile Application.

1.3.2 Scope of Study

This study focuses on mobile technology where only smart phone users who are using Android can use the application to learn MySL in order to have a better communication with Deaf people. This study also will focus on Deaf people in Malaysia where this application developed based on the Malaysian responsibility towards Deaf community in Malaysia. While the target user is among normal people because not all normal people know how to use sign language. However, Deaf people also can use the application as their additional tool. A firm understanding on MySL is important to understand the language structure as well as having a complete set of signs for different situations. Therefore, further research on MySL will be conducted to address these issues. The findings will go into providing a database of all the signs to implement within the application. Research area of this project consists of identifying the most suitable design that can be applied in developing the system logic and interface. UT (User Testing) then also will be conducted in order to test the usability and the effectiveness of the application.

1.4 The Relevancy of the Project

This project will give benefits to users because nowadays almost everyone knows how to use smart phone especially young generation. Learning can be integrated by using the technology and easy to understand. Moreover, there are no Sign Language learning application for Malaysian in Google Play unlike American Sign Language (ASL), British Sign Language (BSL), Spanish Sign Language (SSL), Greek Sign Language (GSL), and Arabic Sign Language (ArSL). Although ASL is similar to MySL, however it is not 100% similar to the MySL.

1.5 Feasibility of the Project

1.5.1 Technical feasibility

Hardware

- Processor: Intel Celeron 1.5GHz or Pentium 1.2GHz same class or AMDx2 processor.
- Memory and Disk Space: Win XP 512 MB RAM, 1GB RAM (Win Vista or Win 7) and 290 MB disk space.
- Local Area Network (LAN).
- Samsung Galaxy Wonder.

Software

- Operating System: Windows XP (SP 2 or higher), Vista or Windows 7.
- App Inventor.
- Java.
- Android SDK.
- Android Gingerbread.

1.5.2 Economic feasibility

The development of this application is not expensive because we can get the sources for free such as the software. However, we have to pay some fees for the registration in the market but it is worth because it help the user in solving the problems regarding communication using sign language and at the same time to increase the awareness towards Deaf people.

1.5.3 Organizational feasibility

TABLE 1. Organizational Feasibility

	Roles	**Techniques for Improvement**
Developer ▪ **Developer**	▪ Develop the application. ▪ Sell or launch the application.	▪ Make a presentation about the objectives of the system and proposed benefits to those user who will use the application. ▪ Create a prototype of the application to demonstrate its potential value and benefits. ▪ Conduct a User Acceptance Test (UAT) to improve the application.
User ▪ **Normal people**	▪ Use the application. ▪ Determine whether the application is successful or not.	▪ Assign users to test the prototype. ▪ Give a feedback for UAT.

CHAPTER 2

LITERATURE REVIEW

2.1 Sign Language

According to Duke, I. (2009), sign language is a complete visual mode of communication which is the third most used language in the United States and the fourth most used language worldwide. Using sign language for conversations and information are conveyed visually rather than auditory and are composed of precise hand shapes and movements. On the other hand, sign language users combine coherent hand movements, facial expressions, and head and body movements to communicate their feelings, intentions, humour, complex and abstract ideas, and more (Duke, I., 2009).

Duke, I. (2009) also claimed, American Sign Language (ASL) is the natural native language of the American Deaf community. ASL is used as the primary form of communication in the daily lives of the Deaf. ASL is a full language with its own syntax, punctuation, and grammar where is composed of precise hand shapes, palm positions, movements, and the use of space around the signer. These elements, movements, and hand shapes are capable to convey complex and abstract ideas through supported by facial expressions and body language (Duke, I., 2009).

Mr. Tan Yap, also known as the ‘Father of the Deaf’, introduced the ASL to Malaysia in the early 1690s. The government then developed the Malaysian Sign Language (MySL) which has almost 80% similarity with ASL after through many changes and adaptation to local cultures and context (Hurlbut, 2005).

2.2 American Sign Language (ASL)

Another advance has been the recognition and acceptance of American Sign Language (ASL), not only as the language that Deaf people use but also as a language worthy of formal research. According to Andrews, J. F., Leigh, I. W., & Weiner, M. T. (2004), American Sign Language (ASL) is a fully developed language with a complex grammar. It has formal structures at the same level as spoken language which have similar organizational principles and a constrained set of features. In other words, just as a person cannot make up a sign with random hand shapes, location, and position. English uses word order to show its relationships or grammar; ASL uses space and movement (Andrews, J. F., Leigh, I. W., & Weiner, M. T., 2004). For example, using the same words or signs, a person can compose two sentences with different meanings, but when the movement in the sentence is changed, the meaning is also changed:

- The dog bit the cat.
- The cat bit the dog.

In ASL, the signer sets up where the dog is situated and where the cat is situated. The signer then makes the movement from one to another: DOG CAT BITE or CAT DOG BITE. American Sign Language has many grammatical processes like this that use space and movement to show meaningful relationships among the signs, whereas English uses sequential word order.

English uses morphemes to express time; ASL uses signs to mark time (NOW, FUTURE, LONG-TIME-AGO, PAST, FINISH) and movement. For example, these sentences have a different time frame:

TABLE 2. ASL Sentence Differences

English	**ASL**
The cat walk*s.*	CAT WALK.
The cat is walk*ing.*	CAT WALK-continuous-movement
The cat walk*ed.*	CAT FINISH WALK.
The cat *will* walk.	CAT WALK WILL.

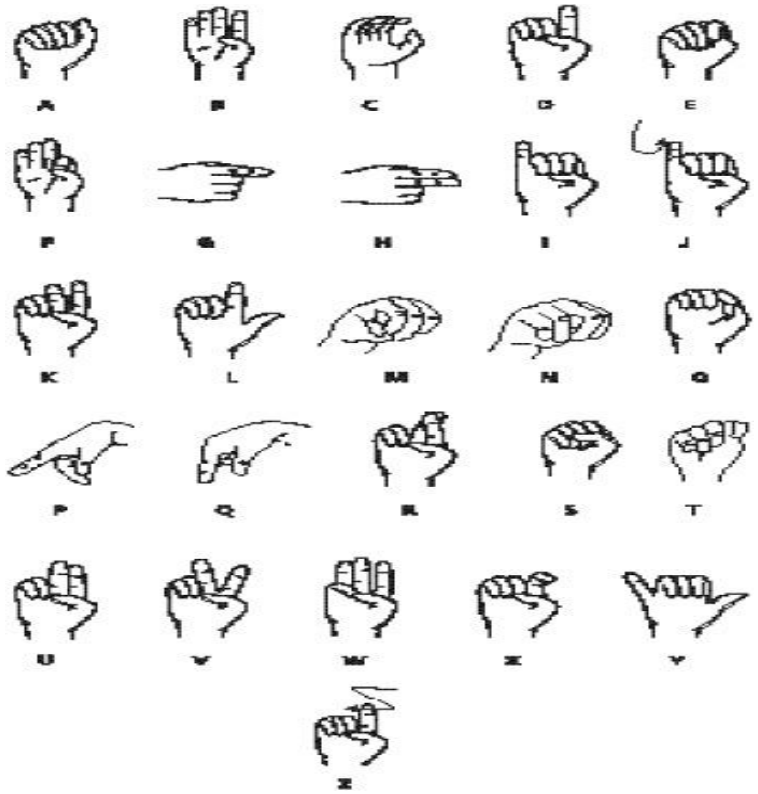

FIGURE 2. American Sign Language

Source: https://www.google.com/search?q=american+sign+language&source

2.3 British Sign Language (BSL)

According to City, Lit. (2008), British Sign Language (BSL) is usually referred to in its abbreviated form of BSL. The same applies to the Sign Languages of other countries, for example, American Sign Language (ASL), Australian Sign Language (AUSLAN) and Langue des Signes Francaise (LSF) for French Sign Language. City, Lit. (2008) claimed that BSL has been used for hundreds of years but was only recognized by the government as an official language (along with Welsh and Gaelic) in 2003 – after a prolonged campaign by the Deaf community. In common with spoken languages, BSL is different from the sign languages of other countries. The British finger-spelling alphabet uses both hands whilst the above countries, and most others, use only one (City, Lit., 2008).

Below are the examples of sentences which have a different time frame:

TABLE 2. BSL Sentence Differences

English	BSL
Are you Deaf?	YOU DEAF?
I'm Mark. What's your name?	(pointing to self) M-A-R-K. (pointing) NAME?
Yes, that's right.	(head nod) RIGHT.
I know a little bit.	LITTLE.

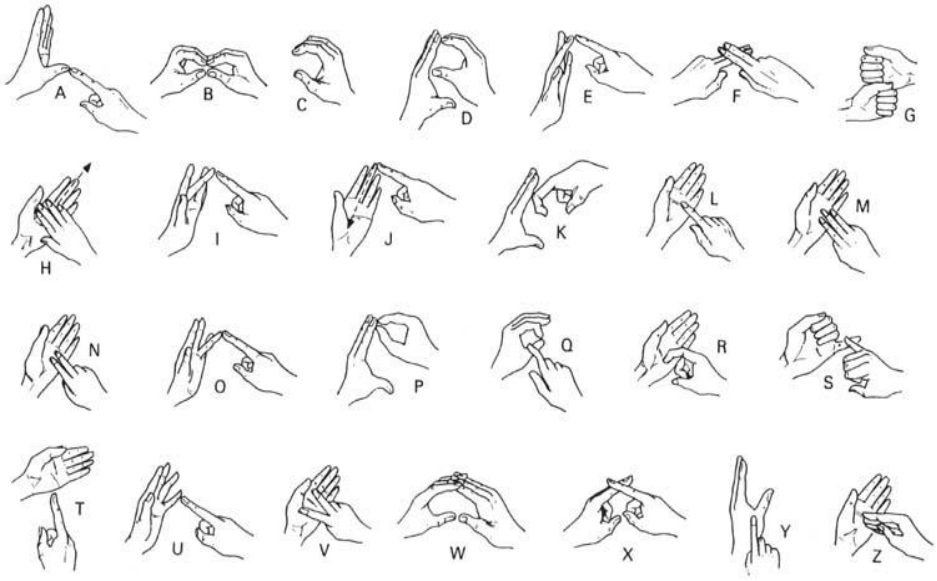

FIGURE 2. British Sign Language

Source: https://www.google.com/search?q=british+sign+language&tbm

2.4 Malaysian Sign Language (MySL)

According to Dhiya'uddin, S. (2012), Malaysian Sign Language (MySL) had been taught in special educational schools in Malaysia since its commencement in 1998. The common delusion 'only the Deaf should know sign language', should be corrected. In fact, the Deaf community not only involve hearing persons who could communicate using sign language, it also includes the hearing parents, siblings, students of sign language, interpreters, teachers, as well as the organization that supports the welfare of the Deaf (Dhiya'uddin, S., 2012).

Dhiya'uddin, S. (2012) also claimed, there are differences in the 'grammar' for Malaysian Sign Language as compared to the spoken Malay Language. Table shows the example of the differences:

TABLE 2. MySL Grammar Differences

English	MySL
He did not came to class	HE. CLASS. EMPTY
I want to go to the market.	ME. MARKET.
Where does that girl live?	GIRL THERE LIVE WHERE?

The order of sign eases the signing communication better with more comfortable pace between the signers. There are signs that represent verbs, pronouns, nouns, objects as well as idioms; meanwhile for items that does not have sign to represent them, is signed using finger spelling.

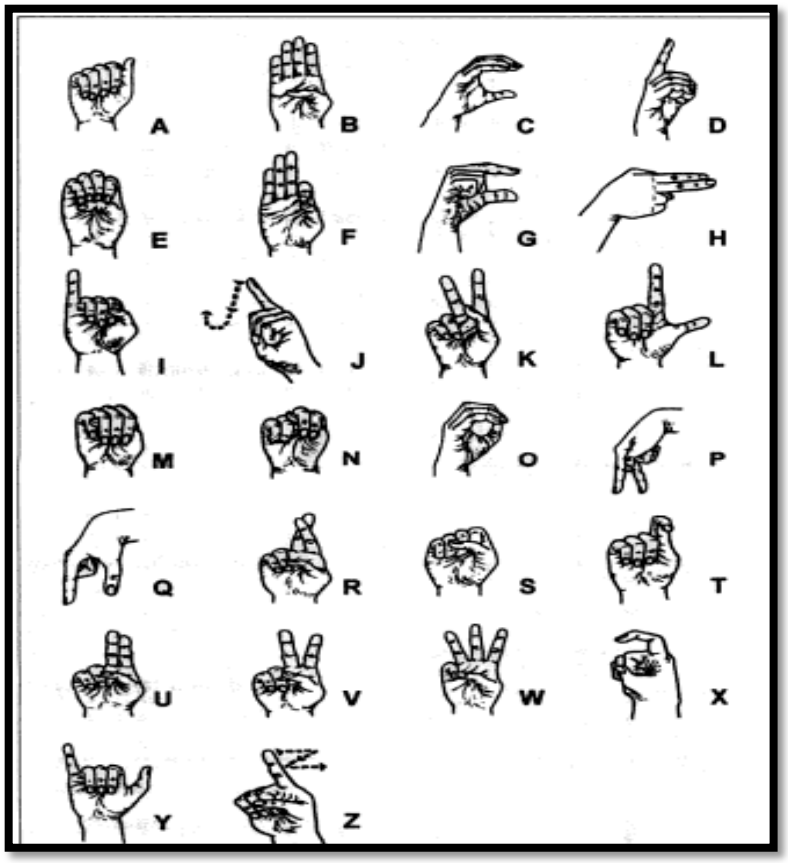

FIGURE 2. Malaysian Sign Language

Source: https://www.google.com/search?q=malaysian+sign+language&tbm

2.5 Communication with Deaf People using Technology

In the modern era, Deaf people stay in touch through the use of technology and they make effective the use of the phone line and other bits and pieces to communicate each other or with other people especially normal people. These are the examples of the way Deaf people communicate among them by using the technology:

- Minicoms and Text-phones

A text-phone is popular equipment used by Deaf people to communicate through the telephone, as it involves typing and reading rather than relying on speaking, or listening to speech. People with speech impairments, therefore, also use text-phones. Text-phones (also commonly known as minicoms) make use of a normal phone line. Some may have the phone line permanently connected, meaning that you make the call directly from the machine, and others may contain two circular pads, on which the standard telephone is placed after the call is made and connected.

- Type-Talk and Text-Direct

You can call Deaf person with the help of a useful relay service called 'Text-Direct', which is operated by RNID Type Talk. Using a normal phone, a hearing person can dial a prefix number (18002), then the Deaf person's full telephone number, and automatically a TypeTalk operator comes into the call, and everything you say is relayed by the operator who types your message to the Deaf person, who reads it on their text-phone. Likewise, when the Deaf person types a message back, the operator reads out exactly what is typed to the hearing person on the other end of the line. In the same way, using this service, a Deaf person can have access to anyone who has a telephone (for example friends, doctors, businesses) by using their minicom.

- SMS

These days, nobody seems to be without a mobile phone, and Deaf people are no exception. Using SMS (Short Message Service), Deaf people can stay in touch and have 'text-chats' in the same way that anyone can. Some of the great things about texting are the speed, the directness, which you don't need any specialist technology (even most landline phones have an SMS function), and you don't need a third person to relay a message. Text message tend to be short, to the point, and contain their own spelling peculiarities that cross the Deaf/hearing cultural divide.

- Fax machines

Some may say that fax machines have had their day, because everyone's using email. But a fax machine is a useful piece of equipment to have, at home or in the office. Using fax machine, the Deaf person can draw diagrams and pictures to express their feeling and meaning. They can also annotate things, circle bits of information, scribble things out, modify language in a way that they may not so easily be able to do with emails, unless they're technical whiz. Such differences make fax machines a useful piece of technology for Deaf people who predominantly use sign language to communicate. Deaf people find emails useful too, but writing emails requires a fair amount of knowledge of written English, which may be a barrier to some. So, Deaf people can be more visual and creative with their pen, if they have access to a fax machine.

- Email

Every office in organization dependent on email and this technology has made an enormous difference to Deaf people in employment in positions that may until recently have required speaking, listening, and using a telephone. Email keeps everyone in contact on an equal level – hearing or Deaf, whether among colleagues, friends or for business.

- Videophones/Webcams

Using videophones and webcams in communication has great potential especially among Sign Language users. Unlike with email, text-phones, and SMS, Deaf people don't need any knowledge of the English language to use a webcam or videophone, and this aspect of the technology is great if they prefer to use Sign Language instead. Evidently, this technology is likely to be huge benefit for Deaf Sign Language users who able to contact friends using their first language. The technology at the moment is a little expensive and the picture quality needs to be pretty top-notch to make good use of it for sign language, but things are improving all the time.

2.6 Introduction the Android Computing Platform

FIGURE 2. Android Symbol

Source: https://www.google.com/search?tbm=isch&sa=1&q=android&oq=android&gs_l

Mobile phones use a variety of operating systems, such as Symbian OS, Microsoft's Windows Mobile, Mobile Linux, iPhone OS (based on Mac OS X), Moblin (from Intel),

and many other proprietary OSes (Komatineni, S., MacLean, D., & Hashimi, S. Y., 2011). According to Komatineni, S., MacLean, D., & Hashimi, S. Y., (2011), Google acquired the start up company Android Inc. in 2005 to start the development of the Android platform. There were four key players at Android Inc. included Andy Rubin (Senior Vice President of Mobile at Google and co-founder of Android Inc.), Rich Miner, Nick Sears, and Chris White.

When Android was released, one of its key architectural goals was to allow applications to interact with one another and reuse components from one another. This reuse not only applies to services, but also to data and the user interface (UI). As a result, the Android platform has a number of architectural features that keep this openness a reality (Komatineni, S., MacLean, D., & Hashimi, S. Y., 2011).

Komatineni, S., MacLean, D., & Hashimi, S. Y. (2011) also claimed that Android has concerned an early following and continued the developer thrust because of its fully developed features to exploit the cloud-computing model offered by Web resources and to enhance that experience with local data stores on the handset itself and also support for a relational database on the handset played a part in early implementation.

2.7 Mobile Application in Aid for Sign Language Learning

- American Sign Language (ASL) Flash Cards.

The application only teaches the alphabets, not full extent of ASL since it is free.

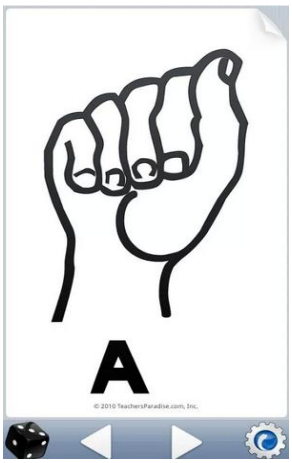

FIGURE 2. ASL Flash Cards

Source: http://www.americansignlanguageflashcards.com/

- Signing Savvy online sign language resource.

Signing Savvy is a sign language dictionary containing high resolution videos of American Sign Language (ASL) signs, finger spelled words, and other common signs used within the United States and Canada.

Signing Savvy Member Apps is for members of Signing Savvy. The app includes the ability to search for and view high-quality sign pictures. However, this is only applies for Signing Savvy members only, normal user can only see sign of the day.

FIGURE 2. Signing Savvy

Source: http://www.signingsavvy.com/

2.8 Sign Language Learning using Voice

Besides learn the sign, this application also have a voice which can be heard when the user click on the picture. Instead of young generation, children also can use the application to learn the sign and learn to pronoun the sign. According to Foong, O.M., Low, T.J., & La, W.W., (2009), by providing a voice (English Language) to sign language translation system using Speech and Image processing technique, it can be a solution in the process of learning and understanding the sign language. Thus, the using of voice can be used as a medium in learning process and the use of voice function also can make this application more valuable to the user.

CHAPTER 3

METHODOLOGY

3.1 Research Methodology

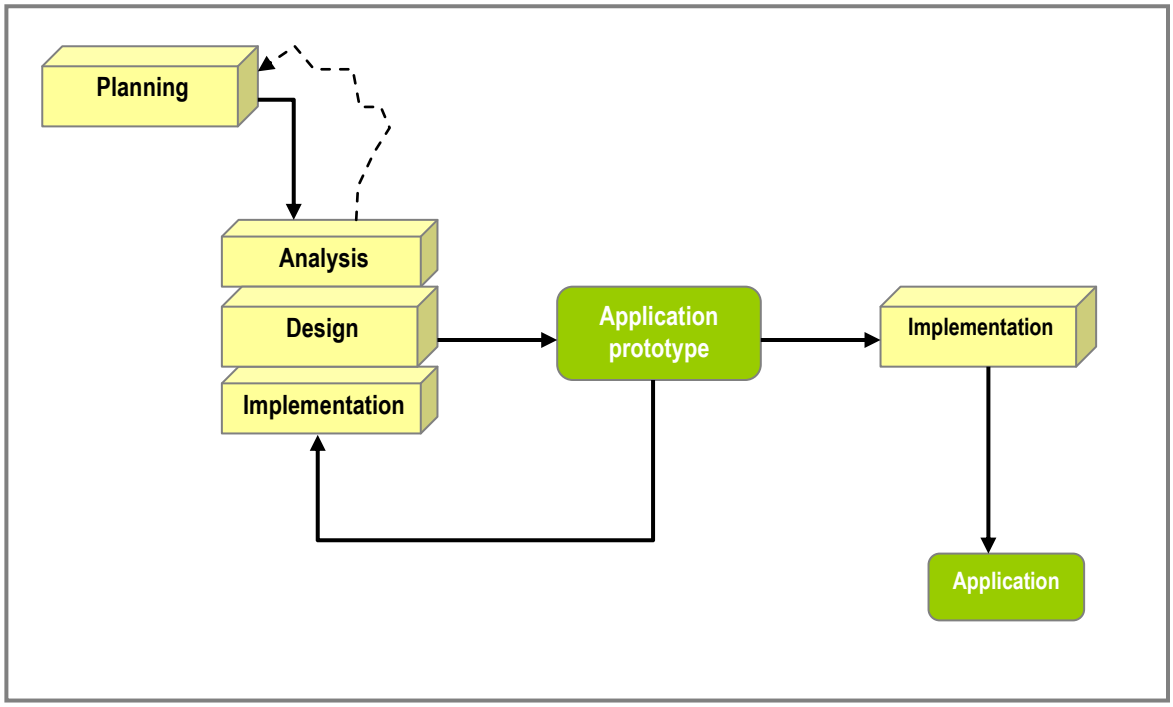

FIGURE 3. Prototyping Methodology Diagram

3.1.1 Planning – Data Gathering

In planning stage, essential information for this research will be collected through primary and secondary sources with the combination of:

- **Unstructured interview** – An interview will be conducted with person who manages the Deaf person such as the management of Malaysian Deaf Association in Perak and a mother or father who have Deaf children.

- **User requirement survey** – A survey will be conducted on the selected population which consists of students and staffs from Universiti Teknologi PETRONAS (UTP). The students and staffs of Universiti Teknologi PETRONAS represents views from multiple states in Malaysia; the local residence of Bandar Seri Iskandar, regarding the importance of communication between Deaf person and the normal person.

    - **Sample size -** Total number of 40 respondents will be used to represent the overall population of Perak state, which general assumption should be made with caution and knowledge regarding the local social structure.

    - **Sampling method –** Opportunity sampling is a type of non-probability sampling which involves the sample is selected from that part of the population which is close to hand. A sample population selected because it is readily available and convenient. However, since the method is open to tendency bias and does not represent the population as whole, no general assumption is made without knowledge of the social structure of the population itself.

    - **Questionnaires –** there will be a questionnaire distributed to the respondents which is students and staffs of UTP. The questionnaire consists of close-end questions to enable conveniences for the respondents to complete the survey without any trouble.

3.1.2 Analysis – Data Analysis

The analysis phase is conducted to perform a user need analysis after gather data and statistics that will determine the requirements of the application. This phase will involve analyzing the surveys and interviews conducted on the normal people to understand what difficulties they faced when trying to communicate with Deaf people. Also on Deaf people, the barriers they faced when want to communicate with normal people.

3.1.3 Design – Application Development

The design phase determines how the application will works in the mobile phone. A prototype of the application will be developed during this phase. This will allow for numerous testing of the product such as validating the system specifications and requirements, addressing any newly discovered requirements, and uncovering any design flaws. This phase will be repeated continuously for improvement until the prototype meets the requirements and satisfy the developer.

The application will not be tested all at the same time, but will be designed and tested in small modules because it is less risky to develop and handle. For example, for the application, there were eight categories for Sign Language learning, so there will be eight modules which are:

- Module 1: Numbers
- Module 2: Alphabets
- Module 3: Pronouns
- Module 4: Family
- Module 5: Questions
- Module 6: Feelings

- Module 7: Greetings
- Module 8: Games

3.1.4 Implementation

Upon finishing the initial prototype of the application and reaching a significant level of approval in terms of performance and execution, implementation of the application is conducted with the target user. After the application is designed, the usability testing will be conducted among users. This is to ensure the application meets the requirements and useful. At the end of this phase, the final product, the development of the system is complete and the final deliverable of the project makes the project successful.

3.2 Project Activities and Key Milestone

TABLE 3. Project Activities

No.	Deliverables/Activities	Schedule
1	Title selection and proposal	Week 2
2	Project approval	Week 4
3	Problem identification	Week 5
4	Extended proposal	Week 6
5	Market survey and Requirement Gathering	Week 8
6	Process and System Modelling	Week 10
7	Interface Design	Week 12
8	Proposal Defence	Week 12
9	Interim Report	Week 14
10	Architecture and System Design	Week 15
11	System Complete	Week 17
12	Progress Report	Week 20
13	Usability Testing	Week 21
14	Pre-Sedex	Week 24
15	Viva	Week 27
16	Final Dissertation	Week 28

3.3 Gantt Chart

TABLE 3. Gantt Chart

DETAILS WEEK																												
	FYP 1														FYP 2													
ACTIVITIES	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Planning Phase																												
Problem identification & feasibility study																												
Initial background study																												
Literature review																												
Construct questionnaire																												
Analysis Phase																												
Conduct a survey																												
Study on Android																												
Data gathering																												
Tabulation of data/data analyzing																												
Design Phase																												
Modelling																												
Interface sketch and design																												
Prototype design																												
Implementation																												
System development																												
Usability testing																												
Tabulation of usability data & feedback																												
Improvement of prototype																												

3.4 Tools

3.4.1 Hardware

For this project, smart phone which are using android such as Samsung smart phone will be used as a device that controls the programme that help public also Deaf and hearing impaired person to learn MySL. In the development phase, a personal computer or notebook will be use as a workstation before demonstrate the application.

3.4.2 Software

For the software, App Inventor, Java, Android SDK, Microsoft Windows 7 and Android Gingerbread will be used as the development tool of the prototype.

CHAPTER 4
RESULT AND DISCUSSION

4.1 System Design

4.1.1 Use Case Diagram

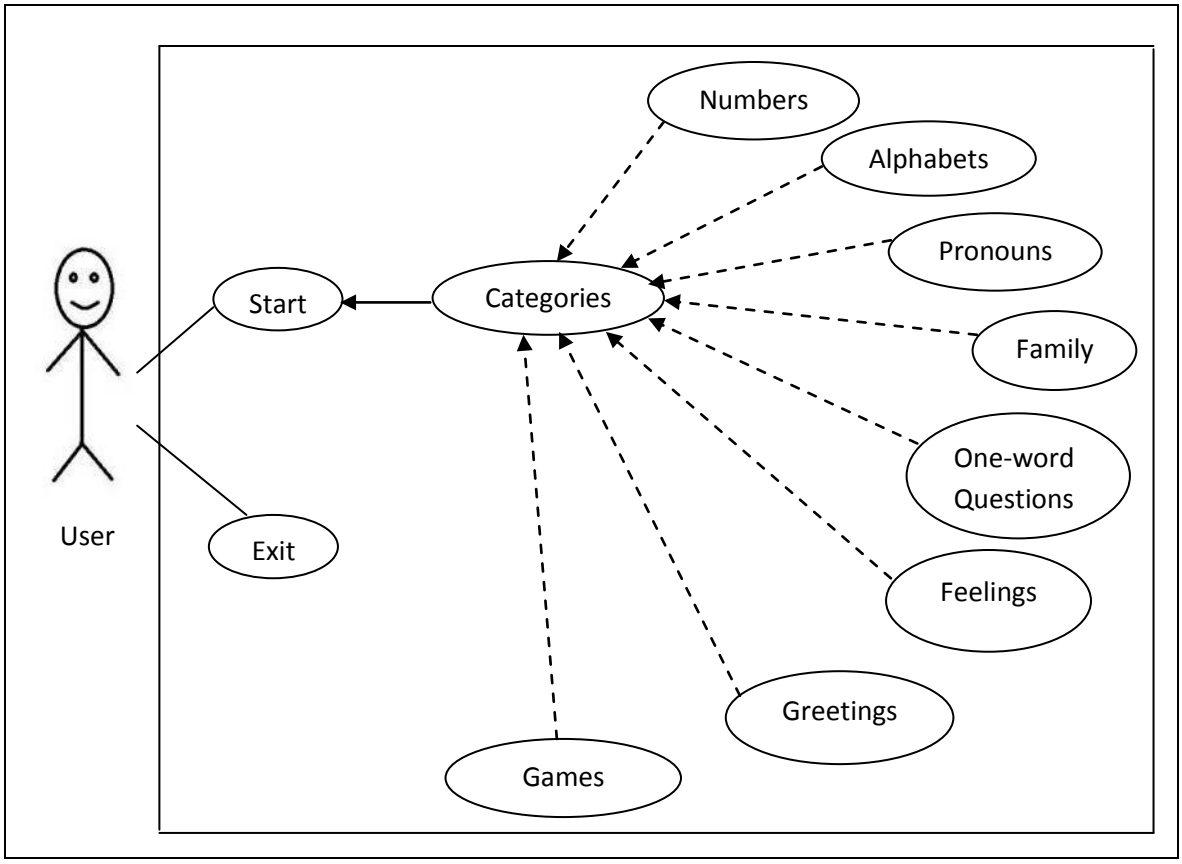

FIGURE 4. Use Case Diagram

4.1.2 Activity Diagram

- **View words by Categories**

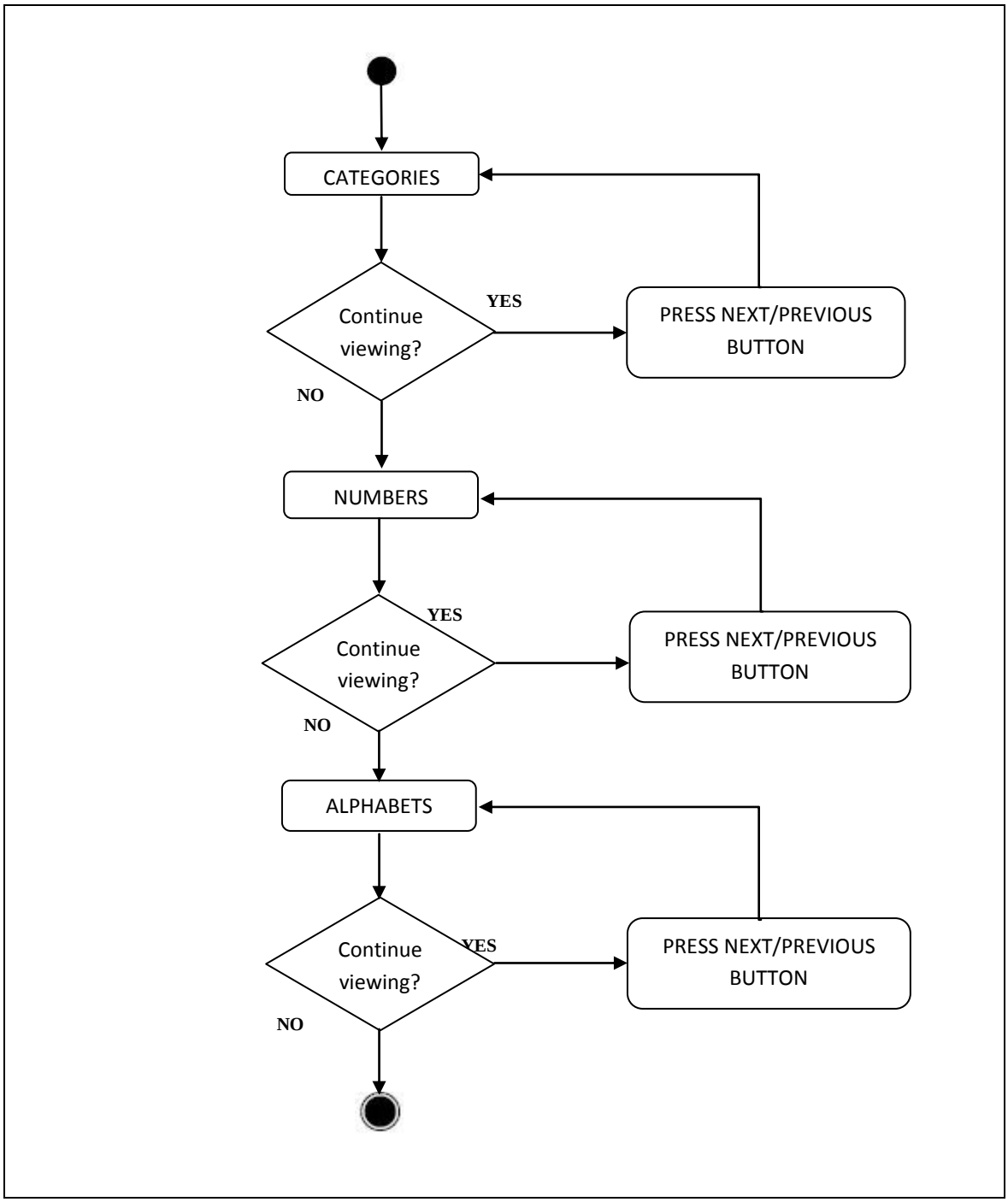

FIGURE 4. View words by Categories

By sorting the signs by categories, user can browse through the categories and learn BIM more systematic method. The categories include; Numbers, Alphabets, Pronouns, Family, Question, Feelings, and Greetings. These categories will be update in the future. However, sufficient signs are given in the first place for enriched user experience.

- **Games**

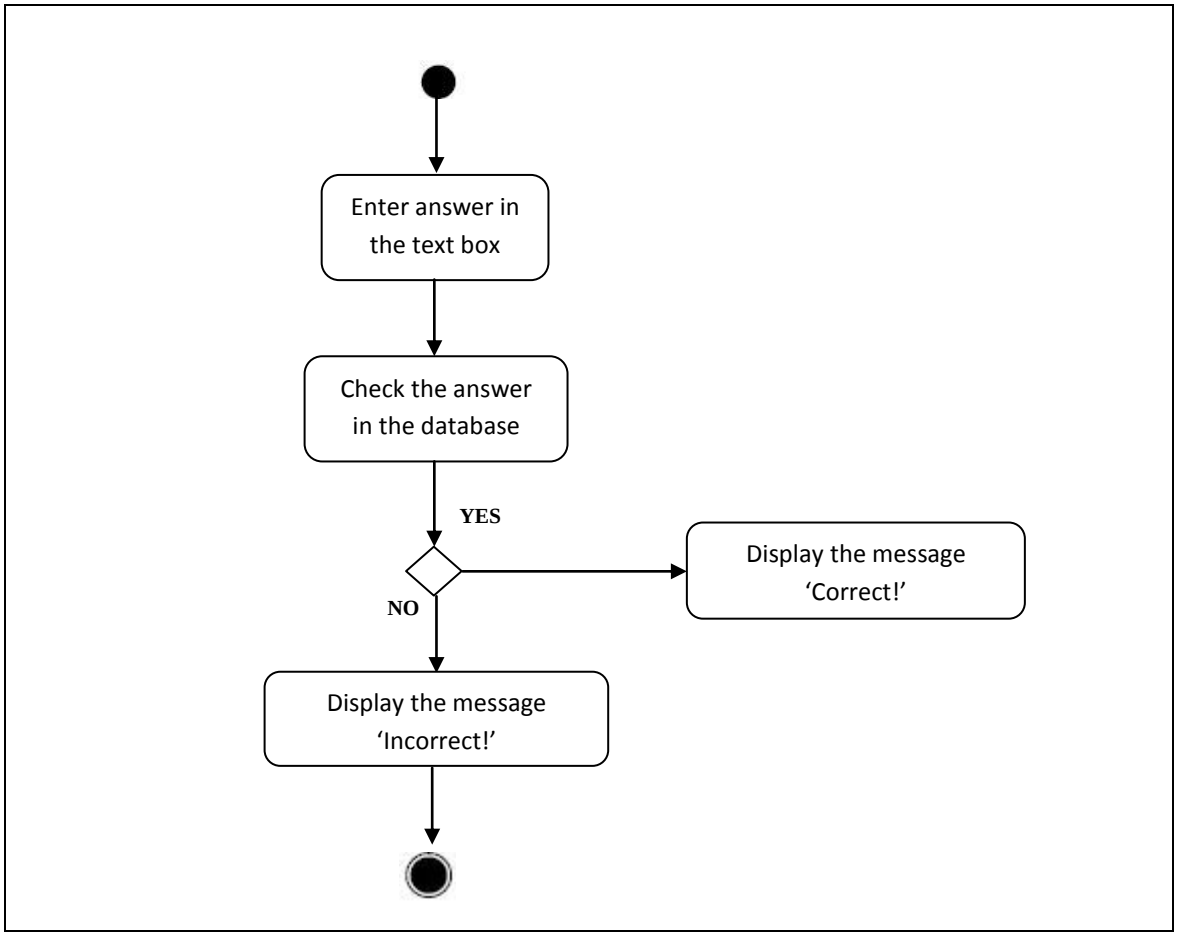

Figure 4. Games

By utilizing the Games function in the application, the user will be able to have effective learning by remembering the sign. To play the game, user need to type the answer in the text box. If the answer is correct, the label under the text box will display 'Correct' and otherwise, it will display 'Incorrect'.

4.1.3 Initial Prototype

FIGURE 4. Screenshot 1

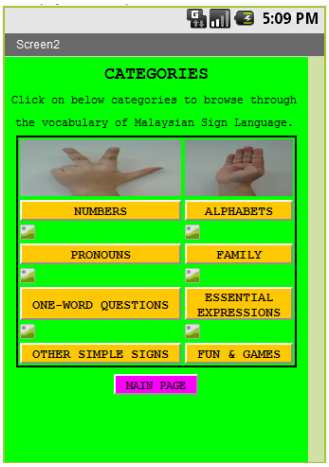

FIGURE 4. Screenshot 2

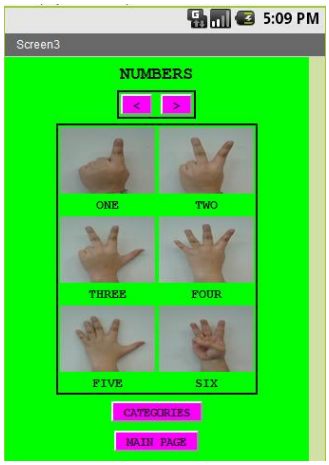

FIGURE 4. Screenshot 3

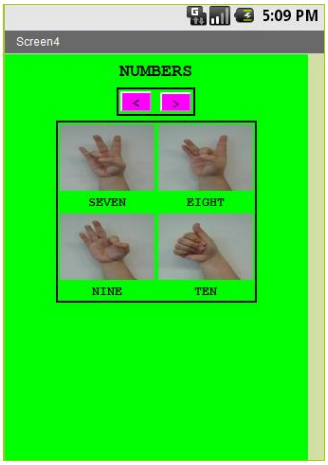

FIGURE 4. Screenshot 4

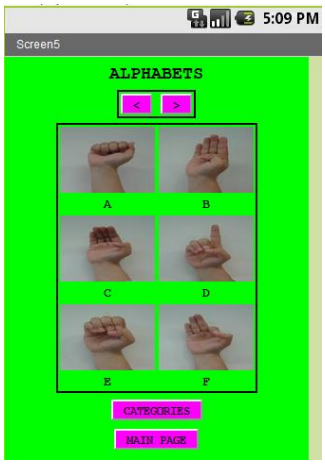

FIGURE 4. Screenshot 5

FIGURE 4. Screenshot 6

FIGURE 4. Screenshot 7

FIGURE 4. Screenshot 8

4.2 Discussion of Findings

4.2.1 Results from the Survey conducted

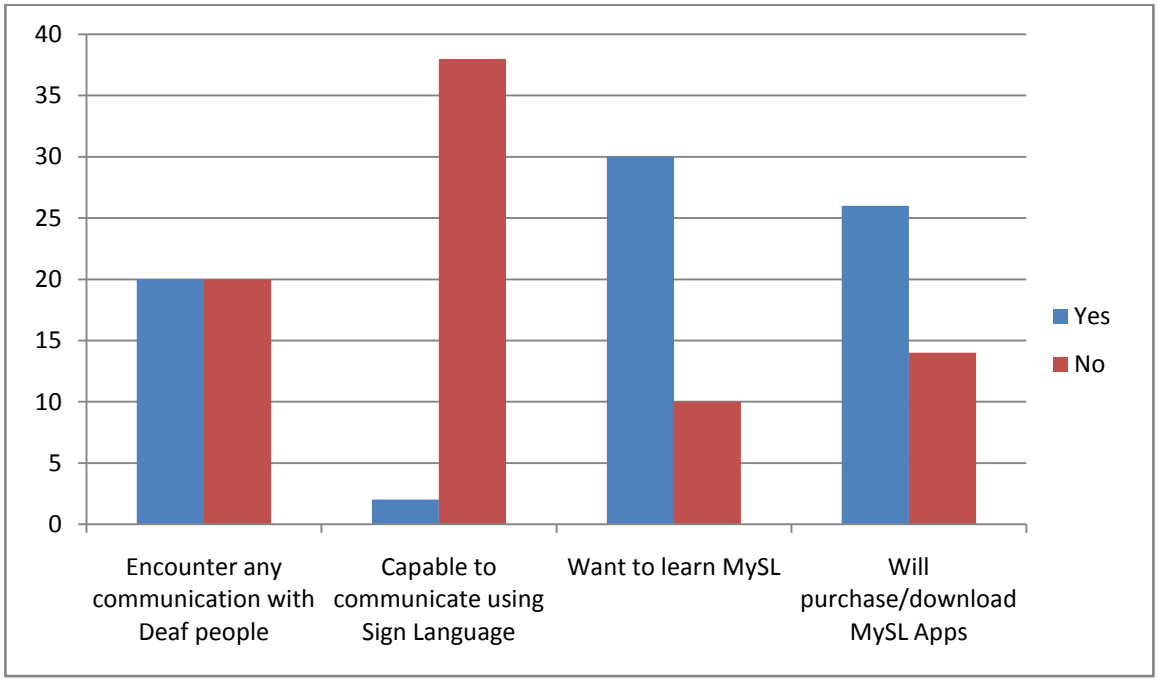

FIGURE 4. Respondents Knowledge on Sign Language and Technology Capacity

From the survey, there were half of the respondent have encountered a communication with Deaf people and this show there were an interaction between normal people and Deaf people. However, almost all of the respondents were not capable to communicate using Sign Language because they were not being exposed to Sign Language and also lack of awareness towards Deaf people. Luckily, if they are given a chance to learn Sign Language using BIM mobile application, they are willing to do so because from the survey, there were 75 % respondents want to learn Sign Language. Furthermore, out of 40 respondents, 26 respondents are willing to purchase or download BIM mobile application. This means they are interested with this application and there were a user for this application. In addition, an interview with mother who has a Deaf child indicates that she has a barrier to communicate with her child for the first time and it also takes a time to familiar with the situation and she also has to learn Sign Language to communicate better with her child. Thus, this application will give benefits to both

parties, normal and Deaf people in order to have better communication between each other.

4.2.2 User Requirements

- **Colour**

From the survey conducted, based on the user requirements for the application, the application will be developed with coloured images to enhance visual attraction of users.

- **User friendly**

The application also will be developed based on user friendly which the layout of the sign images will need to be easy on the eye while not cluttering the information the signs trying to convey.

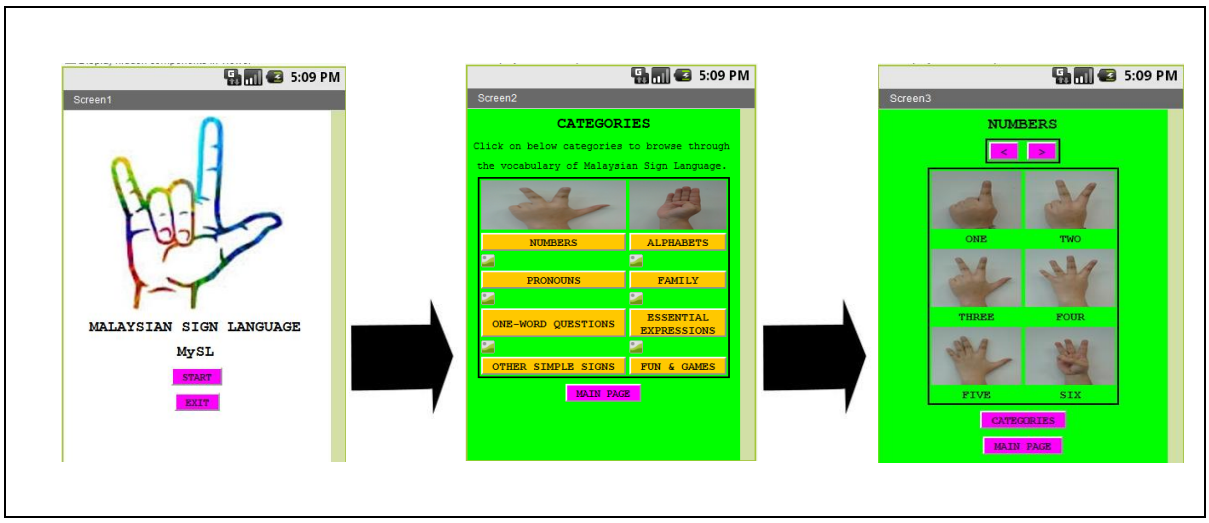

FIGURE 4. Screenshot

From the screenshot above, there were only three pages that the user needs to pass to reach the learning page where it gives pleasure to the user.

- **Language**

Users that have been interviewed also asked to change the language of the application from English to Malay in order for them to use the application easily especially for the elderly and the children.

4.2.3 Prototype Improvement

After several testing, there were a lot of improvement needs to be done into the application. The improvement include to change the interface colour, the picture, design, function, and also to include a sound into the application.

- **Colour**

The colour was changed from green to blue. This is due to the suitability of the user and the colour was not too bright.

FIGURE 4. Colour before and after

- **Picture**

The pictures were changed from real picture to animation picture. This is due to the difficulties to use the real pictures because there were some signs need more than one gestures. There were also instructions for user to understand the pictures before the changes. The replacement of the old picture also makes the new picture can display bigger than the old picture.

FIGURE 4. Pictures before and after

- **Design**

Instead of using two pictures for one word, the design was changed to use only one picture for one word. The changes make the user more understandable to learn the sign. In order to make the application user friendly, the user only needs to click on the ‘Ke belakang’ or ‘Seterusnya’ button to display the picture and the name of the sign.

FIGURE 4. Design before and after

- **Function**

The main function which is the language's application was changed from English to Malay. The function button also changed where before the changes, the user needs to click on the button that labelled with the name of the categories. After the changes, the user needs to click on the picture to proceed using the application.

The final functions are:

- Numbers → Nombor
- Alphabets → Huruf
- Pronouns → Kata Ganti Nama
- Family → Keluarga
- Questions → Pertanyaan
- Feelings → Perasaan
- Greetings → Ucapan
- Games → Permainan

FIGURE 4. Function before and after

4.2.4 Structure of Application (Finalised Interface)

- **Main Page**

To start the application, the user need to click on the 'MULA' button and then, the application will display the categories that available in the application. To end the application, the user can click on the 'KELUAR' button.

FIGURE 4. Main page

- **Categories**

There were eight categories/function that user can choose to learn which is Numbers (Nombor), Alphabets (Huruf), Pronouns (Kata Ganti Nama), Family (Keluarga), Question (Pertanyaan), Feelings (Perasaan), Greetings (Ucapan), and Games (Permainan). To view the content in the categories available, the user can click on the picture. To go to the main page or exit the application, the user can click on the 'LAMAN UTAMA' button. To start the learning, user can click on the 'Ke belakang' or 'Seterusnya' button to view the picture and the sign's name.

FIGURE 4. Categories

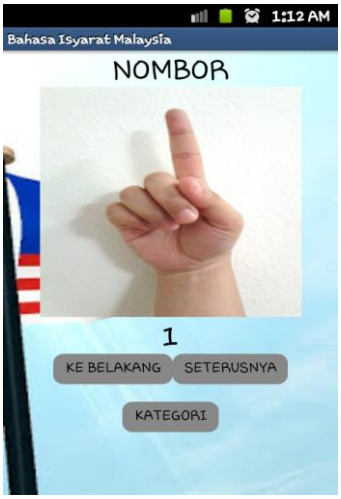

FIGURE 4. Numbers

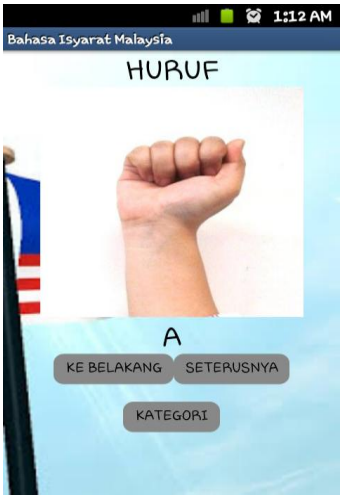

FIGURE 4. Alphabets

FIGURE 4. Pronouns

FIGURE 4. Family

FIGURE 4. Questions

FIGURE 4. Feelings

FIGURE 4. Greetings

- **Games**

To enjoy the sign language learning, user can play a game on sign language. The game required the user to guess the picture and enter the answer. To play the game, user need to enter the answer in the textbox and click on the 'HANTAR' button. If the answer is correct, the word 'Betul' will appear below the textbox and if the answer is wrong, the

word ‘Salah’ will appear. To continue with the other picture to guess, the user need to click on the ‘SETERUSNYA’ button.

FIGURE 4. Games

FIGURE 4. Games

4.2.5 User Testing

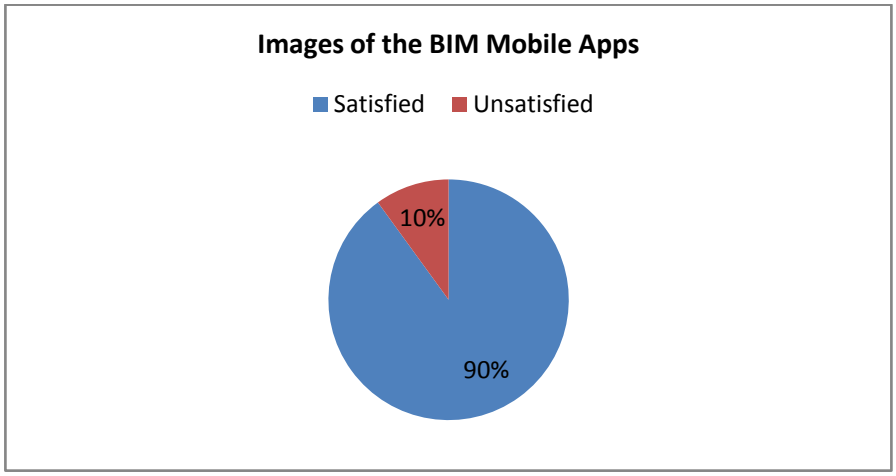

Figure 4. Images of the BIM Mobile Apps

There were 90% users satisfied with the application images. It indicates that the images are big, clear and understandable.

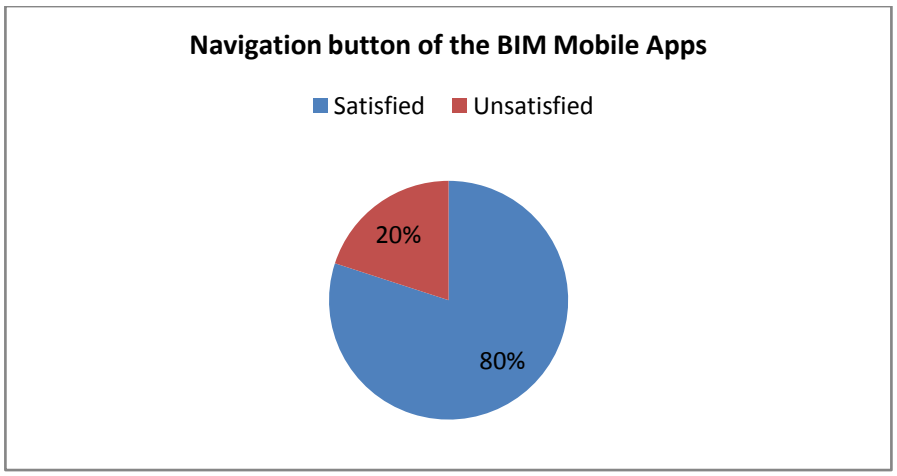

Figure 4. Navigation Button of BIM Mobile Apps

While on the other aspect, 80% users were satisfied with the navigation button where the buttons are easy to handle, simple and structured.

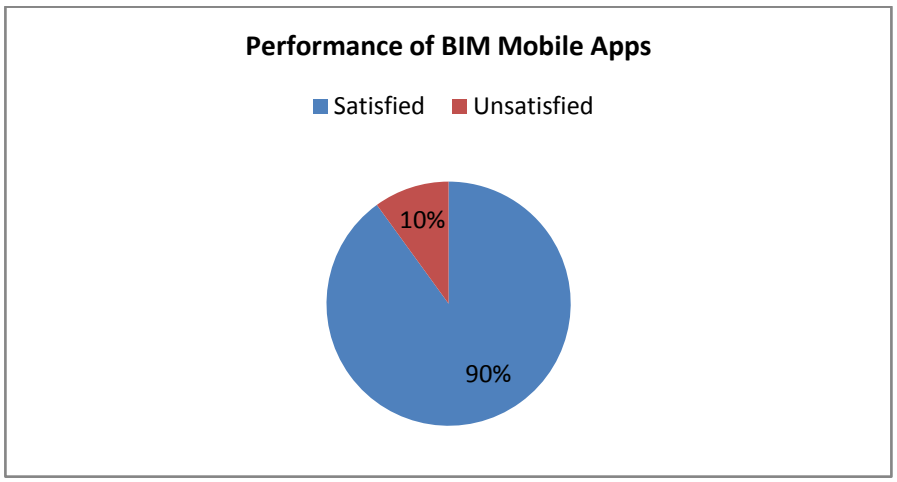

Figure 4. Performance of BIM Mobile Apps

There were 90% users satisfied with the application performance. For example, the answer entered by the user matches the picture output for games function.

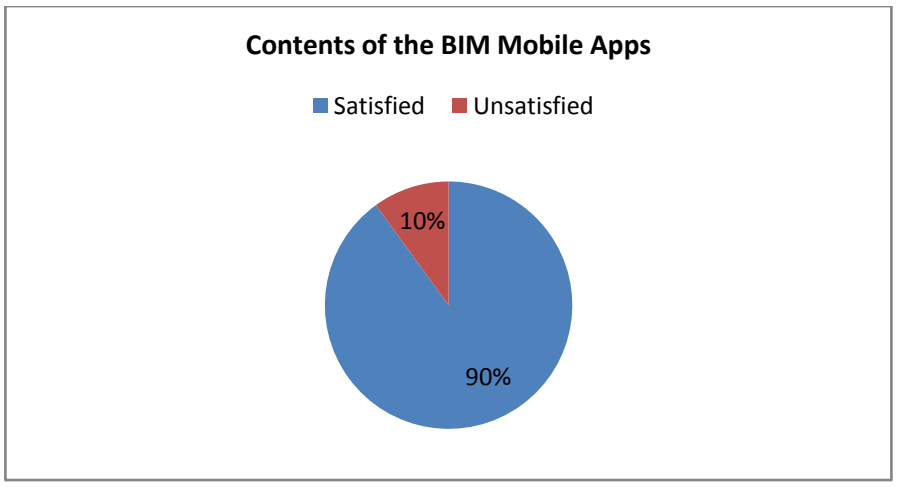

Figure 4. Contents of BIM Mobile Apps

There were 90% users satisfied with the contents of the application, means the signs are sufficient for basic conversation.

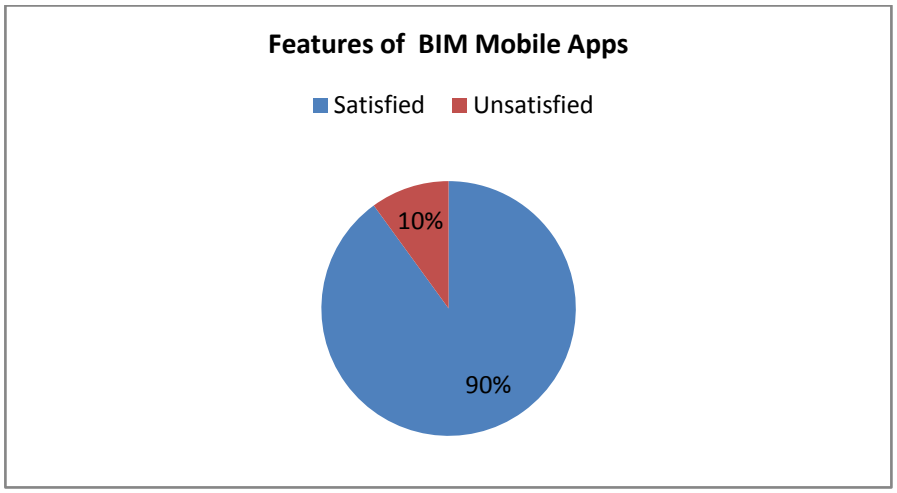

Figure 4. Features of BIM Mobile Apps

For features aspect, there were 90% users satisfied with the features where the games make they enjoy using the application.

CHAPTER 5
CONCLUSION

5.1 Conclusion

As for conclusion, in hope to bring equality towards the nation, both normal and Deaf people must be equalized. The daily miscommunications between both parties lead to inequalities among them; in terms of opportunity, benefits and even daily needs. In order to do so, the normal people must learn compassion and provide equal opportunities for the Deaf, by learning Sign Language as an initiative.

By introducing Bahasa Isyarat Malaysia (BIM) Mobile Application, normal people can have better communication between Deaf people. On the other hand, the normal people are able to learn Sign Language and engage with the Deaf, thus the inequalities among them can be eliminated.

Using mobile technology, learning can be highly efficient. Furthermore, incorporating learning with technology would be an effective way to promote the learning of Sign Language towards the generation X and generation Y. Hence, the Bahasa Isyarat Malaysia (BIM) Mobile Application is expected to enable the users to learn and communicate better with Deaf people with ease.

5.2 Recommendation

There are numerous undertakings that can proceed to improve the development of the application such as:

- Use of videos to represent hand gestures or simple idioms.
- The use of sound to represent the signs pronunciations.

Due to time restrictions and limited technical capability, several of these improvements are not feasibility to be implemented into the application within the time given frame. The implementation of videos to portray the hand gestures movement will allow a more precise description of the sign which will correspondingly allow the person using the application to perform the sign more accurately. However, there is limited function using App Inventor which is the video allowed to store in the application is no more than 1 MB per video.

By utilizing the blocks editor, the application can also be included sound to represent the signs pronunciations to allow for wider use and availability for the public.

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APPENDICES

- **Questionnaire**

Final Year Project

Department of Computer & Information Sciences

UniversitiTeknologi PETRONAS

Section I: User Profile

Instructions: Please tick (□) one of the options provided or specify otherwise.

Date: _____

Gender: □ Male □ Female

Age Group: □ below 15 □ 15-20 □ 21-25 □ 26-30 □ 31-35

(Years) □ 36-40 □ 41-45 □ 46-50 □ Above 50

Race: □ Malay □ Chinese □ Indian □ others, please specify: _____

Occupation: _____

Section II: User Knowledge on Sign Language

Do you have family member(s) who have speech/hearing impediment?

□ Yes □ No

Have you encounter any communication with speech/hearing impediment?

□ Yes □ No

Are you capable of communicating using Sign Language?

□ Yes □ No

Would you like to learn Malaysian Sign Language?

□ Yes □ No

Section III: User Technology Capacity

Do you have a smartphone? If yes, state the model _____

Do you believe learning should be integrated with smartphones?

□ Yes □ No

Will you purchase an application that teaches Malaysian Sign Language?

□ Yes □ No

- **User Testing Form**

User Testing Form	
Date	
Name	
Contact Phone Number	
E-mail Address	
Test Scenario	**Result**
1. Signs images (clear/unclear/confuse/understandable, /etc.)	
2. Navigation button (clear/unclear/structured/unstructured /etc.)	
3. Application performance (run smoothly/error)	
4. Contents (sufficient/insufficient)	
5. Features (good/lack)	