B-Friend- Navigation Mobile Application for Visually Impaired in Malaysia

By

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Dissertation submitted in partial fulfilment of
the requirements for the
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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
Information Communication Technology Programme
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In partial fulfillment of the requirements for the
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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.

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KUGARUBAAN A/L SRI VETIVELAN

Abstract

Blind, since the beginning have been using traditional methods such as the walking stick and guide-dog for their mobility purposes. Guide dogs are not employable at a large scale .The cane is too restrictive. Due to the development of modern technologies, many different types of devices are available to assist the blind .

The study is aimed to capitalize on the GPS implementation to assist the blind in navigation with predefined destinations. With this, the blind can have the utmost confidence and freedom to be able to carry out daily activities like any other. The predefined destinations are selected based on the user preference and these destinations are selected using the volume buttons. The selected destination will then be routed on to the Google Maps to navigate the blind using the pedestrian mode.

So, it is an attempt to adapt the advancement of technology in a best possible way to assist the blinds in Malaysia in navigation. The mobile application is mainly targeted for the blinds and the visually impaired. Research on the mechanisms, interviews and technologies needed to solve outdoor navigation and orientation problems for blind users is presented in . The blind need to be studied on their daily activities and understand the needs of the blind when it comes to navigating themselves. A close rapport with the blind, analyzing the daily activities would open up the possibility of clearly understanding the unfulfilled needs of the blind. It is also crucial enough to take in measuring considerations on the safety of the blind when it comes to the usage of the device.

Acknowledgement

Firstly, I would like to dedicate this column to thank all the involved parties who have been my support during my final year period. Throughout this period, the main person that I would like to thank is my Supervisor, Miss Penny Goh Kim Nee who has been my tremendous support. She has been giving ideas on how to improve my project execution and her inputs are inarguably helped me a lot to achieve what it is today. I would also like to thank my UTP technician, Mr.Musa who adhered to my project specification and gave the gave tremendous inputs to enhance my project. My classmates have been one of the most important factors in me completing my project successfully. They have been supportive where we help each other to achieve what is to be said as the students' objective. Last but not least, I would like acknowledge the support of family and friends during these time reducing the weight on my shoulder.

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Background of study

About 285 million people are visually impaired worldwide: 39 million are blind and 246 million have low vision (severe or moderate visual impairment). And narrowing down the context to Malaysia, the number of blind is thought to be 60,000. (WHO Facts).

Blind, since the beginning have been using traditional methods such as the walking stick and guide-dog for their mobility purposes. Guide dogs are not employable at a large scale (the training capacity in the Netherlands is about 100 guide dogs yearly; just enough to help about 1000 users). The cane is too restrictive. Due to the development of modern technologies, many different types of devices are available to assist the blind .

They are commonly known as electronic travel aid but there are very few devices specifically designed in order to assist the blind in navigation. So the whole concept of this research is to establish a mobile application to assist the blind in Malaysia particularly in navigation. A single Global Positioning System (GPS) could be explored with few other implementations such as the voice recognition and voice command to assist the blind in navigation. In the western context, where technological advancement is far ahead, there are available devices in the western market but this study would like to localize the working mechanism of the device for the locals and also to help the blind to have the purchasing power to own the device by producing it at a lower cost.

Integrating navigation system for the blind in a town, A GPS receiver would be the perfect tool in identifying the exact location of the user's location, with continuous measure of the longitude and latitude in real time. The blind can inform their preferred destination which will be captured by voice recognition system of the device, and then the blind will be navigated to their destination using voice commands. These commands will be channeled through earpieces.

Problem Statement

In this context, there are several issues to be highlighted as problem statements. The problem statement here is that the blinds are having issues in mobility. Mobility depicts on two areas for the blinds whereby the first revolves around the assistance that the blinds need in order to identify the obstacles along their walking path. The second is that, the blinds need assistance in navigating themselves to a particular destination. Traditional methods such as the cane and the dog are found to be less effective and not doing enough in assisting them in navigating themselves. In daily life, it is important for the blind to carry out daily activities just like anyone else without the help of any other human being. Instead of seeking for human help for navigation, implementation of an electronic approach, a mobile application in this case would help the blind to ease on their mobility as well as to reduce dependence on fellow mankind. In Malaysia, the blinds are less exposed to the latest technologies compared to the western context.

So, it is an attempt to adapt the advancement of technology in a best possible way to assist the blinds in Malaysia in navigation. The cost of the device is another major factor and it is planned and aimed to establish the adaptation of technology in the lowest possible cost in order to enable the blind to acquire the purchasing power to own the device.

Objective

1. To study the current technologies and implementation in the context

The first objective is to study and analyze on the existing technologies. Major research chunk is focused on studying the researches that have been done and the devices which are already in the market which are aimed to assist the blind in mobility.

2.To create a mobile application to assist the blind in navigation in Malaysia

The mobile application will be implemented using GPS functions whereby it navigates its user to their destination using voice command. The voice recognition function to enable user to navigate themselves without the help of a another person.

3. To test the developed prototype with the visually impaired.

Upon completion of the prototype, the application first is tested under Alpha testing method. The finished product is tested in the developer's site to check whether it fulfills the requirement specification. After then, the device would be up for Beta testing which would be testing the device in real environment with the real end users - the visually impaired.

Scope of study

The mobile application is mainly targeted for the blinds and the visually impaired. Research on the mechanisms and technologies needed to solve outdoor navigation and orientation problems for blind users is presented in . The blind need to be studied on their daily activities and understand the needs of the blind when it comes to navigating themselves. A close rapport with the blind, analyzing the daily activities would open up the possibility of clearly understanding the unfulfilled needs of the blind. It is also crucial enough to take in measuring considerations on the safety of the blind when it comes to the usage of the device.

In this study ,the use of a system that focuses on the ways in which users with visual disabilities perceive and take in information from their environment. The study is aimed on assisting the blind in navigation concentrating in Malaysian context. The scope is to understand the modus operandi and the implementation of GPS in a best possible way to assist the blind. It is also fundamental to grasp the basic working mechanism ideas of voice recognition and voice command features to be implemented along with GPS to ease the navigation of blind.

Chapter 2
Literature Review

Assisting the blind in navigation had been a noble idea and it has been attempted widely over the years. Many attempts and innovation have taken place in the yesteryears and it is important to study these attempts to understand the advancement of technology that has been adapted. This would also help to understand the need for the blinds and to hit the right chord when it comes to innovating the right idea. This also helps to find the loopholes in the previous innovations, on the unfulfilled needs of the blind. Generally, innovations have been concentrated on the western context and it is understood that there is a current need to localize the innovation implementation towards the local concept, Malaysia in order to cater for the mobility of the blinds in Malaysia.

2.1 Understanding GPS

It is important to understand the working mechanism of GPS as this innovation have been attempted to operate based on Global Positioning System (GPS). According to Marshal Brain and Tom Harris - "Global positioning System is actually the constellation of 27 Earth-orbiting satellites." It is actually 24 operational satellites and three which belong to Plan B in the case of any failure.

The Global Positioning System receiver works under the concept of three-dimensional trilateration. If the first satellite in the sky records that you are 15 miles away from it, you can be anywhere on the globe under a sphere of 10-mile radius. If the second satellite records that you are 10 miles from it, then we can narrow down the location with the overlapping area of first satellite and the second. If you know the distance to a third satellite, you get a third sphere, which intersects with this circle at two points.

The Earth can play the role as the fourth sphere -- only one of the two possible points will actually be on the surface of the planet, so you can eliminate the one in space.

Receivers actually consider minimum of four satellites recording in order precisely calculate the location and improve accuracy.

In order to make this simple calculation, then, the GPS receiver has to know two things:

- The location of at least three satellites above you
- The distance between you and each of those satellites

The GPS receiver acquires these two information by analyzing high frequency, low power radio signals from the GPS satellites. Radio waves are electromagnetic energy, which means they travel at the speed of light (about 186,000 miles per second, 300,000 km per second in a vacuum).

The basic concept of calculating the signal would be by considering the elapsed time for the signal transmission. In order to take this measurement, a precisely synchronized clock to nanosecond is needed both on the receiver and the satellite. As a solution, The GPS system, embeds an atomic clocks in the satellite and receivers with quarts clock, which constantly resets. So, after acquiring readings from four or more satellites, the receives offsets the values in order to normalize all the acquired time to a single point. That time value is the time value held by the atomic clocks in all of the satellites. So the receiver sets its clock to that time value, and it then has the same time value that all the atomic clocks in all of the satellites have. The GPS receiver gets atomic clock accuracy "for free."

Measuring distance from four satellites, four spheres can be found to intersect at one point. Three ambiguous values may produce intersection point, but it is difficult to find the intersection point for four spheres. Since the receiver makes all its distance measurements using its own built-in clock, the distances will all be proportionally incorrect. The receiver can easily calculate the necessary adjustment that will cause the four spheres to intersect at one point. Based on this, it resets its clock to be in sync with the satellite's atomic clock.

The crucial part of the receiver is to integrate the transmission of at least four satellites and combine the information in those transmissions with information in an electronic almanac, all in order to figure out the receiver's position on Earth.

Once the receiver makes this calculation, it can tell you the latitude, longitude and altitude (or some similar measurement) of its current position and this data is loaded into map files which are placed in the memory. (How GPS Receivers Work, 2006).

2.2 NAVIGATION SYSTEM FOR THE BLIND USING GPS AND MOBILE PHONE COMBINATION

In the development of the navigation of blind was first provoked with the combined usage of microcomputer and speech synthesizer. (Hideo Makino M. O., 1992). This innovation however was initiated by Loomis who was the pioneer when he came up with the idea of navigation system for the blind utilizing the GPS and acoustic information in 1985 at the University of California, Santa Barbara (UCSB).In 1994, along with his colleagues, implemented a model of the navigation system. (LoomisJ.M, 1995)

In the early millennium, the system is further developed using Differential GPS (DGPS) along with FM correction data receiver for accurate localizing the position of user. Further researches from Hideo Makino, Ikuo Ishii, Makoto Nakashizuka from Niigata University, Japan developed a device to assist the blind in navigation but with the usage of mobile phone. The working mechanism of the device would be when the user activates the unit and this would trigger a automatic connection established to the base station. The would unit would send its latitude and longitude data (pseudo range values and satellite numbers) to the station through modem. At the base, this raw data would be processed by microcomputers to detect the exact location of the user and then transmits navigation instruction trough speech signals as output to traveler's mobile phone. (Hideo Makino I. I., 1996)

However, this innovation had its own limitations as the user need to have the mobile phone to establish connection with the base. In the case of emergency, and if the user fails to establish connection with the base due to technical reasons, it would be big setback for the user as the device would fail to serve its purpose at the most valid time. Base stations are also required to be established in all country so that the raw data can be processed to provide the navigation routes.

2.3 Independent Outdoor Mobility

One of the research has underlined the problems caused by the usage of GPS. The mapping of the whole city would not only invite additional cost but also creeps up the problem of embedding it. It is also touted on its low level of accuracy where it can be a major setback for the blinds. This setbacks are corrected using certain strategies such as by navigating through a clock system. (Jaime H. Sánchez, 2007).

In this study, GPS is used in a device connected to a Pocket PC which translates and analyzes the raw data from GPS and make comparisons with the internal data in order to deliver information about their destination. The innovation do not really lead the user for navigation instead it makes the user to be equipped with tools to navigate themselves, stimulating as such the use of problem solving skills. The objective of the research was that to hike up the possibilities for visually impaired to have mobility in daily lives. This eliminated the need of speed, routes and waypoints aspects related to a GPS device. This innovation was studied to grasp the modus operandi of the device. However the device do not provide full assistance to the blind in navigation whereas it involves several cognitive processes to be done by the user for reasoning. It does help the visually impaired in mobility but do not help to navigate from point A to point B. (Hideo Makino, 1996)

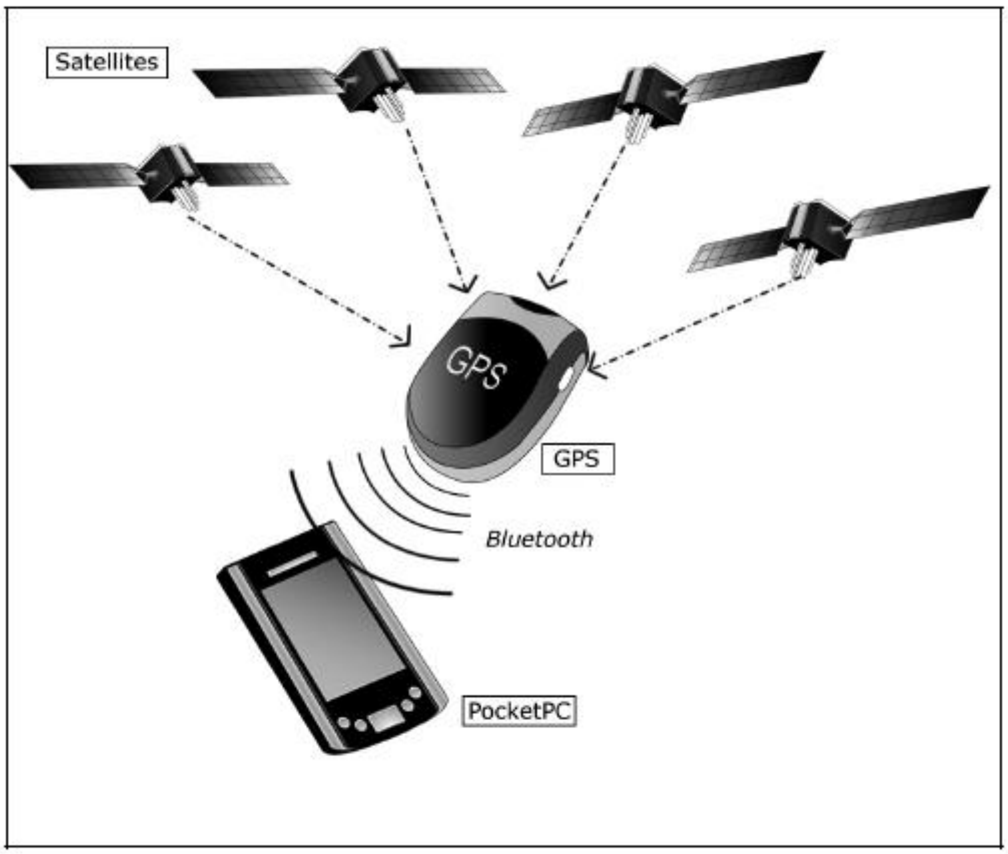


Figure 1 : System Communication between GPS and Pocket PC

2.4 Auditory Display Modes and Guidance - Personal Guidance System

This research was aimed to develop a navigation system for the blind which is portable, self-contained system that will enable mobility for the visually impaired without guide. The system, as it exists now, consists of the following functional components:

(1) a module for determining the traveler's position and orientation in space,

(2) a Geographic Information System comprising a detailed database of our test site and software for route planning and for obtaining information from the database, and

(3) the user interface.

This study concentrates on one aspect, that is to guide the blind in navigation in a predefined route. We evaluate guidance performance as a function of four different display modes: one involving spatialized sound from a virtual acoustic display, and three involving verbal commands issued by a synthetic speech display. However, the blind will still need to use old school methods to avoid obstacles along the way in this innovation. The innovation was acquiring the input through keypad but this can be a setback to the user (the blind) because it can be difficult for the blind to fully utilize the keypad. This device consists of DGPS receiver subsystem for position sensing and the fluxgate compass mounted on the earphone strap for determining head orientation which would enable the user to hear the names of building and street intersections. This is one of the aspects which is very useful for the visually impaired to hear the instruction during navigation. (Jack M. Loomis, 1998)

2.5 Vibrating Bracelet Interface For Blind People

In the midst of electronic devices being implemented on the voice command basis, this particular research brought up an innovation by presenting a vibrating bracelet as a multipoint communication modules for a mobile safety system. The bracelet is carried on a wrist, thus is does not restrain movements or occupy a palm. "Apart from informing the visually impaired people about obstacles, distances and pre-learned scenario objects, the bracelet is also capable of sending commands and indicators to the users by means of a multipoint vibration."

The whole bracelet concept relies of the predefined vibrating pattern, its direction, duration and location is being informed to the user using the vibration mechanism. The bracelet can send commands to turn left, right, to inform about transferring navigation data, calculating route and even to inform about an incoming call, a received SMS or an e-mail when connected to an external device. The setback of the device is that, the vibration pattern which is serving as the command passage can be ambiguous and confuse the users. We are attempting on creating a device which capitalizes the least on the cognitive processes of the user. (Kos, 2012)

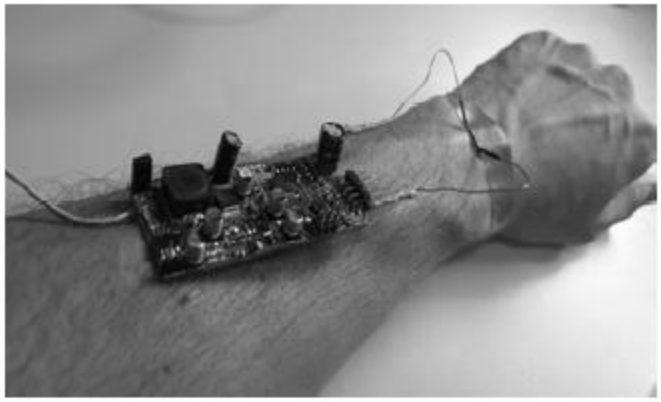


Figure 2 : Model of Vibrating Bracelet

2.6 An Intelligent Walking Stick For Elderly and Blind Safety Protection

This innovation was based on creating a device to assist the elderly and blind implemented within a walking stick which enable the group the establish communication between them where details on navigation and network will be shared. The kind of network that is being used is ad hoc network. Vehicular ad hoc network (VANET) adapted from mobile ad hoc network (MANET) which formed dramatically through the cooperation and self organizations of mobile nodes and designs to support the modern intelligent transportation systems (ITS).

The range finder is operated by using the radio frequency carrier with the center frequency at 27.6 MHz. In operation, the required detection range is recognized as the safety zone, in which all required data is controlled by the control unit. The radio carrier is generated by the sensor and propagated to the target, in which the reflected signal can be detected by the receiver, where finally, the distance can be calculated and compared to the database by the control unit.

However there is no voice alarm to trigger in the case of emergency. Using ad hoc network also provides a lot of limitations such as the short range of network due to the ad hoc network feature. This can also lead to unavailability of the network if there are no users within the particular range. (Romteera Khlaikhayai, 2010)

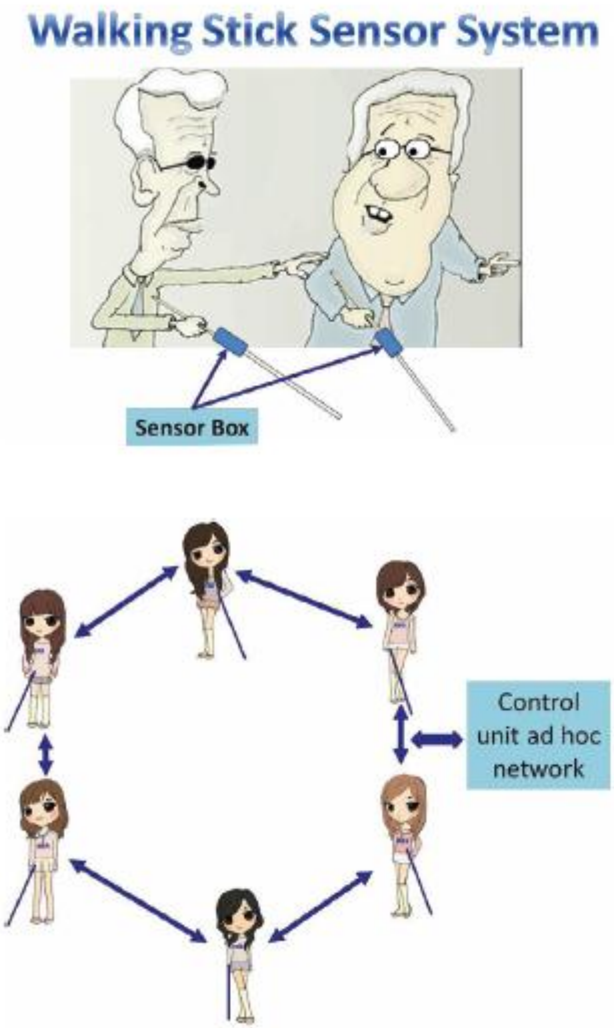


Figure 3 : Walking Stick Sensor System

2.7 Ariadne GPS

Ariadne GPS is an mobile application which runs on iOS platform utilizing the GPS function. The application enables the possibility of knowing our position at any time and monitor it while walking. There is an option to save favorite points to be notified and upon arrival at these points, sound and vibration are utilized to buzz the user. Furthermore, there is an interesting and innovative feature, namely the ability to explore the map. The same way a person who sees the map has a whole view of what surrounds them or a view of a specific location, those using VoiceOver can now have an idea of the conformation of a certain area by tapping the map with their finger. Moving your finger on the map, you can hear the street names and numbers pronounced by VoiceOver and make yourself a mental map of the area. This platform which is readily accessible and access to uncommon details to people who use the speech synthesizer and can therefore be particularly useful for the blind and visually impaired.

The application is depending on the GPS and a remote service, - momentarily - Google. This causes the accuracy level of the application to be hampered in some ways. (depending on the gps signal, the network and server availability).

2.8 Be My Eyes

Be My Eyes is an application which connects the blind people around the world to the network of volunteers or helpers through live video chat. The user (the blind) will requests assistance in the application by snapping a picture of the what he/she needs helps with from knowing the expiry date on the milk to navigating new surroundings. On the other hand, the volunteer receives a notification for help and a they can help the blind via live video connection by answering all the questions arised.

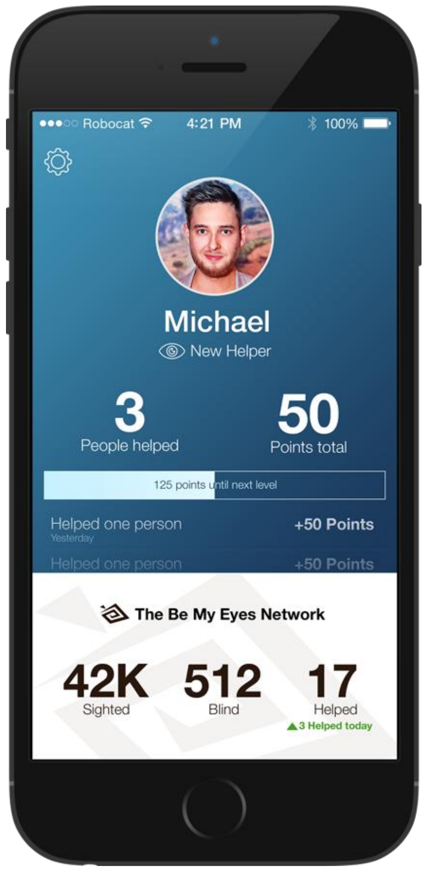


Figure 4 : Be My Eyes application screenshot

2.9 Blind Navigator - Android Application

Blind Navigator- is very useful for blind person where it has main 8 functions. It incorporates the phone dialing function which dials the number by hearing the voice. It can also read contacts, messages and also enables alarm setting with voice control. Most of all, it has a GPS navigator which has been strategized using voice control. It also includes the services to know battery information and signal strength.

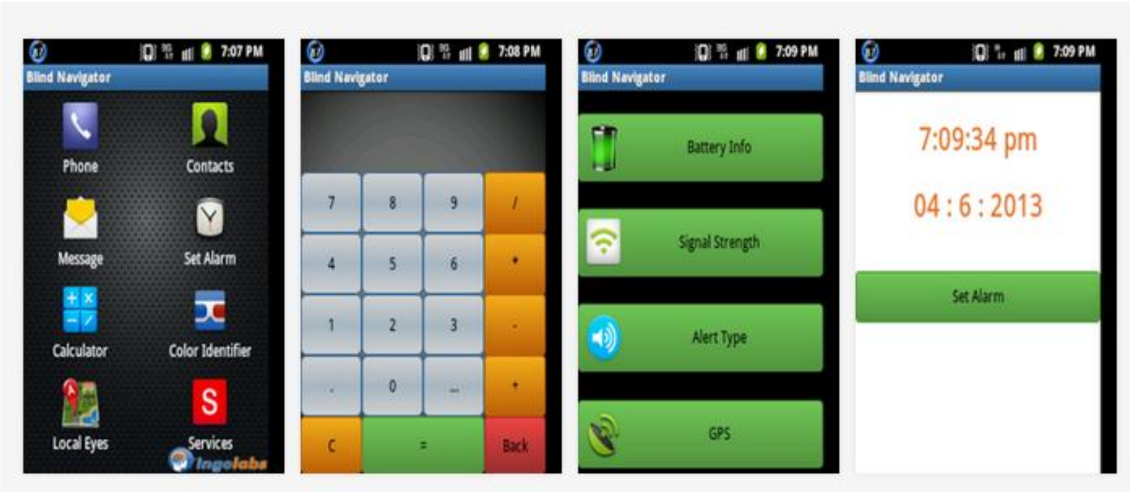


Figure 5 : Blind Navigator application screenshot

2.10 Forget Blind People - Google's Application

Forget Blind People is another application which utilizes the GPS implementation for navigating the visually impaired to their destination. Well, this application is very much constrained to the context of the United States and doesn't cater much out of the context.

Figure 6 :Forget Blind People application screenshot

2.11 Comparison table

Research ref. num	Brief Description	Disadvantage
2.2	-using mobile phone -user activates the unit and this would trigger a automatic connection established to the base station	-user need to have the mobile phone to establish connection -if the user fails to establish connection with the base due to technical reasons, it would be big setback for the user as the device would fail to serve its purpose at the most valid time. -Base stations are also required to be established in all country so that the raw data can be processed to provide the navigation routes.
2.3	GPS is used in a device connected to a Pocket PC which translates and analyzes the raw data from GPS and make comparisons with the internal data in order to deliver information about their destination.	Do not provide full assistance to the blind in navigation whereas it involves several cognitive processes to be done by the user for reasoning
2.4	self-contained system which consist of: (1) a module for determining the traveler's position and orientation in space, (2) a Geographic Information System comprising a detailed database of our test site and software for route planning and for obtaining information from the database, and (3) the user interface.	-predefined route -blind will still need to use old school methods to avoid obstacles -input through keypad

2.5	vibrating bracelet as a multipoint communication modules for a mobile safety system.	-vibration pattern which is serving as the command passage can be ambiguous and confuse the users
2.6	walking stick which enable the group the establish communication between them where details on navigation and network will be shared	- no voice alarm to trigger in the case of emergency. - short range of network due to the ad hoc network feature. - unavailability of the network if there are no users within the particular range.
2.7	Ariadne GPS is an mobile application which runs on iOS platform utilizing the GPS function. The application enables the possibility of knowing our position at any time and monitor it while walking. There is an option to save favorite points to be notified and upon arrival at these points, sound and vibration are utilized to buzz the user.	- the application runs on iOS platform which doesnot cater major users who are using Android
2.8	connects the blind people around the world to the network of volunteers or helpers through live video chat.	- unavailability of volunteer to help the request.
2.9	Very useful for blind person where it has main 8 functions. It incorporates the phone dialing function which dials the number by hearing the voice. It can also read contacts, messages and also enables alarm setting with voice control. Most of all, it has a GPS navigator which has been strategized using voice control. It also includes the services to know battery information and signal strength.	It has too many function where it lacks on efficiency when it comes to GPS navigation. It is much very much concentrated on western context and orientation and do not have predefined routes.

2.10	Forget Blind People is another application which utilizes the GPS implementation for navigating the visually impaired to their destination	this application is very much constrained to the context of the United States and doesn't cater much out of the context.

Table 1 : Comparison Table

Based on the literature review done, it has understood that there are few existing innovations in the market, there are some of the gaps which are not properly served by those innovations. B-Friend is attempting to eliminate all the setbacks and provide a better experience to the user.

Chapter 3

Methodology

3.1Research Methodology

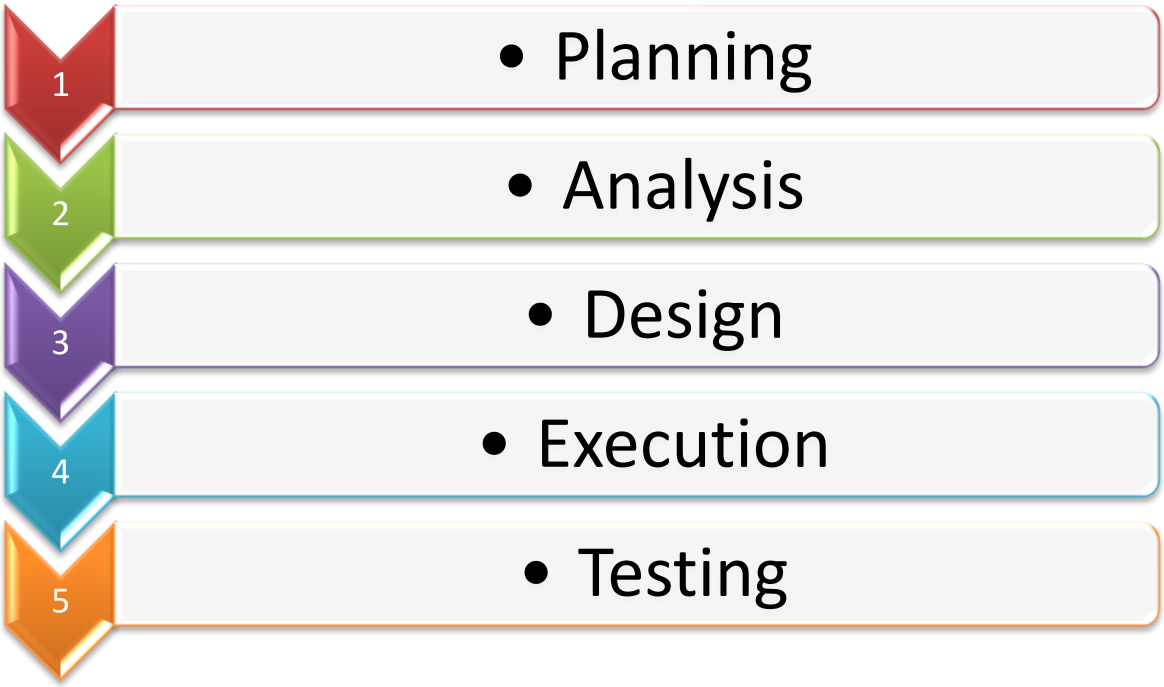


Figure 7 : Research Methodology

As shown in the diagram, the research methodology is implemented using the waterfall method. Waterfall method is the traditional methodology whereby the tasks are completed one after another. This provides a fundamental grasping of the requirements for the project and lists out the requirements for the project so that the requirement cans set the basic outline for project implementation and ensure that the tasks are aligned to meet the requirements. Waterfall method reduces the possibilities of deviation from the specified objectives. Proper planning and analysis at the beginning stage would build the foundation for the developers to develop models serve the purpose for intended users. This would ease the design and execution process and typically builds tremendous level of confidence for the developers. As outlined, the research gets initiated with planning, followed by analysis, design, execution and testing.

3.2 Methodology Description

Planning

- *Collecting data for user requirement*

  Conducting interview with the users, the visually impaired to understand their requirements

- *Sketching on cost and feasibility*

  The data requirement will then be used to study on the cost and feasibility of the project

Analysis

- *Study on the hardware implementation*

  Gather information on hardware implementation, tools required and deliverable

- *Research*

  Study on the past research papers and existing devices in market on the proposed concept and study on the loopholes in the existing implementations.

Design

- *Model sketching*

  Sketch the model of the prototype of the device as in system architecture design considering factors like cost and scheduling

Execution

- *Prototyping*

  Putting together the hardware components and make the device ready for testing

Testing

- *Alpha testing*

  The finished product is tested in the developer's site to check whether it fulfills the requirement specification

- *Beta testing*

  The device would be tested in real environment with the real end users.

Tools used

Basically to elicit the requirements and to test the application a direct interview was done with the members of Malaysian Association of Blind, Malaysia. A total of 8 respondents were involved in the preliminary study and 6 respondents for the testing phase.

To develop the application, Android Studio was used - a Java based programming tool incorporating with the Google Maps.

3.3 Milestone & Gantt Chart for FYP 1

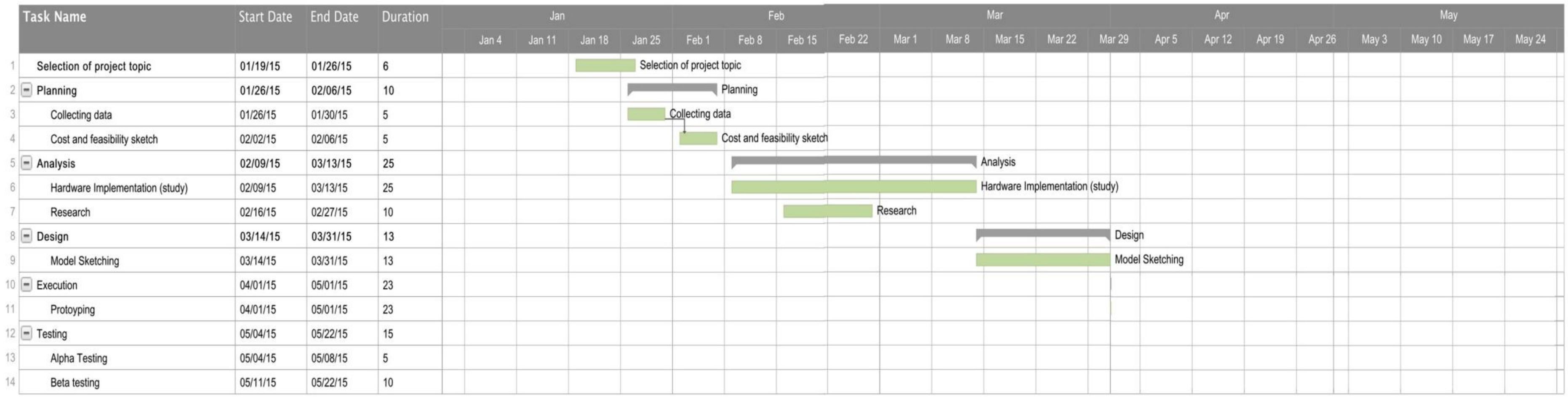


Figure 8 : Gantt Chart FYP1

3.4 Milestone & Gantt Chart for FYP 2

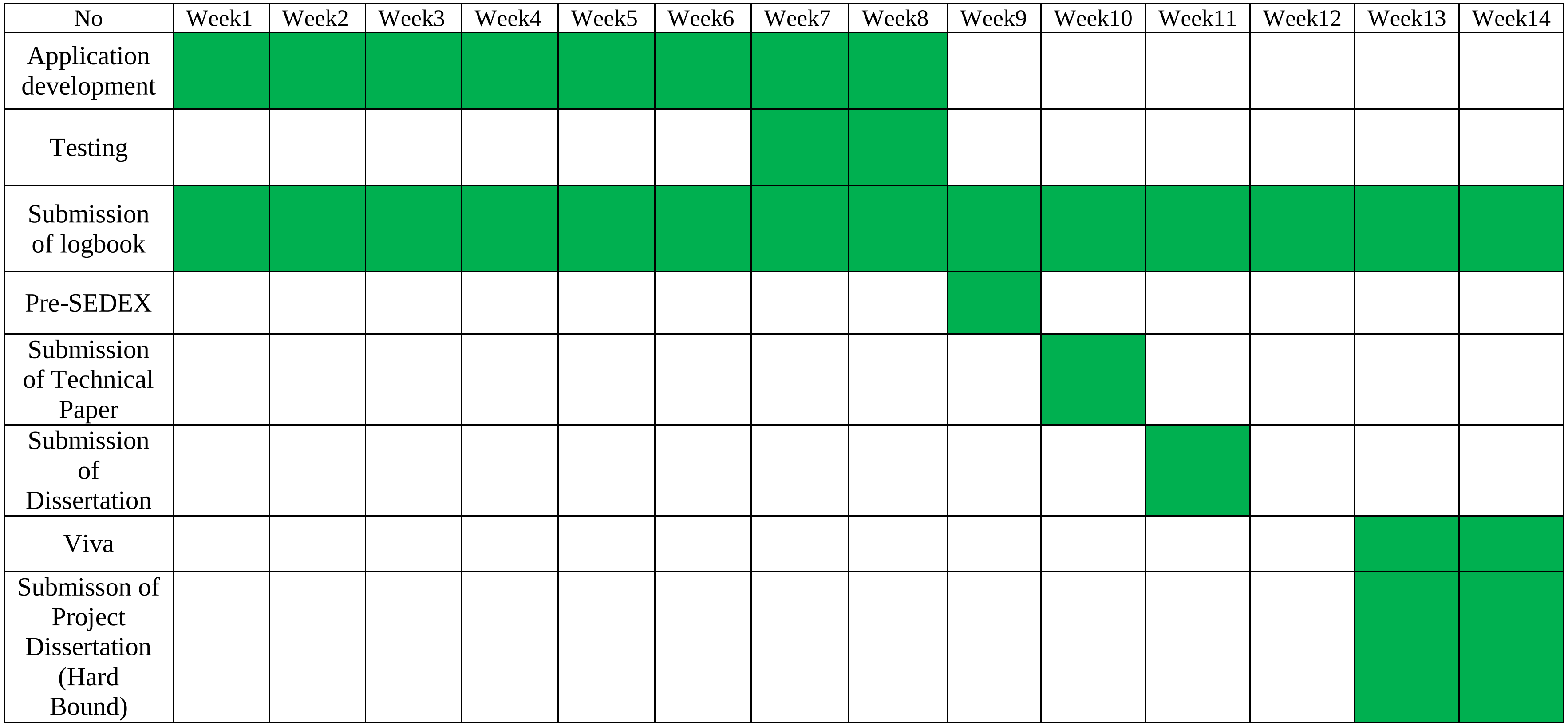


Figure 9 : Gantt Chart FYP2

Chapter 4
Results and Discussion

4.1 Results of the preliminary interview

On the preliminary basis, a visit was conducted to Malaysian Association of Blind in Ipoh, Perak. The interview was successfully conducted with acquiring data from 8 respondents from the Malaysian Association of Blind, Ipoh, Perak. This visit was conducted aiming to get depth information on the mobility issues of the visually impaired and to get their view and opinion on the proposed idea of this device.

a. Gender

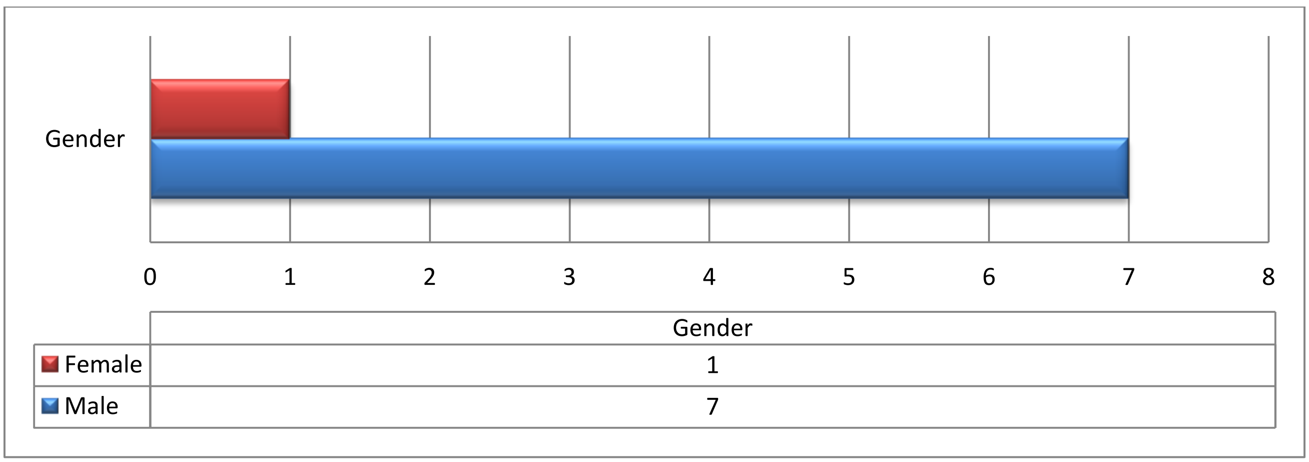
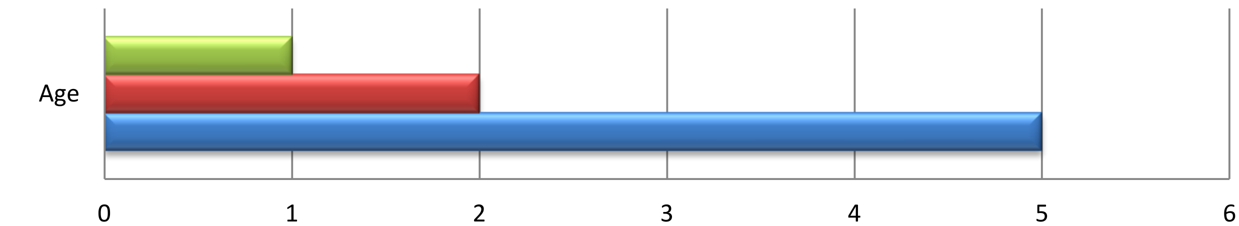


Figure 10 : Gender Classification of respondents

The respondents to the survey in the Malaysian Association of Blind was consisting of 7 male respondents and 1 female respondent.

b. Age

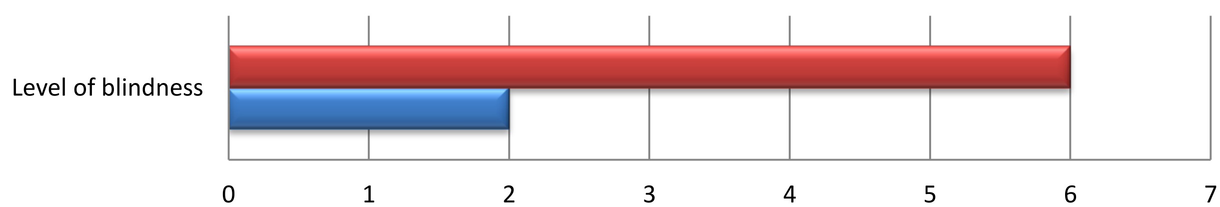


	Age
36-45	1
26-35	2
16-25	5

Figure 11 : Age Classification of respondents

The age range of the respondents to the survey in the Malaysian Association of Blind was consisting of 1 respondent who belong to the range of 36-45, 2 respondents who belong to the range from 26-35 and 5 respondent who belong to the age range of 16-25.

c. Level of blindness



	Level of blindness
Fully impaired	6
Partially impaired	2

Figure 12 : Blindness type classification of respondents

Six out of the 8 respondents in the interview was fully visually impaired which means they are suffering from total blindness. Two of the respondent was partially impaired. These respondent were affected by night blindness and another affected by myopic glare. The partially impaired do not have real problems in mobility during the day, but they are experiencing concerning amount problems when it is night and at the staircases.

d. How do you move from one destination to another?

This was an open ended question which required the respondents to explain their mode of mobility and their move-about.

7 out of the 8 respondents (87.5%) have said that, they rely on the public transports and walking as their mode of transportation. 1 respondent stated that she has her own transport as in she is always guided by her parents assisting her in mobility.

e. Do you have problems in mobility?

This was an semi open ended question which required the respondents to explain about their mobility problems

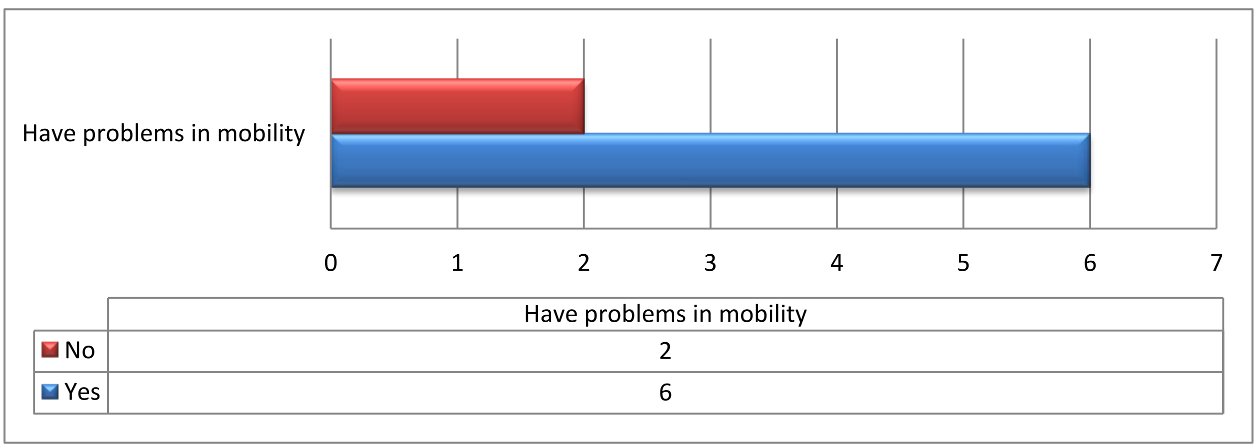


Figure 13 : Mobility problem statistic of respondents

2 out of the 8 respondents (25%) who are the partially impaired respondent have stated that they do not encounter problems in mobility whereas 6 out of the 8 respondents (75%) who are the fully impaired have agreed unanimously that it is a problem for them when it comes to mobility. When it was further questioned on what kind of problems do they face, the top three problems that have been common is that :

i. To move from one destination to another.
ii. Detecting obstacles in their route
iii. The orientation that they are currently facing

f. Are fellow human beings helpful?

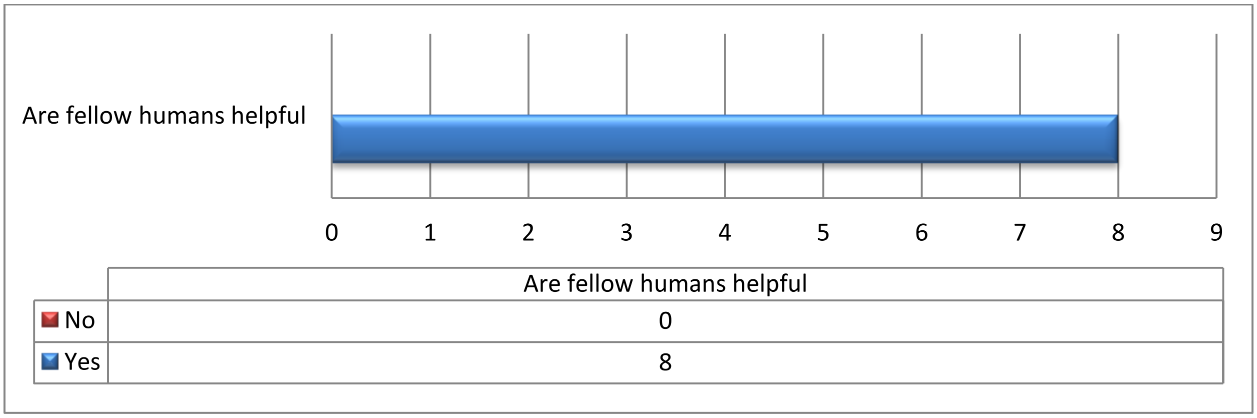


Figure 14 : Level of Assistance from humans

A record scoring of 100% was recorded when it was asked whether fellow human beings are being helpful when the visually impaired are seeking for assistance. It was noted that at any point or other all the respondents were assisted by any man on the street.

g. Are you using any technology to move about currently?

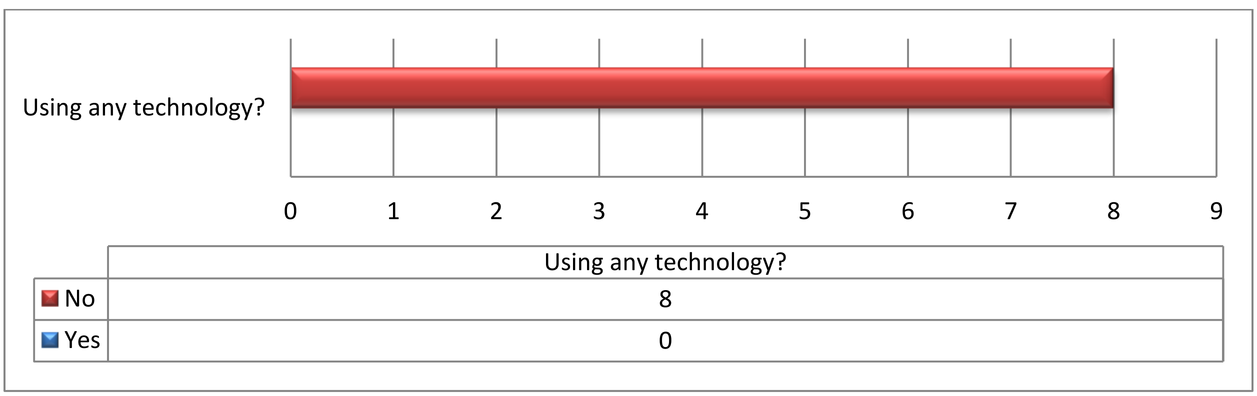


Figure 15: Technological usage by respondents for mobility

All the respondent (100%) have stated that they are not using any technology to assist their mobility. Traditional methods such as the cane is what being used to assist themselves to move about.

h. Do you want B-friend developed and commercialized?

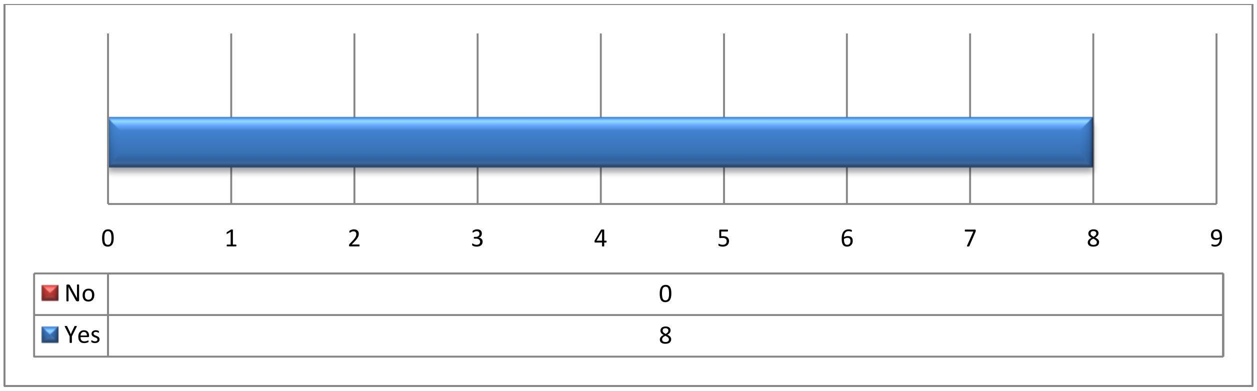


Figure 16: Level of prospect for B-Friend

All the respondent (100%) have shown keen interest in the idea of B-Friend and agreed on the future prospect of the application as they find it very useful and ease the daily activities of the visually impaired.

i. Do you think B-Friend would be helpful?

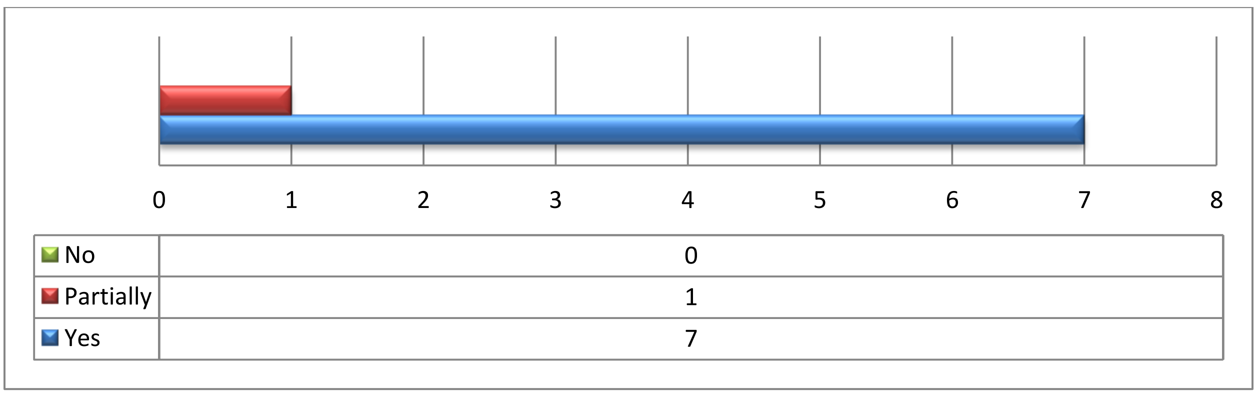


Figure 17: Statistic of B-friend denoted to be helpful

87.5% of the respondent have said that developing and commercializing the idea of B-Friend would be very useful for the visually impaired. However one of the respondent have mentioned that it would be helpful partially as integrating the navigation assistance with obstacle setection would serve better.

j. Would you be confident to go out alone using the application?

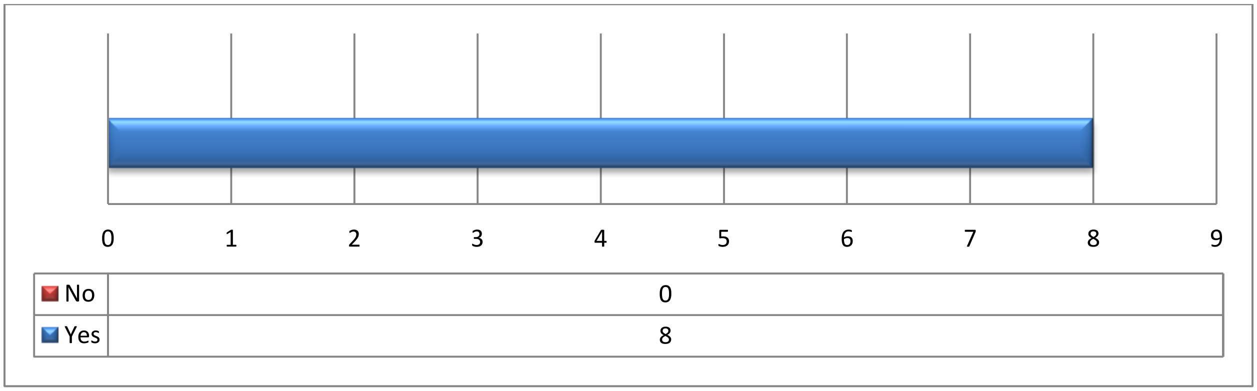
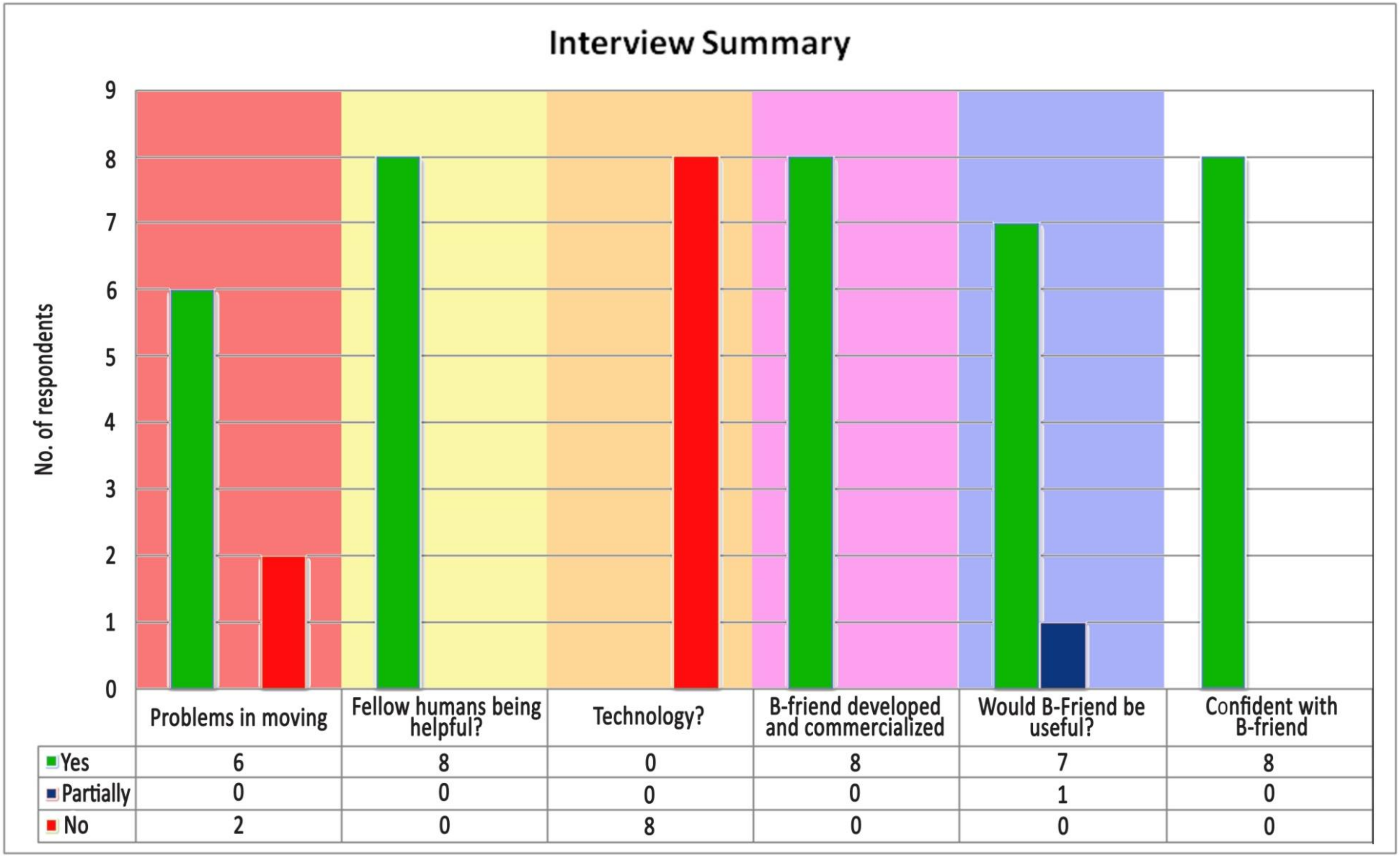


Figure 18: Confidence level of respondent with the usage of B-Friend

All the respondent (100%) have said that having the device would boost up their confidence to move around at ease and they have said that having the device would also reduce the requirement of them to seek for any physical assistance.



	Problems in moving	Fellow humans being helpful?	Technology?	B-friend developed and commercialized	Would B-Friend be useful?	Confident with B-friend
Yes	6	8	0	8	7	8
Partially	0	0	0	0	1	0
No	2	0	8	0	0	0

Figure 19: Interview summary

Based on the Figure 19, it is understood that for the fully impaired, they are facing problems in mobility. The interview has shown that 100% of the fully impaired has stated that they are facing problems in mobility in daily days. Besides that, it is understood that for the partially impaired it is still manageable for them to move unless they encounter unfavorable circumstances such as at night or at staircases.

Furthermore, it has been understood that fellow human beings are helpful when it comes to assisting the visually impaired. However, the visually impaired has raised the concern that it is commendable to say that fellow human beings who are willing to lend a helping hand when it comes to mobility assistance but there can be situations where the visually impaired cannot find any physical assistance such as at late night. So it is understood that despite the overwhelming assistance from humans, it is alarming to note that there can be situations where humans can be absent when the visually impaired are seeking for assistance. Although there are many products developed in order to assist the blind, many researches, it does not have the sufficient reach to the blinds actually, especially in the Malaysian context. This was proved when none of the respondent said that they are utilizing technology and using any device to assist them in navigation.

Having introduced to the idea and concept of B-Friend, the idea was welcomed warmly by the respondents. All of the respondents felt this idea would help them in terms mobility at its best. It was a tremendous response when the respondents extended their wish to see B-friend developed and commercialized in the market. This was due to the fact that they felt the device would be very useful and it boosts their confidence to bring themselves in the busy metropolitan cities without clinging on physical assistance.

4.2 Conceptual Diagram of B-Friend

4.2.1 Use Case Diagram

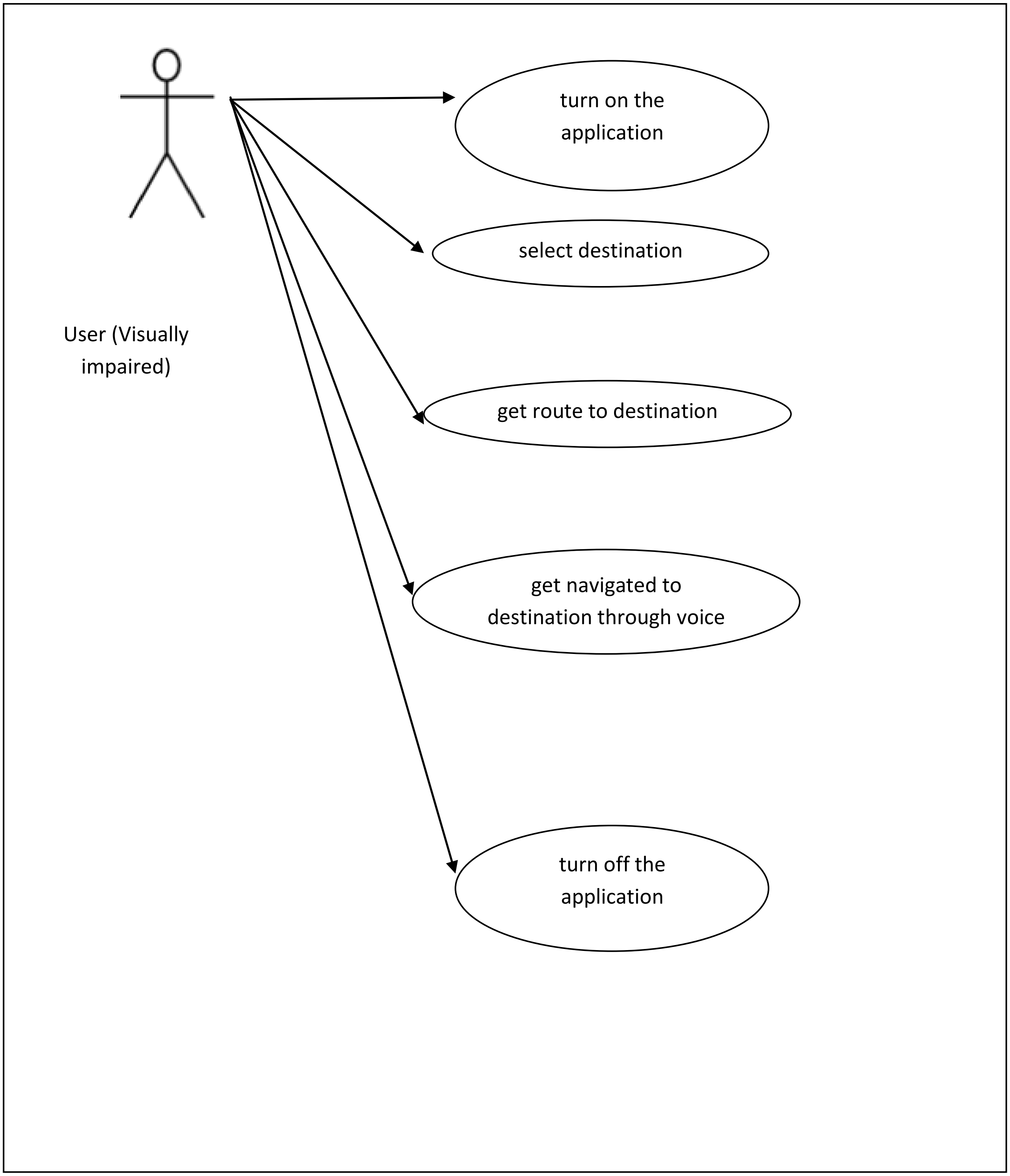


Figure 20: Use Case Diagram

4.2.2 Activity Diagram

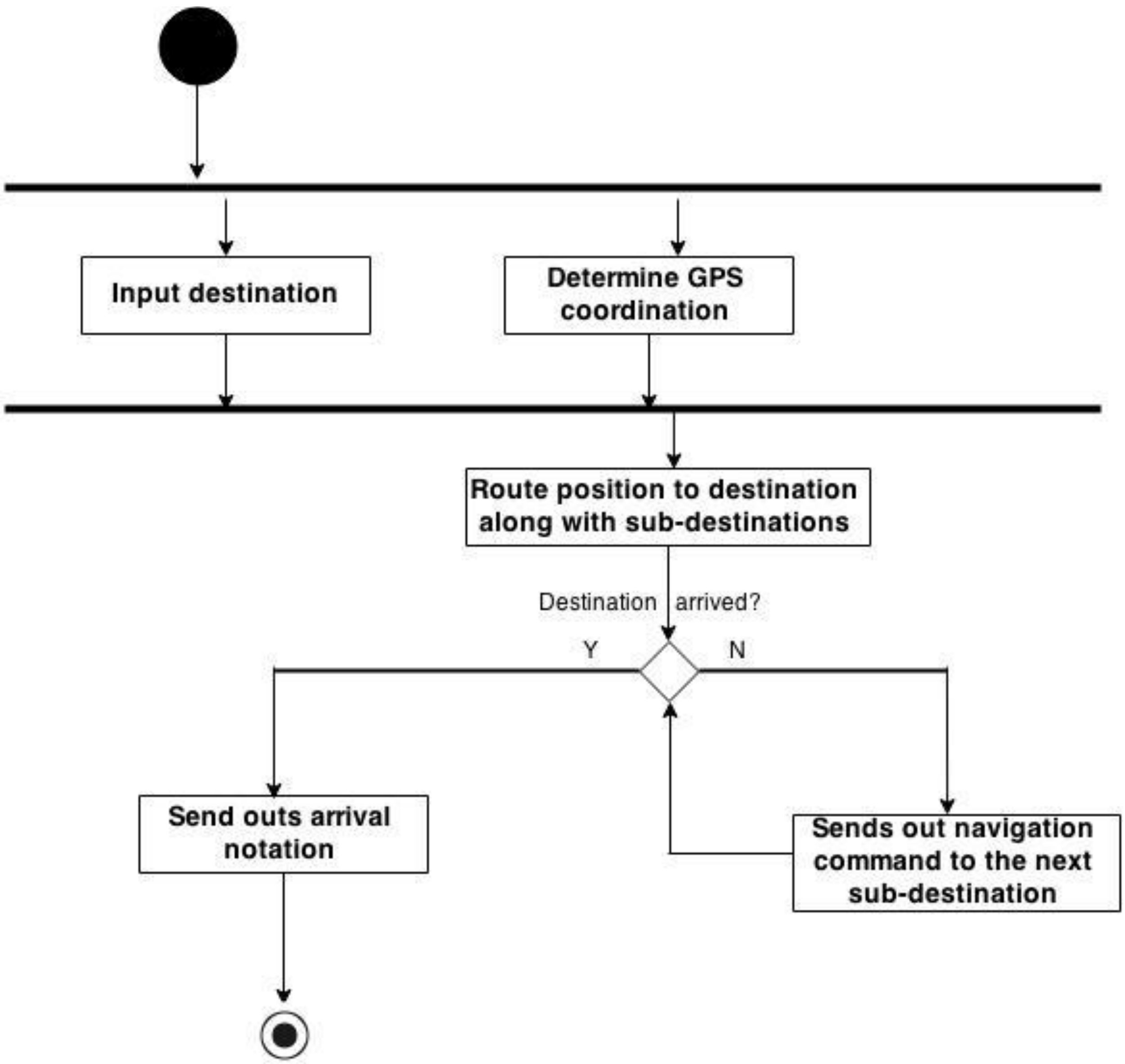


Figure 21: Activity Diagram

4.2.3 Entity Relationship Diagram

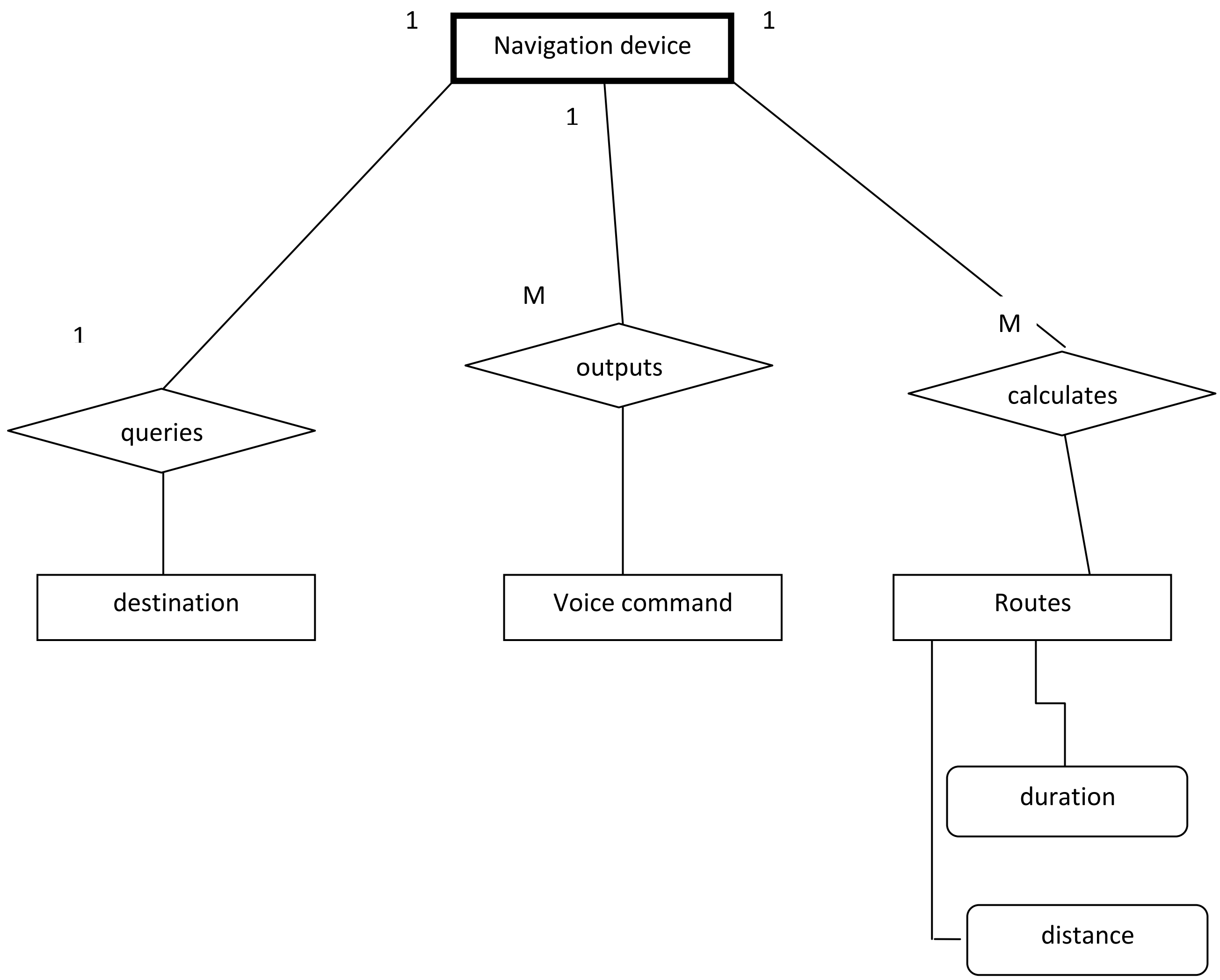


Figure 22: Entity Relationship Diagram

4.3 Screenshot of application

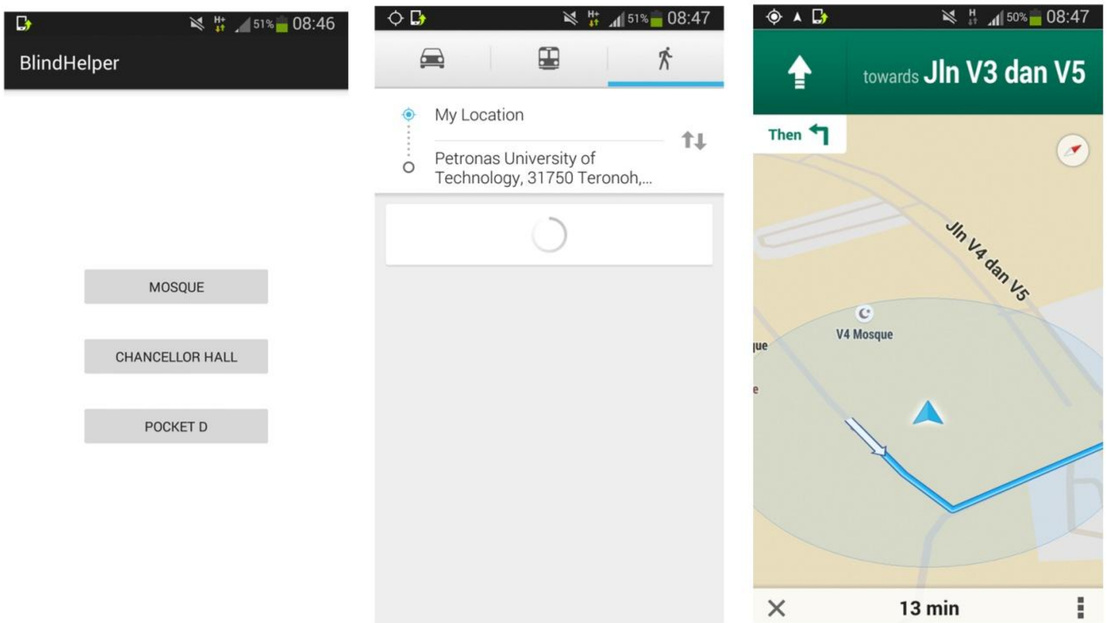


Figure 23: Screenshot of B-Friend Application

When the application is opened, the user is directed to the interface where the user gets to select their destination. These destination are predefined locations which prescribed latitude and longitude. This would help the user to be navigated to their preferred destination. These predefined destination is major plus point for the users as all they need to use is their volume button to select their destination. Rather than using voice command which can have certain level of complication such as the accent and dialect. Usage of volume button which would avoid these sorts of complications. Once the destination is selected, the user is routed using Google Maps using voice command. The user is then navigated using the voice command under the pedestrian mode.

4.4 Results of the testing interview (Beta testing)

On the post-production basis, a visit was conducted to Malaysian Association of Blind in Ipoh, Perak. The interview was successfully conducted with acquiring data from 6 respondents from the Malaysian Association of Blind, Ipoh, Perak. This visit was conducted aiming to get view and opinion of the targeted user on the efficiency and effectiveness of the mobile application. The targeted user were first briefed regarding on how to operate the application and also explained on its usage before it was tested.

1. Do you find the mobile application to be useful?

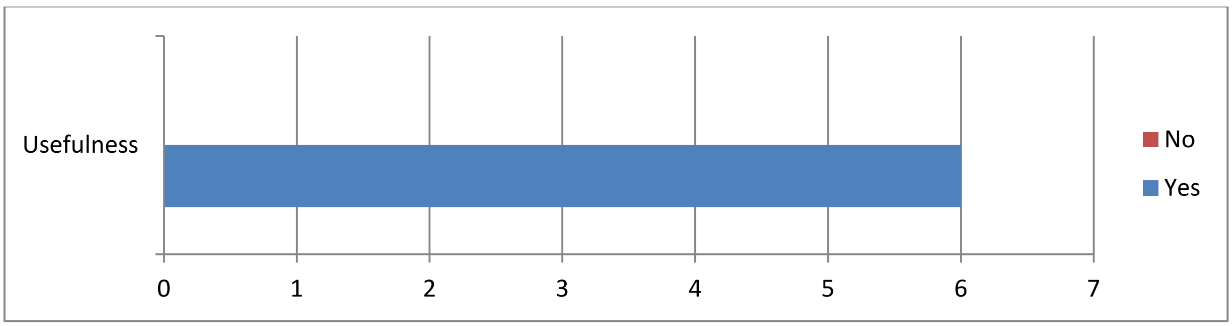


Figure 24: Usefulness of application

First of all, when the respondents were asked whether they feel the application do have some significance or not, all the respondents have agreed that the application is indeed helpful in navigating themselves to their frequent destinations like the bus station and taxi stand.

2. Do you think it will help you in navigation?

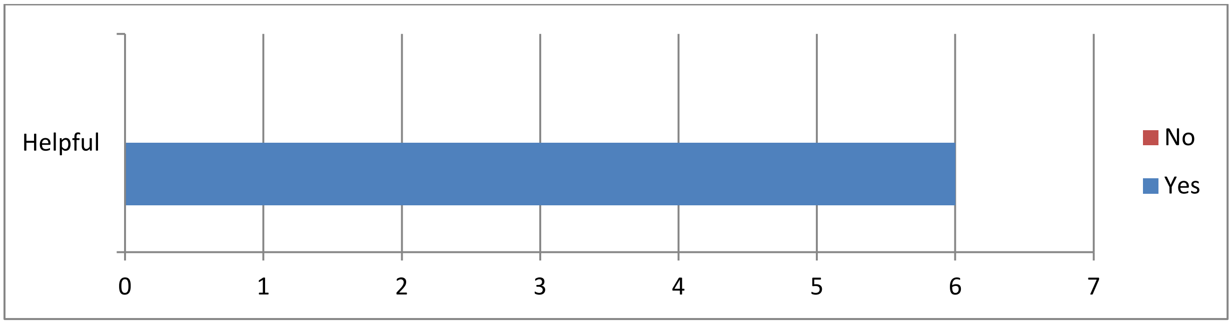


Figure 25: Objectivity achievement of application

All of the respondents have felt that the application has a great potential in assisting the visually impaired in navigation . Suggestions were also given to enhance the application further to have wide range of location choices which is considered for future work.

3. Is the application easy to be used?

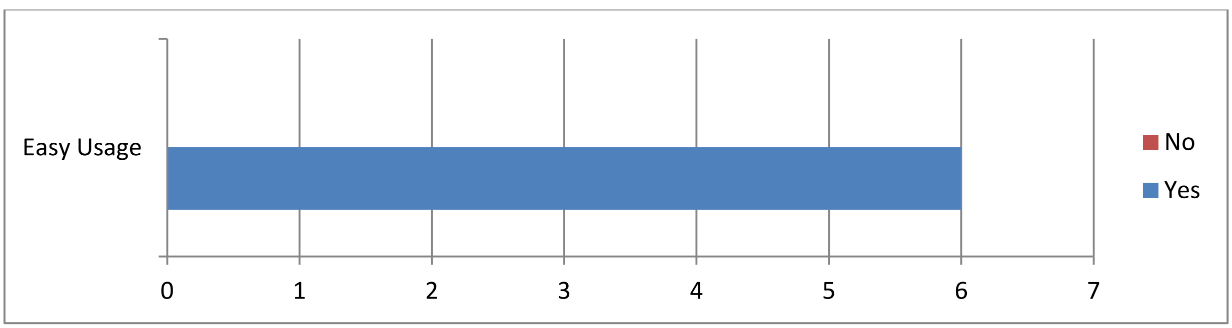


Figure 26: Usability of application

The application has been denoted as very user friendly and the blinds have no issues in operating the application.

4.Do you find it easier to have a mobile application rather than a handheld device to assist you in navigation?

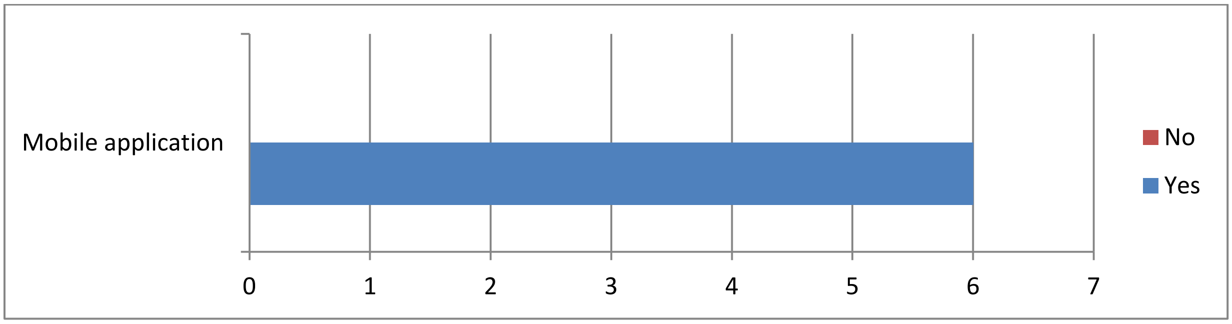


Figure 27: Concept of application instead of handheld device

The blind have all admitted that it is very convincing and easier to have a mobile application developed for navigation purpose for the blind instead of a handheld device which would require them to carry another device with them during journey. Since smartphones these days are well equipped with voice command, it is very much the obvious choice for the blind to navigate using mobile application.

5.Are the voice commands, clear?

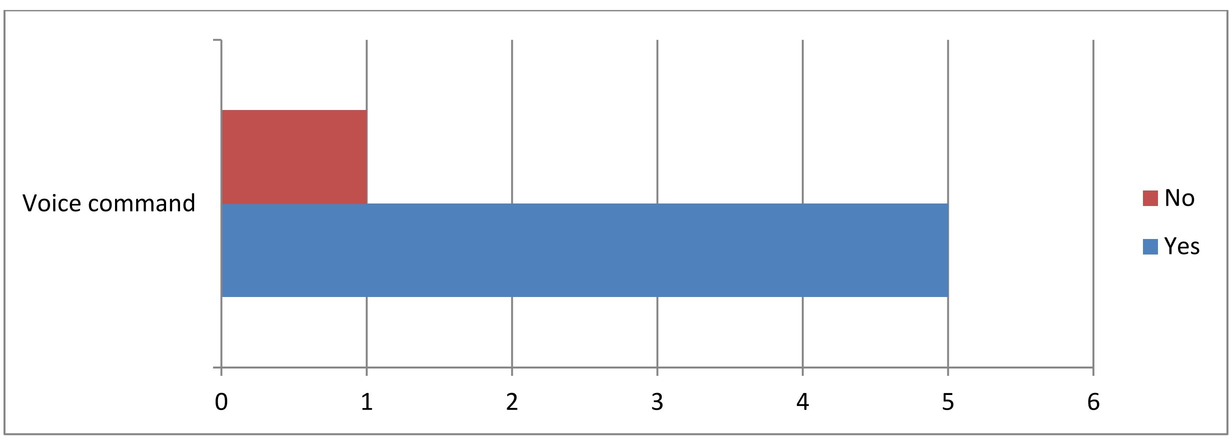


Figure 28: Commands being clear

The commands of navigations were found to have recorded 83.3% of clear outings as 5 of the 6 respondents have said that the commands are clear and direct.

6. Do you have any difficulties selecting your destination?

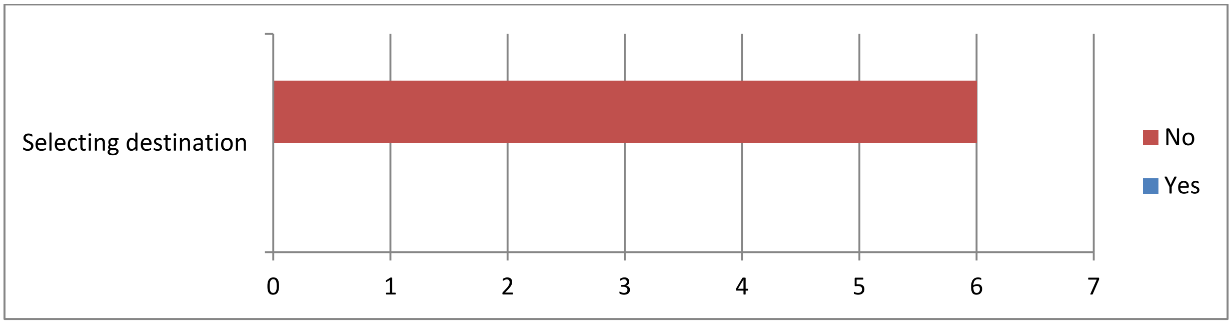


Figure 29: Ease of destination selection

The application has been tested on its user ability to select their destinations. The test results were 100% positive as the respondents have said they do not have difficulties selecting destinations.

7.Are the predefined destination helpful?

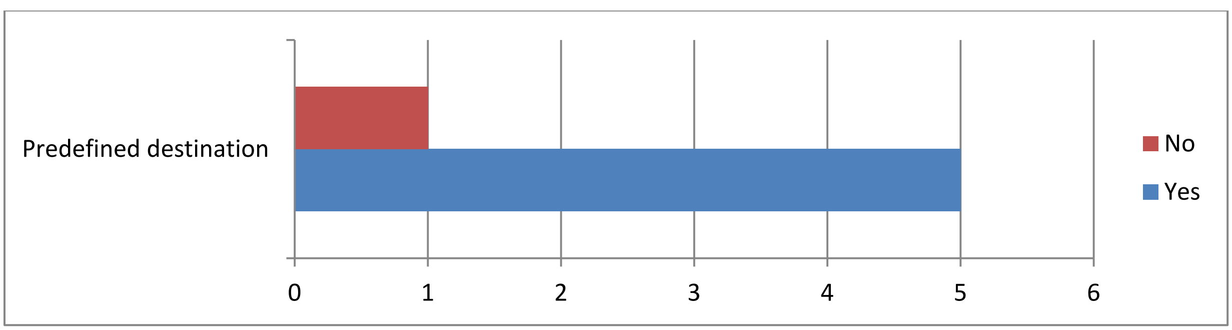


Figure 30: Usefulness of predefined destination

Again, the pinnacle attribute of the application which is the predefined destinations were tested on their effectiveness. This attribute has recorded 83.3% of positive result as 5 out 6 respondents felt that the attribute is contributing to their daily navigation.

8.How would you rate the efficiency of the application? Scale 1-10. 1-worst, 10-best

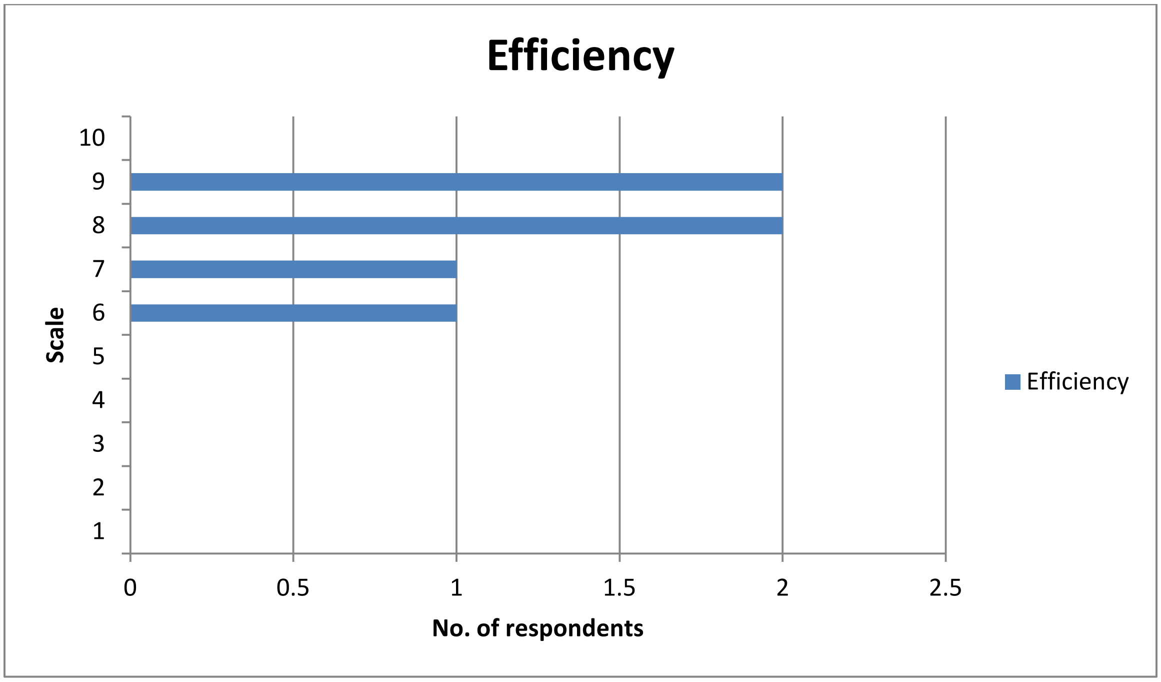


Figure 31:Efficiecy score of application

To scale out the efficiency of the application, the respondents were asked to rate the efficiency of the application is the scale of 10. 1 respondent awarded 6 points followed by 1 respondent awarding 7 points. 2 respondents gave away 8 and 9 points each. In a nutshell, it is found that the application is of high efficiency as it all the points were awarded on the positive side.

Upon the discussion with the users, it is understood that the idea is welcomed warmly and it the objective of the project has been met. The feedback of the users were mostly positive describing on the usability efficiency of the application. The users also recommended to have more destinations to select from. This would ease their daily activities at great ease.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

B-Friend is aimed to help the blind, the visually impaired to navigate themselves to a destination without any physical assistance. This would greatly boost the confidence of the blind in mobility and also enable the blinds to carry out daily activities just like any other. The major advantage of the device is that, it is a mobile application and do not require the blind to carry extra devices with them apart from their very own mobile device and provides navigation assistance to the visually impaired at its best possible way. Provided with this implementation, the blind now can move about at great ease without any hurdles.

The project has met with its own objectives of to study and analyze on the existing technologies. Major research chunk was focused on studying the researches that have been done and the devices which are already in the market which are aimed to assist the blind in mobility. This will also capitalize on the advancement of technology to adapt not only to serve the majority but also to the minorities and physically challenged, the visually impaired.

The project has reached its completion on the first phase which consist of all the preliminary studies. An interview was carried out in the Malaysian Association of Blind with the visually impaired to get the insight of the visually impairer's mobility issues. This creates a strong foundation to understand and make the best solutions to assist the minority. However, a few enhancement need to be done to ensure the effectiveness of the device. Since the adaption of technology in this context very limited, this opens up the possibilities of improvements. It is a great innovation that need to be acknowledged and developed to serve the visually impaired.

5.2 Recommendation

One of the major aspect of improvement that being recommended is that, the concept of the device need to be visualized and realized on par with the technological advancement. Being the fastest evolving jurisdiction, technology need to carefully analyzed and complemented with the concept of the device to maximize the adaptation of technology. As people remain the same but the technologies appear to have a vast changes in a second, tool evolve, better method, procedure and processes emerged and out of date or older technology will fade away. It will continue to give more challenges to human as technology rapidly changes across the world. Failure to adapt may seem the device to be replaced shortly with a better technology and there is high possibility of the concept being neglected again.

Furthermore, the changes in the routes and streets, orientation of the mapping of the premise need to be carefully analyzed and studied to suit the evolving needs of the visually impaired. Although this can be very tedious task but need to carefully considered to meet the basic requirements of the users.

There might be some unknown factors or overlooked attributes to mobility of visually impaired that are not included in the application. Therefore, some effort can be taken by the Malaysian and the experts in this context by their involvement in the research information for future reference and use.

6.0 Appendix

Interview Questions

1. How do you move from one destination from another?

2.Do you have problems in moving?

YES ☐ NO ☐

3.Are fellow human being helpful?

YES ☐ NO ☐

4.Does cane usage helps?

YES ☐ NO ☐

5.Are you using any technologies to move about currently?

YES ☐ NO ☐

6. Do you want to see B-Friend to be developed and made available in the market?

YES ☐ NO ☐

7.Do you think B-Friend would be helpful?

YES ☐ NO ☐

8.Would you be confident to go out alone using the device?

YES ☐ NO ☐

Figure 32 : Interview Questions

Figure 33 : Visit to MBA,Ipoh to conduct preliminary and testing interview (i)

Figure 34 : Visit to MBA,Ipoh to conduct preliminary and testing interview(ii)

Source Code for the application

```
package com.blindhelper;


import android.app.AlertDialog;
import android.app.Service;
import android.content.Context;
import android.content.DialogInterface;
import android.content.Intent;
import android.location.Location;
import android.location.LocationListener;
import android.location.LocationManager;
import android.os.Bundle;
import android.os.IBinder;
import android.provider.Settings;
import android.util.Log;


public class GPSTracker extends Service implements LocationListener {


        private final Context mContext;


        // flag for GPS status
        boolean isGPSEnabled = false;


        // flag for network status
        boolean isNetworkEnabled = false;


        // flag for GPS status
        boolean canGetLocation = false;


        Location location = null; // location
        double latitude; // latitude
        double longitude; // longitude
```

```
// The minimum distance to change Updates in meters
private static final long MIN_DISTANCE_CHANGE_FOR_UPDATES = 10; // 10 meters

// The minimum time between updates in milliseconds
private static final long MIN_TIME_BW_UPDATES = 1000 * 60 * 1; // 1 minute

// Declaring a Location Manager
protected LocationManager locationManager;

public GPSTracker(Context context) {
	this.mContext = context;
	getLocation();
}

public Location getLocation() {
	try {
		locationManager = (LocationManager) mContext
				.getSystemService(LOCATION_SERVICE);

		// getting GPS status
		isGPSEnabled = locationManager
				.isProviderEnabled(LocationManager.GPS_PROVIDER);

		// getting network status
		isNetworkEnabled = locationManager
				.isProviderEnabled(LocationManager.NETWORK_PROVIDER);

		if (!isGPSEnabled && !isNetworkEnabled) {
			// no network provider is enabled
		} else {
			this.canGetLocation = true;
			if (isNetworkEnabled) {
				locationManager.requestLocationUpdates(
						LocationManager.NETWORK_PROVIDER,
```

```
                                                MIN_TIME_BW_UPDATES,
                                                MIN_DISTANCE_CHANGE_FOR_UPDATES, this);
                                Log.d("Network", "Network Enabled");
                                if (locationManager != null) {
                                        location = locationManager

.getLastKnownLocation(LocationManager.NETWORK_PROVIDER);
                                        if (location != null) {
                                                latitude = location.getLatitude();
                                                longitude = location.getLongitude();
                                        }
                                }
                        }
                        // if GPS Enabled get lat/long using GPS Services
                        if (isGPSEnabled) {
                                if (location == null) {
                                        locationManager.requestLocationUpdates(
                                                        LocationManager.GPS_PROVIDER,
                                                        MIN_TIME_BW_UPDATES,

MIN_DISTANCE_CHANGE_FOR_UPDATES, this);
                                        Log.d("GPS", "GPS Enabled");
                                        if (locationManager != null) {
                                                location = locationManager

.getLastKnownLocation(LocationManager.GPS_PROVIDER);
                                                if (location != null) {
                                                        latitude = location.getLatitude();
                                                        longitude = location.getLongitude();
                                                }
                                        }
                                }
                        }
                }
```

```
        } catch (Exception e) {
                e.printStackTrace();
        }

        return location;
}

/**
 * Stop using GPS listener Calling this function will stop using GPS in your
 * app
 * */
public void stopUsingGPS() {
        if (locationManager != null) {
                locationManager.removeUpdates(GPSTracker.this);
        }
}

/**
 * Function to get latitude
 * */
public double getLatitude() {
        if (location != null) {
                latitude = location.getLatitude();
        }

        // return latitude
        return latitude;
}

/**
 * Function to get longitude
 * */
public double getLongitude() {
        if (location != null) {
```

```
                longitude = location.getLongitude();
        }

        // return longitude
        return longitude;
}

/**
 * Function to check GPS/wifi enabled
 *
 * @return boolean
 * */
public boolean canGetLocation() {
        return this.canGetLocation;
}

/**
 * Function to show settings alert dialog On pressing Settings button will
 * lauch Settings Options
 * */
public void showSettingsAlert() {
        AlertDialog.Builder alertDialog = new AlertDialog.Builder(mContext);

        // Setting Dialog Title
        alertDialog.setTitle("GPS is settings");

        // Setting Dialog Message
        alertDialog
                        .setMessage("GPS is not enabled. Do you want to go to settings menu?");

        // On pressing Settings button
        alertDialog.setPositiveButton("Settings",
                        new DialogInterface.OnClickListener() {
                                public void onClick(DialogInterface dialog, int which) {
```

```
                        Intent intent = new Intent(
Settings.ACTION_LOCATION_SOURCE_SETTINGS);
                        mContext.startActivity(intent);
                    }
                });

        // on pressing cancel button
        alertDialog.setNegativeButton("Cancel",
                new DialogInterface.OnClickListener() {
                    public void onClick(DialogInterface dialog, int which) {
                        dialog.cancel();
                    }
                });

        // Showing Alert Message
        alertDialog.show();
}

@Override
public void onLocationChanged(Location location) {
}

@Override
public void onProviderDisabled(String provider) {
}

@Override
public void onProviderEnabled(String provider) {
}

@Override
public void onStatusChanged(String provider, int status, Bundle extras) {
}
```

```
        @Override
        public IBinder onBind(Intent arg0) {
                return null;
        }
}
```

7.0 References

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