

**SCREEN READER FOR THE BLIND USERS TO READ IMAGES USING SANG
KANCIL AND SANG BUAYA STORYBOOK**

by

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Dissertation submitted in partial fulfillment of
the requirement for the
Bachelor of Technology (Hons)
(Business Information System)

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CERTIFICATION OF APPROVAL

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Approved by,


.....
(DR SUZIAH SULAIMAN)


UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

January 2011

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.


.....
(FREDDA AWA ANAK LIPA)

ABSTRACT

The dissertation is complete information about the project titled “Screen reader for the blind users to read images using sang kancil and sang buaya storybook”. It probes on the difficulty that a visually impaired user having problem to imagine a picture and help to settle this problem by developing a new screen reader using the storybook as the control element. The scope of the project is within two semesters and the subjects of study are Malaysian visually impaired users in their teenage year. This dissertation also includes the findings and the analysis and discussion on the findings based on the experiment conducted in a controlled element.

ACKNOWLEDGEMENT

I want to say thank you to all that had contribute to the completion of this final year project. I want to specially thank my supervisor, Dr. Suziah bt. Sulaiman who had help guiding me along my two semesters of doing my project. I also would like to thank my friends who had help me to contribute in my experiments that eventually help me obtained the results that are needed for the success of this project.

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Nowadays lots of software are available for the blinds available on the internet. The existences of this software are to enable the blinds to experience the world of internet just like all normal people can enjoy the internet. Inspire by the thought that a blind users cannot read using their eyes but only using their other senses to explore the net world, screen readers were created just for this purposes. This project development is to enhance another function of the screen reader, reading an image aloud to the blind reader.

1.2 PROBLEM STATEMENT

Even though there are screen readers available nowadays but there is one big flaw in it. The screen readers cannot *read* a picture or image. The most it can do is that it just read aloud the alt text of the image.

The purpose of this project is to overcome this problem, as an attempt to help the blind users to imagine how the images look like in their mind. Hoping that with the completion of this project the blind users can use the software as a medium for them to *see* how a picture looks like.

1.3 OBJECTIVES

The main objective of conducting this research is to study how blind users read or interpret an image and also to create software that goes according to the outcome of the method uses by the blind to read images. The outcome of this research is that

when the methods are known then we can continue with the development of the real end product and then deliver the complete product.

1.4 SCOPE OF STUDY

The scope for this research and software development is:

- a) Image recognition study using the storybook of “Sang Kancil dan Sang Buaya” as the experiment control area
- b) Visually impair users that had visual problem after an accident or sickness
- c) Malaysian users
- d) In their teenage age of group

1.4 RELEVANCY OF PROJECT

The project is about a study on how to read image for the blind and creating software for achieving this ability to read image. So the project is relevant and in line with the objectives of this project.

1.5 FEASIBILITY OF PROJECT

1) Technical Feasibility

The software will be using:

- Language: Visual Basic 2008, C++, and Phyton
- Software: Visual 2008 Express Edition, CMake, Microsoft Speech, and others that might be required

2) Economic Feasibility

Most of the development tools that will be used to develop are available as freeware or shareware so it is downloadable on the net.

3) Schedule Feasibility

The development of the website is going to be completed within the allowed time frame, which is 2 semesters.

4) Operational Feasibility

After the software is completed and tested, it should be able to run on all Microsoft operating system.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The content of this literature review will cover all about; **(i) what are a screen reader, (ii) image reading concept, and (iii) human computer interaction and human senses.** The importance of exploring this area is so that we can fully understand our targeted user problems and how they usually coping with their inapt so that we can find a solution for these problems.

2.2 HUMAN COMPUTER INTERACTION AND HUMAN SENSES

Human has five common senses; **sight, touch hearing, taste, and smell.** These senses are what helping the user to go through their daily life by giving input then later will be interpret by the human brain. The results of the brain interpretation are what we call perception.

With the combination of a couple or more of the senses, we conceive different kind of perceptions. These different perceptions indicate the different level of understanding depending on what happen during the transfer along the pathway.

Human brain actually will decide what is the outcome will be after processing it. Human brain can work wonders because it can actually model an object just by combination of inputs from different senses. For example a blind man can avoid obstacles because he has the input from his sense of hearing and also touch to avoid it.

(dailymail.co.uk)...*"mind is not creating any visual 'qualia' - the name given to conscious experience of sensations, such as sight or sound."*

Human computer interaction, or commonly known as HCI, is an important aspect for designing a website. It is actually a study on how human and computer interact and it helps the computer be accepted by the user.

For a blind user case, they will depend on their sense of touch and hearing. The input for sense of touch will come from the mouse, keyboard, and touch input. The hearing will be the output that comes from the audio of a screen reader when it read out the object on the screen.

Based on what I had research, a normal sighted person will have the difficulty to understand an audio for they had gotten use to having sight.

(webaim.org).. *“Sighted users usually have a hard time imagining having to always rely on an audio interface because their world is so highly visual.”*

Even though they have the four other senses, but because they are use to be dependent on the sense of sight to use the internet, the time they are given the test of audio they will be disoriented on how the website look like because their brain simply cannot map it.

But for blind user who had already use to their dark surrounding had develop a mapping for their surrounding by the electrical messages that runs through their visual and optic nerves even though they can no longer see anything.

(webaim.org)...*“His brain is, somehow, keeping tabs on his surroundings, by processing the electrical messages that are travelling through his eyes and optic nerves even though the normal 'visual' part of his brain is damaged beyond repair.”*

They had to depend on their sense on hearing because the only output that HCI been implemented is haptic (touch), auditory (hearing) and also tactile (sight).

2.3 WHAT IS A SCREEN READER?

Screen reader is a software that is use to help visually impaired users to use their computer or to browse a website.

There are many varieties of screen reader available online such as JAWS, NVDA, Thunder, Window Eyes, and many more. Some are freeware like Thunder and some are commercial software that you need to purchase before you can use it like JAWS and also Window Eyes. Of course they do offer trial version of the software but it has limitations.

Below are the varieties of screen reader availables online right now. Some are freeware but some need to purchase before can be use. But they do have trial version that users can try for a certain period of time before purchasing the real software.

Screen reader	Creator	Supported platforms	License	Notes
95Reader	SSCT	Windows	Commercial	Japanese screen reader
Blindows	BAUM Retec (formerly	Windows	Commercial	Supports Microsoft Active Accessibility (MSAA) and

	Audiodata)			the Java Access Bridge.
BRLTTY	The BRLTTY Team	Unix and Windows console	Free and open source (GPL2)	Available to download; part of most Linux distributions
Capture Assistant	Renovation Software	Windows	Commercial	Multilanguage screen reader
Claro ScreenRuler Suite	Claro Software	Windows	Commercial	Provides a "strip" or "ruler" across the screen.
Edbrowse	Karl Dahlke	*nix console	Free and open source	Makes a complete audio desktop, including web access with JavaScript support.
Spoken Web	Eyal Shalom	Windows	Free Web Site	A free web portal managing a wide range of articles
Emacspeak	T. V. Raman	Emacs (on *nix)	Free and open source	Turns Emacs into a "complete audio desktop".
Fire Vox	Charles L. Chen	Unix, Linux, Windows, OS X	Free and open source	For browsing with firefox only (plugin)
Gnopernicus	BAUM Retec AG	GNOME/Linux	Free and open source	Used to be bundled with GNOME, but now replaced by Orca. Includes a screen magnifier. Supports AT-SPI and the Java Access Bridge.

HAL	Dolphin Computer Access	Windows	Commercial	Supports MSAA, the Java Access Bridge, and PDF. 30 day Free Trial available for download.
HT Reader	HT Visual	Windows	Commercial	Includes support for MSAA and PDF.
iZoom	Issist	Windows	Commercial	Screen magnifier with low-vision speech capabilities. Includes support for Mozilla Firefox.
JAWS	Freedom Scientific	Windows and DOS	Commercial for Windows; freeware for DOS	Includes support for MSAA, the Java Access Bridge, and PDF.
Leitor de Telas	MC / CPqD	Windows	Free	Brazilian Portuguese screen reader. MSAA support.
Linux Screen Reader (LSR)	GNOME/Linux	GNOME/Linux	Free and open source	Supports AT-SPI.
SodelsCot	Sodels Factory	Windows	Commercial	Spanish screen reader
LookOUT	Choice Technology	Windows	Commercial	Also available integrated with a screen magnifier.
MAGic	Freedom Scientific	Windows	Commercial	Speech magnifier with low-vision speech capabilities. It can be used together with

				JAWS.
Microsoft Narrator	Microsoft	Windows	Commercial	Bundled with recent versions of Windows, this basic screen reader makes use of MSAA.
Mobile Speak	Code Factory	Symbian OS,Windows Mobile	Commercial	Full-fledged screen readers and Braille interfaces that let you access your mobile phone. One-month trial version available.
Model T Reader	Dolphin Computer Access	DOS	Freeware	
NonVisual Desktop Access (NVDA)	NonVisual Desktop Access project	Windows	Free and open source (GPL2)	Programmed and scriptable in Python. Supports Mozilla Firefox, Microsoft Internet Explorer, Word, Excel and Outlook Express, and Mozilla Thunderbird to a more limited degree. Supports web content using JavaScript. No Java Access Bridge support yet. IAccessible2 support is being implemented.
Orca	GNOME/Linux	*nix	Free and open source	Bundled with GNOME. Supports AT-SPI and the Java Access Bridge.
PC-Talker	Kochi System	Windows	Commercial	Japanese screen reader.

	Development			Supports MSAA and Flash ^[1]
PCVoz	EzHermetic	Windows	Commercial	Available to buy or download trial. Supports MSAA.
Proloquo	AssistiveWare	Mac OS X	Commercial	Includes a license for Infovox iVox. 15 days trial.
Read & Write	Texthelp Systems	Windows and Mac OS	Commercial	Support toolbar designed to assist users who require extra assistance when reading or composing text.
Simply Talker	EcoNet International	Windows	Commercial	Trial download available.
SUSE-Blinux	Novell	Linux	Free and open source	
Supernova	Dolphin Computer Access	Windows	Commercial	Includes a screen magnifier and output to Braille devices. 30 day Free Trial available for download. Supports MSAA, the Java Access Bridge, and PDF.
System Access	Serotek	Windows	Commercial	Trial download available. Supports Microsoft Internet Explorer (including DHTML/Ajax and Flash), Outlook Express, Outlook, Word, Excel, PowerPoint, Skype, and Adobe Reader. No

				support for Java yet.
Talks	Nuance Communications	Symbian OS Series 60 or 80	Commercial	Presentation and free Trial Version to be found on the site.
Thunder ScreenReader	Sensory Software	Windows	Freeware	Supports MSAA.
Virgo	BAUM Retec AG	Windows	Commercial	Trial download available. Supports MSAA and the Java Access Bridge.
Virtual Vision	MicroPower	Windows	Commercial	Brazilian screen reader. Supports MSAA.
WebAnywhere	University of Washington	Web	Free and Open Source (new BSD)	Doesn't require any software installation to run so can be used at any public terminal that has sound available - works on any platform.
WinZoom	Clarity	Windows	Commercial	Screen reader with magnifier. USB version doesn't require any installation and can be used on any public computer.
Window-Eyes	GW Micro	Windows	Commercial	Available to buy or download 30-minutes per Windows session demo. Supports MSAA.
Screen Access	National	Windows	Open	

for All	Association for the Blind, New Delhi		source	
ZoomText	Ai Squared	Windows	Commercial	Includes a screen magnifier. Trial download available.

TABLE 1: Contemporary screen readers taken from wikipedia

The popularity of the screen reader is top by JAWS and followed by Window Eyes. This is based on the study done by Redish and Theofanos(2003) on the articles “Observing Users Who Listen to Web Sites” conducted on 16 vision-impaired users from one part of America.

All screen reader works the same way. It reads from top-to-bottom, left-to-right, and when it comes to images it will only read the link or the alt text that are available. We need to understand how a screen reader work so that we can integrate the screen reader functions with the blind user capability that will later help the screen reader to read an image with its descriptions.

There are different types of screen reader. The types are text screen reader, GUI screen reader, off-screen model, accessibility APIs, self-voicing applications, web-based screen reader, emulators, verbosity, and language. These different types of screen reader work differently to each other.

2.4 THE CONCEPT OF READING IMAGE

Image reading is one concept that is not consciously realized by many. The brain works by reading an image and then models it inside our head according to the characteristics that it had received from the optic input. But reading image can also be done by audio, where the description of an image is read aloud and then the brain will process the information and model it later. Jim

Burke had venture on this idea and he had come up with questions that actually the brain always unconsciously ask for it to interpret an image. His book *“Reading Reminders: Tools, Tips, and Techniques”* has the list of questions that we actually ask ourselves every day.

Burke(2010)...”*As more texts are used to convey information print once did, we must bring to these visual texts critical literacies that will help us construct meaning from their elements. Some of the questions below are designed to help readers make sense of images they encounter in various contexts.*”

The brain already has the capability of processing any type of information be it in audio or visual. The screen reader just need to read out aloud the information needed and the image will be model inside a blind user brain.

The brain area for image processing is the biggest area, call the middle temporal, or MT for short.

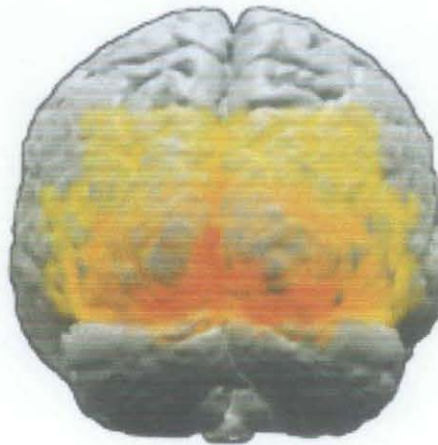


Figure 1: Brain middle temporal area

CHAPTER 3: METHODOLOGY

3.1 METHOD

After identifying the methodologies used for the system analysis and design, I have chosen the throwaway prototyping-based. The reasons for this choice are:

- Throwaway prototyping-based outcome is more accurate to most methodology because every time there is a mistake we just need to *throw-away* the faulty part and continue with the development process without needs to start from scratch. Besides in the end the prototype will be the end product.

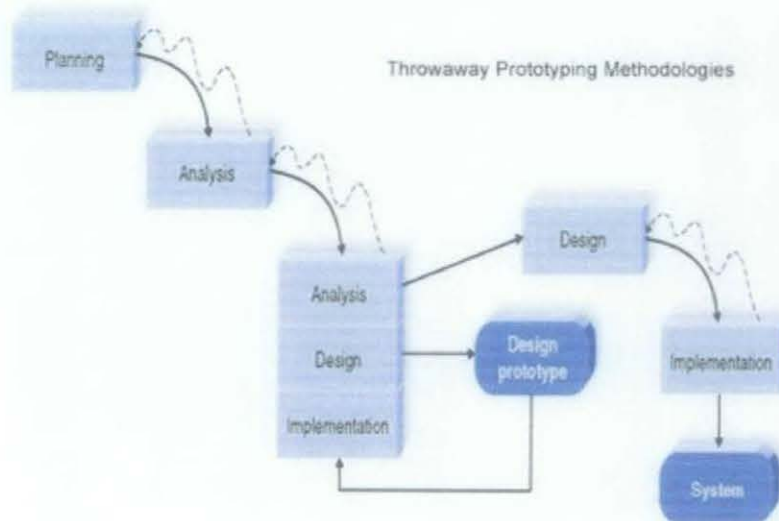


Figure 2: Throwaway Prototyping

3.2 ACTIVITIES

Initial stage:

1. Research on the information needed for developing the software.
2. Gather as many journals, articles, books and also internet resources need for the research.

Analysis stage: extract all information needed for the next stage of the software development.

Prototyping stage: design and develop the software according to the information gathered and any obsolete features are removed and replace by a new and importance features.

Implementation stage: I will develop the software in a story telling form where it contains various images and then using the screen reader it will read the image data that had previously been instate with data of its own description to prove the concept of reading images. Then I will deliver the software after finish developing, testing and also debugging.

3.3 GANTT CHART

Please refer to appendices for the Gantt chart.

3.4 KEY MILESTONE

Please refer to appendices for the milestone for the project.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 FINDINGS AND DISCUSSION

How this software will actually work?

In the outcome, it will be able to detect the images in the Sang Kancil and Sang Buaya using OpenCV which will be developed using CMake to read the images that had been recorded inside my Microsoft Access database. Then after it retrieved the image information, Microsoft Speech will read out aloud the image attribute that will help the users to imagine the picture.

The system architecture itself is very simple because it has a simple interface that I had created using Visual Basic 2008. Below is the image of the software that I had created.

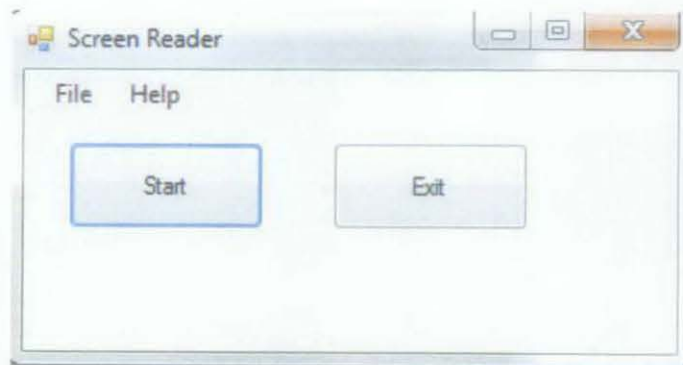


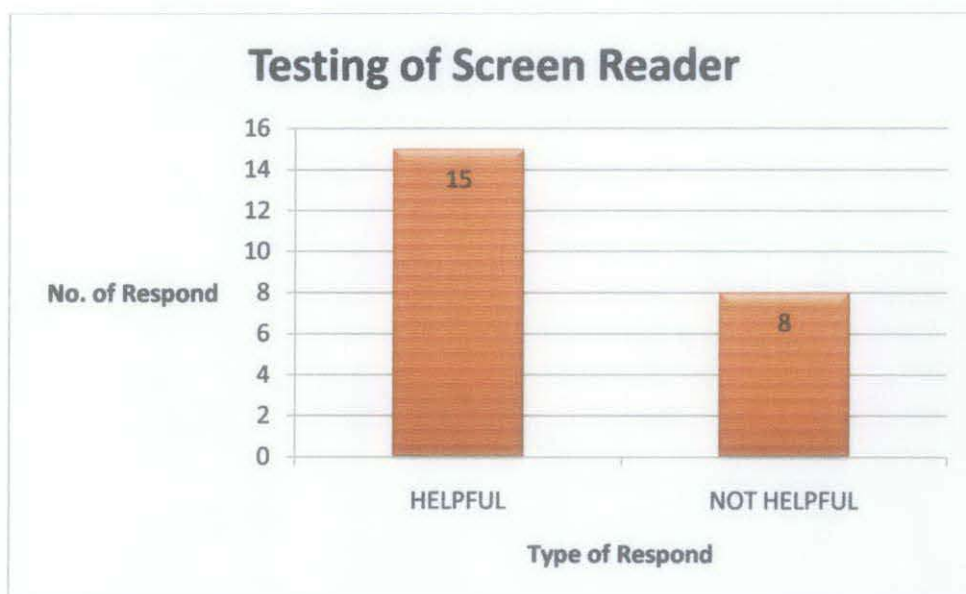
FIGURE 3: SCREEN READER

Since the software is more relevant to be tested on those who lost their sight after a few years for being sighted, since they already know an image of an object before, I decide to do viral testing. I e-mail out the screen reader to my

friend and ask his help to pass it on to his community of blind. Out of 23 people who had responded to my email and testing of my screen reader, 15 had said that the software is a big help for them.

HELPFUL	NOT HELPFUL
15	8

TABLE 2: RESULT OF SURVEY

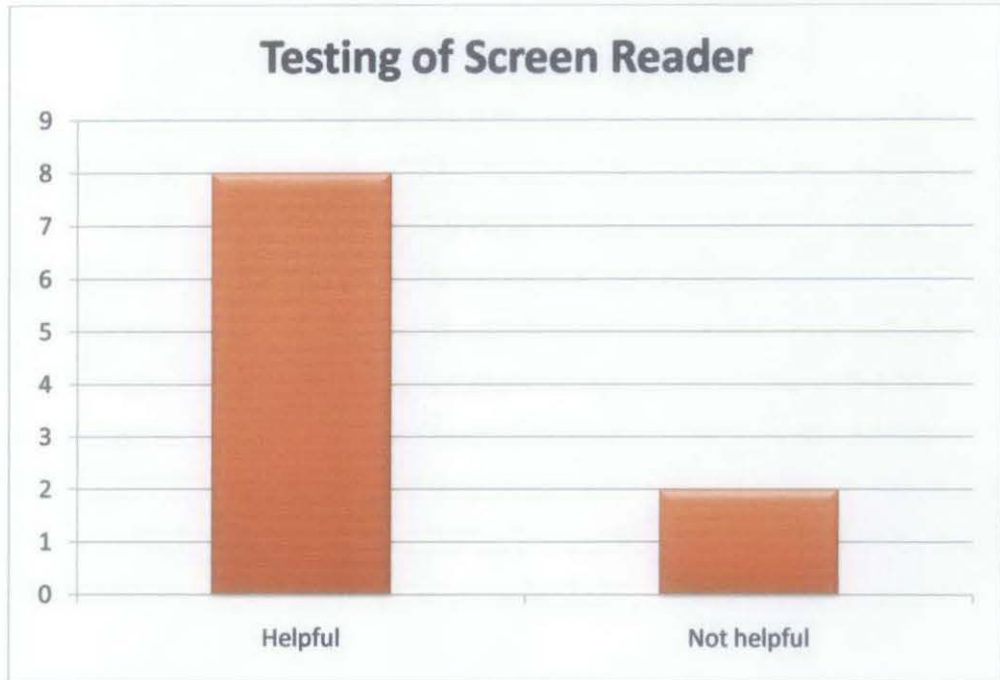


Majority of the users are satisfied by the software even though it still has its shortcomings because they hope to have a screen reader that can describe pictures to them because they no longer can see like normal people do. The other 8 people who dislike the screen reader give reasons that the screen reader still lacks a few functions that they want in their screen which I had addressed to them that the other functions will be added if time permitted because the focus now is to create a screen reader that can read images.

Second time testing is at the blind centre in Miri. Here I manage to do the experiment to 10 users in the age group in their early 20s'. The result that I get is like below.

	Testing of Screen Reader
Helpful	8
Not helpful	2

TABLE 3: RESULT OF SURVEY 2



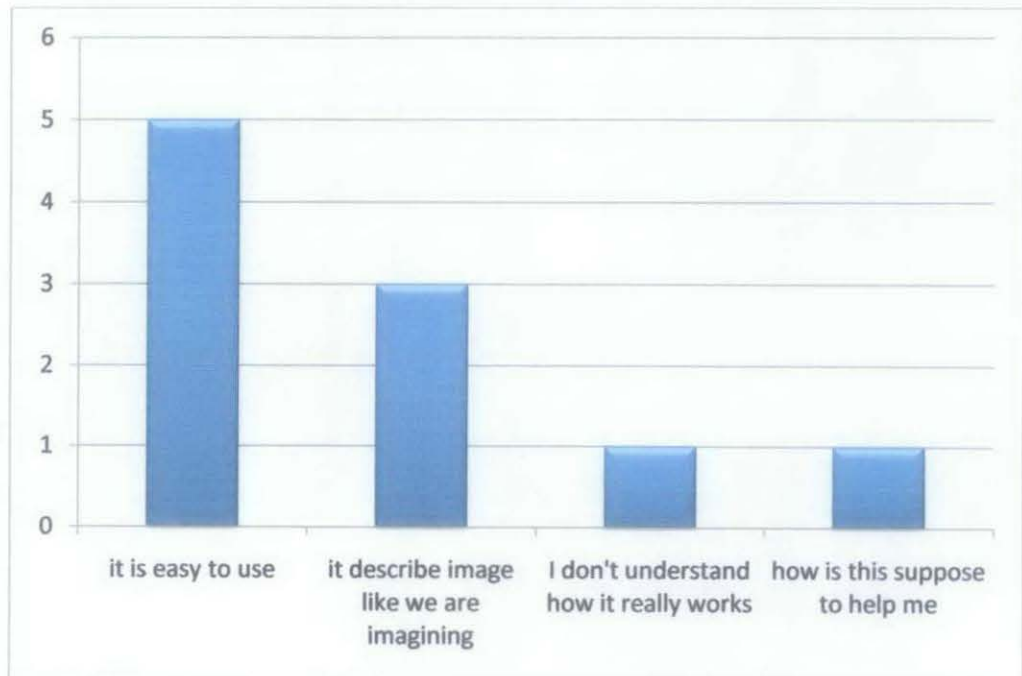
From the second experiment, I can get more accurate data because I met personally with the visually impaired users and I can actually control the experiment condition because I choose the people for the experiment according to my scope of study. When previously I just do viral experiment I cannot determine whether the users that use my software is actually a blind user and also within the age group but with this second experiment I can actually determine it.

The responds that I received is actually base on these reasons:

- a) It is easy to use
- b) It describe image like what we are imagining
- c) I don't understand how it really works
- d) How is this suppose to help me

Based on the reasons this is the graph that I come up with:

Reasons	No. of responds
it is easy to use	5
it describe image like we are imagining	3
I don't understand how it really works	1
how is this suppose to help me	1



CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.1 RELEVANCY OF OBJECTIVES

My objective of learning how the blind user browsing a website had been achieved by going through various articles, journals and also websites that had done researches on this very subject. They also had the aim for helping the users to achieve optimum states of interacting with the computer. My objective for developing the software also had been met and it is within the scope of the project.

5.2 SUGGESTED FUTURE WORK EXPANSION AND CONTINUATION

I hope that in the future that I can fully develop a complete and up to requirement screen reader because it will help a lot for those who need it. They had difficulties to use the computer because of the screen reader lacking features and they need to spend a lot of money just to purchase a screen reader like JAWS.

In conclusion, with this software finally developed I hope that the visually impaired users are no more having problem when trying to read an image and I hope that in the future a more sophisticated but user friendly software will be developed because we are to help these blind users to discover the beauty of the net world.

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APPENDICES

Gantt chart

1 st semester	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9	Wk10	Wk11	Wk12	Wk13	Wk14	Wk15	Wk16
Proposal																
Problem Analysis																
Research and Finding																
Solution design																
Prototype development																
Oral presentation																
2 nd semester	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9	Wk10	Wk11	Wk12	Wk13	Wk14	Wk15	Wk16
Full software development																
Testing and Bug finding																
Deliver product																

Key milestone

1 st semester	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9	Wk10	Wk11	Wk12	Wk13	Wk14	Wk15	Wk16
Proposal	■															
Problem Analysis		■	■	■												
Research and Finding					■	■	■	■								
Solution design									■	■	■	■	■			
Prototype development												■	■	■	■	
Oral presentation																■
2 nd semester	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9	Wk10	Wk11	Wk12	Wk13	Wk14	Wk15	Wk16
Full software development	■	■	■	■	■	■	■	■	■	■	■					
Testing and Bug finding					■	■	■	■	■	■	■					
Deliver product																