**EYESEE – Image Analyzer and Guide for the Visually Impaired within the Vicinity of Pamantasan ng Lungsod ng Maynila**

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**CHAPTER 1**

**INTRODUCTION**

*This chapter serves as a background for readers to have an overview of the study even without*

*prior reference to other publications on the topic.*

**I. Project Context**

In this world where people with disabilities are associated as a burden for others and being isolated from the society, a meaningful medium from where they can show everyone that having a disability is not a reason to treat them like the way they are being treated. There are cases in the country where lack of help and welfare for people with disabilities are perceived. There are different kinds of disability that needs to be given so much attention to. Laws in the Philippines support access by persons with disabilities (PWDs) to many of the elements necessary to succeed in life, including employment, education, infrastructure, and rights in court. Although these laws are well-intentioned, the Philippines lack the government budget to create and staff regulatory agencies that make sure they are effectively implemented. (Nika Tumao, 2012) Not enough programs are established, especially for those people who live on the remote areas of the country.

Visual impairment, refers to as any kind of vision loss. It can be a person who cannot see at all, that cannot be corrected by any paraphernalia like glasses or contact lenses. However, it can also be someone who has a partial vision loss, who are advised to use paraphernalia that will help them on their eye problems. Seeing this as a huge problem for one person, can urge someone to do something about it, and perhaps give them a much better solution. There are several reasons for why a person is visually impaired. It can be a result from a terrible accident, illness from which the eyes got affected and probably the disability is in-born. No one knows what horrible things might come, not even in a blink of an eye.

People with vision disabilities, face different problems every day just like any other people, but for them it is much more difficult because not being able to see the things around you is one of the reasons that made it hard. On their daily lives, they face hardships that are probably normal for other people but for them it is very different. Most of them have to depend on others just to go through the day but there are some that tries to depend themselves but still find it so difficult.

As what the proponents have seen about the problems faced by the visually impaired people, they’ve decided to create an application that will help these people cope up to the fast pace changing that is happening to the world. This application is specifically made for the visually impaired people that will enter the vicinity of Pamantasan ng Lungsod ng Maynila (PLM). Providing them a guide while inside the university. It’ll help them depend more on themselves even on facing other people or the things that they will encounter around.

**Eyesee** is expected to give visually impaired people a lot more probabilities to fully depend on themselves while going around the university. To know the different things that is happening around them, and they can also have an idea what the person in front of them looks like. On the way the application will describe what the camera of the phone captured, they will have the knowledge about it. In this way, they can still have the privilege to know what’s happening around them or what are the things that surrounds them even they cannot really see it with their own eyes. Giving them these kinds of way to reach out to the society will probably give them a lot more confidence that they are just as normal as what others is. Providing them some hope with the use of the modern technology that they can still live normally and wonderfully just like everybody else.

**II. Purpose and Description**

Not all people have the chance to see how wonderful the things that surrounds us. The beautiful faces of humans, things that can help us every day and up to the beautiful sceneries around us.

As to give these people, more encouragement on their lives and to depend upon themselves given the capabilities that they have, an application for them to use was established. Specifically pertaining to those people who will enter the vicinity of PLM (Pamantasan ng Lungsod ng Maynila). It can be the students, or other people from outside who have their concerns inside the university. This application will be their guide, letting them wander inside. Whether they need to go to a building, office, classrooms or even on the comfort rooms. Knowing that most of the visually impaired people depend on others, the proponents want them to start depending on themselves by the use of this application. Navigating around and finding things that they are not very familiar of. When talking to a certain person, gives them an idea of what the person looks like. It can be a great attainment for them because often they don’t want other people to be bothered for their own needs.

This application will let them capture anyone or anything right in front of them, and be able to know what is it. Right about their privacy problems, because given that they cannot read on their own, the application will provide a way that will help them distinguish the contents of a certain thing with a text embedded on it. Being able to use it to read letters, books, or even menu on restaurants and stores will be a great convenience to the visually impaired people.

This study is significant to the given people:

To the ***visually-impaired students***, to help and provide a way for them to become more self-reliant whilst inside the university in terms of navigation and awareness.

To the ***programmers and developers,*** this study will encourage them to partake in the improvement and development of applications that can help disabled people and to advance and develop applications and system that utilizes this technology.

Lastly, to the ***future researchers,*** that they will further this study through investing more time in finding out the effectiveness and relevance and to what extent can Computer Vision help in today’s computing technologies.

This study was provided with the challenges that the visually impaired people may encounter inside a university. Using the modern technology, the proponents wanted to give a hand to these people even not personally. Putting efforts to provide something useful is one of the major reasons why this study is made. Giving them more purpose to live and be able to boost their confidence within themselves is so much of a worthy.

**III. Statement of the Problem**

*Based on proponents’ research, they have come up to the following problems:*

1. **Almost all of the reading materials and resources used by a Visually Impaired Person are not available in Braille.**

Scenario:

*A visually impaired student needs a textbook for reading, this needs to be converted to Braille before the person can obtain the information that the textbook has. It may take some time before it can be converted.*

*After a while, the student received a letter from the office but he won’t be able to read it by himself. So the student needs to find someone who can read it and relay the information.*

2. **Difficulty in navigating within the environment.**

Scenario:

*The visually impaired person entered the vicinity of Pamantasan ng Lungsod ng Maynila but then walked alone after passing the gate. While walking, the person is not sure if it is the right path to go.*

*They probably could make a lot of mistakes regarding the spots, rooms, and offices while wandering around the university.*

3. **Visually Impaired People are having a hard time identifying objects and other people around them.**

Scenario:

*The visually impaired person went to the University canteen because of hunger. Right in front of a stall, he stopped but was not sure if it is right one. Then he asked the seller, if they are selling some Sandwich to make sure of it. After the sandwich was done, he was asked for the payment of the food. He looked for the wallet from his bag and after finding the wallet, he took some money out of it but the problem is he is not sure if it’s the right amount for the food he will purchase.*

**IV. Objectives**

1. The objective of this research is to formulate a way to develop and provide the users (Visually Impaired Individuals) an immediate way to know the contents of an object with a text such as letters, lectures and menu information.

2. To provide a guide to the different locations and spots while the user is on the university.

3. To be able to identify and describe the objects, people and environment that can be encountered around.

**V. Scope and Limitations**

This study focused on the problems and difficulties faced by the visually-impaired people while they’re inside the university. It limits the places and spots which can only be found within the vicinity of Pamantasan ng Lungsod ng Maynila.

Specific key points for places inside the university are covered by the study for the guidance in the navigation of the end-user.

The objects with texts on it, that can probably be found inside the university are the things that can be converted into speech once it was captured. Things that can mostly be encountered in the university like letters, lectures, textbooks, bulletin boards and such are the ones that the application can handle for the user.

Different things that can be found inside the university can be identified. Its identification and basically its description such as color and size. The object will be described just by base on its form and appearance. People around can also be identified and analyzed also based from their appearance. A person can be described on what its gender, color of the clothes and the action currently doing.

The things and places outside the Pamantasan ng Lungsod ng Maynila is out of bounds and is not included in this study. Giving directions on how an end-user can reach a particular spot within the university is the only thing the application can provide. Other properties of an object not specified cannot be produce for the object, the same thing goes on if a person is on capture.

**CHAPTER 2**

**REVIEW OF RELATED LITERATURE AND STUDIES**

*This chapter presents the review of related literature and studies from both local and foreign sources, articles, forums and other knowledge bases about the study and the overall synthesis.*

**I. Related Literature**

**A. Foreign**

According to Mastropieri & Sruggs, visual impairments referred to both blindness and low vision. Visual impairment can be defined legally and educationally. This study adopted educational definition of visual impairment which considers the ability or degree of a person to use visual ability educationally. Educationally, a student with low vision is the one who has some vision, and therefore can read enlarged prints. On the other side, an educationally blind child is the one with very limited vision and thus relies on reading and writing by using the braille system or by using audio tapes. (Mastropieri & Scruggs, 2010)

Discussed on “*The Literacy and persons with developmental disabilities: Why and how?”,* different experiences of how a person with vision loss is and what kind of things they put on their mind while working on their situation day by day. When contemplating vision loss, people imagine a debilitating, black void filled with isolation and loneliness. “Many people have an image of a person imprisoned by darkness—stumbling, falling, or groping around in the dark. They imagine a person who is totally inadequate and unable to take care of himself”. (Schultz, p. 9) How one adjusts in a particular situation depends upon one's personal characteristics and also the circumstances. In other words, both personal and environmental factors work side by side in adjustment. Tuttle (1987) defines adjustment as the process of responding to life's demands and stresses. Adjustment becomes difficult for persons who have a certain kind of disability especially in case of visually impaired persons as they also lack one sense out of five, because of which their lives have certain restricts. There are three major limitations imposed by serious visual impairment- 1) Restriction in range of variety of experiences. 2) Restriction in ability to get about. 3) Restriction in control of environment in relation to one's own self. Adjustments of a visually impaired person become difficult due to these limitations. A blind person has to go through seven stages for adjustment (Tuttle and Tuttle, 1996): Trauma (physical and social); Shock and denial; Mourning and withdrawal; Succumbing and depression; Reassessment and reaffirmation; Coping and mobilization and Self-acceptance and self-esteem. While many often people perceive that visually impaired persons as helpless, resentful, bitter, and unhappy. Professionals have suggested that blindness itself does not create emotional disturbance. Instead, it is societal prejudices that cause emotional distress; many people who are blind concurred that the misconceptions others have about blindness, and not the loss of vision or the need for adaptive skills, is what causes anxiety (Cutsforth, 1951; Jernigan, 1969). The attitudes of significant others (i.e. family and friends) have the most significant impact on the blind individual's self-concept; families with positive attitudes help the blind person maintain a positive outlook (Versluys, 1980). Not only the family but the school also contributes towards the adjustment pattern of the visually impaired students. Mittal (1981) is of the opinion that in India where parental attitudes towards the visually impaired child are found to be mostly negative and where social prejudice is presently too strongly embedded to allow free and equal participation in the activities of the community and common school, the success and efficacy of integrated education needs to be objectively assessed. The debate of how to handle children with disabilities has been raging since the traditional educational system began questioning the effectiveness of segregated institutions. (Balescut and Eklindh, 2006)

Education for people who are visually impaired, is one of the issues that needs more attention because everyone is capable of learning whether you have a disability or not. Each and every human being have the right to learn and gain knowledge from others.

Regarding on the education of visually impaired, Rosenblum and Amato found more than a few problems that they’ve seen upon. There were several problems in the lesson books such as reading the textbooks, accuracy in the textbook in the Braille form, and having the translated textbook access. Since the textbooks were not designed specifically for visually impaired students they needed to be adapted for visually impaired students. When the books were translated into the Braille alphabet, there were several accuracy problems and printed version differences between the Braille version and the textbook version. Therefore, lesson books were not useful for visually impaired students as much as they were for the sighted students. According to the article, without reading and writing mathematical content, learning mathematics became harder for visually impaired students. (Rosenblum and Amato, 2004)

Other complex mathematical equations became a much bigger problem for the education of the visually impaired people. Given that there are limitations on what only can be translated into Braille. Karshmer and Bledsoe had given some reasons regarding on the difficulty of visually impaired when it comes to mathematical complex equations.

There were two reasons for these problems: the first one is the linearity of the alphabet and character set problem. Because the Braille alphabet is linear, there are no problems in writing simple 18 equations or expressions in mathematics. For example, if a student wanted to write f(x)=ax2 +b, the characters that correspond to f(x)=a\*(x^2)+b are used. If more complicated equations or expression are written in Braille, it could be significantly problematic. For example, if the expression is ( ) , the student needs to use the characters f(x)=[3\*(x^3)]:[(x^2)+4]. Therefore, it gets more complicated when the equations are more complex. The other problem is the character set of the alphabet. The letters can represent different notations and its capital position or other conditions could affect the writing of mathematical expressions. (Karshmer and Bledsoe, 2002)

Seeing that there are other factors that affect the learning of visually impaired people when it comes to other subjects like mathematics and science, Fraser and Maguvhe (2008) mentioned that, “Yes, lack of resources, unprepared teachers, experiments, graphs, maps and tables are some of the setbacks the blind learners encounter when doing or want to do mathematics and science. However, this should not be an excuse not to teach them” Reasoning that these difficulties concerning things and the people around them, must not stop them to learn for themselves. (Fraser &Maguvhe 2008:86)

There are lot of new application today regarding ways on how it can be helpful to the people with disability, specifically on people who are visually impaired. There are applications developed to help them in different aspects. One of the most essential need when it comes to the visually impaired people, is the way of their navigation within the surrounding. According to Koenig and Holbrook (2000), “The significant and immediate consequence of visual impairment is the restriction in one’s ability to travel through physical and social environments and to anticipate and exercise control over potentially hazardous situations.” (Koenig and Holbrook 2000:2)

Narrative Maps: “Directions” and Click And Go Wayfinding Maps are two forms of narrative maps (verbal or text-based descriptions of an area) that function both indoors and outdoors). “Directions” is a smartphone application that allows visually impaired users to receive instructions from a sighted user. Click And Go Wayfinding Maps is a website that uses pre-recorded instructions from landmark to landmark that can be downloaded as audio or braille text. ClickAndGo sets out to professional O&M consultation to visually impaired travelers, though the limited number of locations available in the database could make the tool less useful to the end users. Virtual Exploration: Virtual exploration consists of using sensory feedback to help visually impaired travelers familiarize themselves within the context of an environment. This has been accomplished through spatial audio systems such as the Audio-based Environments Simulator, where objects in the virtual environment correspond with a certain sound as well as spoken words . Spatial audio systems can be augmented with a force-feedback joystick (vibration-enabled) for a multisensory experience, for which researchers concluded that users were able to develop a better perception of space and location of objects in the environment. If applied to transit systems and stations, virtual exploration devices as such have the potential to help visually impaired travelers familiarize themselves with the layout of the building or with the layout of the overall transportation network. The next phase described researcher’s review consists of localization and navigation. These tools help the visually impaired traveler determine where he or she is at a given moment and help provide directions to safely guide the traveler to his or her destination. Tools in this space include enhancements to traditional mobility aids, outdoor smartphone GPS systems, use of landmarks and dead-reckoning on smartphones, as well as non-smartphone enabled solutions. Enhancements to Traditional Mobility Aids: Solutions such as the affordable Sensible Blind Cane incorporates an ultrasonic sensor module used to detect obstacles in an effort to enhance the commonly adopted mobility aid . Similarly, the MobiFree Cane, Sunglasses and Echo, are a set of wearables and mobility aids that help detect obstacles and notify the user through audio blips or vibrotactile interfaces. Other systems like the SonicGuide uses enhanced sunglasses and ultrasonic waves to convey spatial information to the user. Relating to dog guides, another traditional mobility aid, robots such as eyeDog have been marketed as more affordable options .Smartphone Navigation Apps: There have been attempts to create smartphone applications using occasional GPS, landmark inputs, and dead-reckoning tools. Navatar is an example of a smartphone 11 application that uses the built-in features of a smartphone such as the accelerometer to perform dead reckoning in between user-inputted landmarks (Dias and Ravishankar, 2015)

For a person who is blind, and cannot read Braille, access to printed material has traditionally been mediated through others, particularly a family member or friend, or perhaps a helper, or an organization. Apart from assisted access to print, radio, audio cassettes and telephones have provided the main ways in which people who are blind or visually impaired have accessed information. Braille is only commonly used among those who have been blind since a young age. As a large proportion of people who are blind and visually impaired have become so later in life, Braille is not the most common form of communication. As funding is limited in organizations for people who are blind and visually impaired, only a small percentage of the printed information in the world is available on audiotape, radio, over the telephone or in Braille. The information may often be out-of-date by the time it is made available, and is expensive to convert into more accessible formats. While blind and visually impaired students and those who are employed can get printed materials converted to audio for free (in Australia at least), others usually cannot afford this. (Williamson, et al., 2001)

"In the case of a child who is blind or visually impaired, provide for instruction in Braille and the use of Braille unless the IEP Team determines, after an evaluation of the child's reading and writing skills, needs, and appropriate reading and writing media (including an evaluation of the child's future needs for instruction in Braille or the use of Braille), that instruction in Braille or the use of Braille is not appropriate for the child." (Sec. 300.324, US Department of Education)

**The app that helps blind people ‘see’: Be My Eyes lets sighted users read signs and navigate for the visually impaired (2015)**

According to Woollaston (2015), a Visually impaired developer from Denmark has developed an application that will help other people with problems on their vision. “It connects blind people to a sighted volunteer using a live video chat. The volunteer can then answer questions and see the blind person’s surroundings using a phone’s camera.”



**Be My Eyes** takes advantage of an iPhone feature called VoiceOver. This lets people who are completely blind use the device using synthetic speech and a touch-based interface. To ask for help, a blind person opens the Be My Eyes app and requests assistance from a sighted user. This can be anything from knowing the expiry date on the milk, to navigating new surroundings.

Interpreted from the article, He said: ‘Be My Eyes makes life easier for the blind, by connecting them with sighted helpers through a smartphone app.’ (Woollan, 2015)

**B. Local**

The “blind” as we use to call them are now called the “visually impaired”. According to Resources for the Blind, Inc. there are more than half a million blind people and many more who are visually impaired to a lesser degree in the Philippines. Statistics also reveal that about 100 children lose their sight every week.

Almost half of these cases are either treatable or preventable. Poor nutrition, measles, and premature birth are among the leading causes of preventable blindness in children. Early detection and treatment will save their sight. On the other hand, cataract is said to be the major cause of blindness among adults accounting for around 400,000 cases. The treatment of cataract is simple and effective but the problem is, it is not readily available or affordable for the less privilege.

More than anything else, blind children also want to be able to go to school. They have normal intelligence and can learn as easily and as quickly as any other child their age. They have hopes and dreams for the future and they know that a good education will help make those dreams come true.

Parents Advocates for Visually Impaired Children (PAVIC) is a non-government organization that is a support group. It is a young organization that began three years ago. The group is resolved to work towards educational access for children with visual impairment and to increase school enrolment. They also want to encourage more parents to bring out their children into the mainstream of society.

Resources for the Blind, Inc. (RBI) is a non-government Christian organization serving blind people all over the Philippines since 1988. It has a staff of 50 blindness specialists in Manila, Davao and Cebu offices. It is a personal project of Dr. Arthur Lown who was blind since childhood. He retired as Director of the Atlanta Public Schools Services for Blind students in 1970 and moved to the Philippines to serve as administrator of the Summer Institute of Liguistics until he started RBI.

RBI produces Braille books and distributes them nationwide. The organization also conducts many projects: Bible College for the Blind, Integrated Education, livelihood programs, summer camps, computer training and employment training.

There are about 2,000 blind students around the country who need their textbooks converted to Braille. Approximately 5,000 volumes of textbooks are sent out each year to students. As many as half a million of text pages are converted to electronic view by RBI annually. What happens then to the visually impaired without RBI? Our government seems to have no alternative program or service for the visually impaired. By the way, RBI caters to only a segment of our society. I wonder what happens to those who have no access to RBI.

Visual impairments can mean a number of things. If you are visually impaired it doesn’t necessarily mean you are blind, it could mean you are blind or have impaired vision. A person who is totally blind cannot see light or anything else. Some people use different things to help with their visual impairments by using adaptive equipment, computers, optical devices, Braille and guide dogs. (De Guzman, 2011)

**Executive Summary of the Second National Survey of Blindness, Philippines, 1995**

The second national survey of blindness was conducted from April 1994 to June 1995. It covered 76 provinces and 17 municipalities in Metro Manila represented by a total of 155 barangays or villages. A total of 19,449 persons consisting of 46% males and 54% females were examined.

The survey showed that the prevalence of bilateral blindness in Filipinos is 0.70% meaning 478,968 out of 68.4 million Filipinos are blind by WHO definition of inability to count fingers at 3 meters. This represents only a decrease by 35% from the 642,000 estimated blind during the first national survey in 1987 when the prevalence rate was 1.07% in a population of 60 million. Cataract (77% of blind), glaucoma and uncorrected aphakia were the most common causes of blindness found during this second national survey.

Bilateral blindness is a serious problem in the country, but the other visual disability problems are no less important. Bilateral low vision, with a prevalence rate of 1.95%, affects more than 1.3 million Filipinos. This is mostly due to cataract. In less than 5 years, these people will likely become blind, further increasing the present 400,000 cataract backlog.

Monocular blindness affects 1.09% of the population (700,000 Filipinos). Cataract is the most common cause. In addition, eye diseases traceable to industrialization are significantly causing a lot of monocular blindness.

Within eight years from the first survey, the Prevention of Blindness Program of the Department of Health was launched, the biggest component of which is the cataract backlog eradication program. A Cataract Backlog Project (Oplan Sagip Mata) has been on-going for the past two years. The goal of a national prevalence rate of 0.5% or less by year 2000 seems attainable in spite of the huge cataract backlog if efforts towards its eradication are strengthened.

The following recommendations are being made: efficient and effective coordination of eye care services through a national prevention of blindness committee; a good referral network; empowerment of local governments to deal with the cataract backlog in their own areas; incorporation of eye care education in school curricula; intensive information campaign against blindness and on eye health; and a national registry of the blind as an evaluation tool. (Executive Summary of the Second National Survey of Blindness, Philippines, 1995)

**Prevalence of Blindness and Vision Impairment in the Philippines, 2011**

The 3rd National Survey on Blindness in the Philippines of 2004 says prevalence of visual impairment among children (0 to 20 years old) is 0.43. Further quote: “Some random surveys showed increasing dropout among students in public schools in the upper elementary grades and in high school. This could be attributed to eye problems particularly refractive errors and the high cost of optical services by private optometrists that are not affordable by vast majority.” Almost half of these cases are either treatable or preventable. The causes of childhood blindness in the Philippines are:

1. refractive errors
2. cataract
3. phthisis bulbi
4. corneal opacity
5. retinopathy of prematurity
6. optic atrophy
7. amblyopia / others
8. glaucoma and
9. uveitis.

Among adults the leading cause is still cataract.

According to Harrison, et al (2013), the usefulness of mobile devices has increased greatly in recent years allowing users to perform more tasks in a mobile context. This increase in usefulness has come at the expense of the usability of these devices in some contexts. We conducted a small review of mobile usability models and found that usability is usually measured in terms of three attributes; effectiveness, efficiency and satisfaction. Other attributes, such as cognitive load, tend to be overlooked in the usability models that are most prominent despite their likely impact on the success or failure of an application. (Harrison, Flood & Duce, 2013)

Regarding institutions that help visually impaired people, there are people who locally provide support to them. MANILA, Philippines - Adaptive Technology for Rehabilitation, Integration and Empowerment of the Visually Impaired (ATRIEV), the only school for the blind in the Philippines that specializes in providing access to computers and information technology for the visually impaired, has helped more than 500 blind and low vision individuals for nearly two decades now.

And for them, ATRIEV is not just a learning institution for the blind but an essential partner for them as well to help them achieve their vision in life — and not just plain physical sight.

ATRIEV opened new possibilities for the blind that were once unimaginable, and they did it with the help of some its organizational partners who gave their time and effort to help many blind Filipinos reach their goals and enrich their lives. (The Philippine Star, 2013)

**Serving Persons with Disabilities in the Philippines (2012)**

Laws in the Philippines support access by persons with disabilities (PWDs) to many of the elements necessary to succeed in life, including employment, education, infrastructure, and rights in court. Although these laws are well-intentioned, the Philippines lack the government budget to create and staff regulatory agencies that make sure they are effectively implemented. [2]

Though it’s important to acknowledge their merits, these examples of existing financial products illustrate the opportunity to expand financial services for PWDs. For example, MFIs could partner with providers of wheelchairs to finance their purchase through loans or leasing. An increase in accessibility from acquiring a wheelchair could very well result in new opportunities for employment and productivity and ease the burden of paying back a loan.[8]

As promising as any existing or hypothetical financial product for PWDs might be, they create no impact if clients don’t know about them. Arguably, this component of communication is the biggest missing link currently impeding PWDs achieving full financial inclusion. In the Philippines’ current environment MFIs appear to be disappointingly ineffective at reaching PWDs, and few PWDs appear to aware of microfinance options. Support from government and NGOs could very well help to bridge this connection. [9] (Tumao, 2012)

According to the Jose Rizal Memorial Lecturer, Alejandro S. De Leon, MD, MHA, the eye society, civic groups, and nongovernment organizations (NGOs) provided service to the blind Filipino through outreach missions, but these were insufficient to significantly reduce blindness prevalence.

The National Council on Blindness (NCB) composed of professional groups, civic organizations, government agencies, educational institutions and commercial corporations envisioned to bring together those involved in the prevention and elimination of blindness to a common program of action. One of its major accomplishments was the formulation of the National Sight Plan (NSP). Implementation, however, proved difficult. (de Leon, 2004)

The lecturer interpreted that there are several civic groups that provide support to people who are blind but though given that there are groups that are willing to give a hand to them, it’s not sufficient to cover all related problems regarding visually impaired. There are lots of projects and programs that was formulated for the elimination of blindness in the country and one of it was NSP but implementation of the said project became very difficult for the developers but carried it on.

**II. Related Studies**

1. **Foreign**

**USABILITY OF MOBILE APPLICATIONS: LITERATURE REVIEW AND RATIONALE FOR A NEW USABILITY MODEL**

In the journal made by Rachel Harrison et al. (2013), advances in mobile technology have enabled a wide range of applications to be developed that can be used by people on the move. Developers sometimes overlook the fact that users will want to interact with such devices while on the move. Small screen sizes, limited connectivity, high power consumption rates and limited input modalities are just some of the issues that arise when designing for small, portable devices. One of the biggest issues is the context in which they are used. As these devices are designed to enable users to use them while mobile, the impact that the use of these devices has on the mobility of the user is a critical factor to the success or failure of the application. (Harrison, et al, 2013)

**PROVIDING LEARNING SUPPORT FOR BLIND AND VISUALLY** **IMPAIRED STUDENTS UNDERTAKING FIELDWORK AND REALTED ACTIVITIES**

Seeking for the solutions for giving people who are visually impaired, a student from University of Middlesex has been made. That says, ‘This guide makes no attempt to be exhaustive. Not only is every teaching situation and learning environment different, but each visually impaired student is unique. We have also refrained from being too prescriptive – we do not pretend to know all the answers, or to be able to provide the best advice for each and every situation, or each and every student.’

With regards to the equipment ownership and provision, the researchers provided information. Some visually impaired students, particularly those who may have been blind from an early age, will already own the kind of aids they need to complete field study effectively, and will also have developed preferred ways of working. However, others may have only a rudimentary grasp of the aids available, may own few items of specialist equipment, and may still be seeking guidance on the best way to study, particularly in relation to fieldwork.

In both cases, it is important to take the trouble to find out what equipment is already owned, and what preferred styles of working may have been adopted. For the experienced student, very little advice or support may be needed, but for the recently blind or impaired student, there may be a lot you can do to inform, guide and advise them in their choice of support aids.

Among the items of equipment commonly owned by visually impaired students are:

* portable Braille embosser
* tape recorder
* print magnification tool
* laptop computer, with speech or large print output
* scanner and optical character recognition (OCR) software (for input of printed

text to computer).

(Ifan Shepherd, 2001)

**BLIND PEOPLE AND MOBILE TOUCH-BASED TEXT-ENTRY: ACKNOWLEDGING THE NEED FOR DIFFERENT FLAVORS**

Touch-based phones have paved their way into the mobile scene and turned the richness of the user interfaces into a differentiating factor between brands. Touch-based devices present a wide set of possibilities but a comparable number of new challenges. These devices have incrementally decreased the number of tactile cues and simultaneously amplified the interaction possibilities, thus increasing the visual demands imposed to their users.

While a blind person is likely to be able to interact with a keypad-based phone to place a call without the need for any assistive technology, it would be a herculean task to do so with today‟s touch screen devices. The magnitude of this problem increases as we load the screen with interface elements, as happens with text-entry interfaces, where all letters are placed onscreen.

Our goal is to identify and quantify the individual attributes that make a difference in a blind user when interacting with a mobile touch screen. The mapping between individual capabilities and interface demands will then enable us to suggest the best interface for a particular individual or inform designers about the most promising methods and attributes, thus promoting inclusive design. In this paper, we focus our attention on mobile touch-based text-entry, a very visual, common, useful and demanding task.

**Procedure**

The study comprised two phases: one to portray the users, their attributes and abilities, and a second one to analyze their speed and accuracy, capabilities and limitations, with the aforementioned text-entry methods. All the evaluations were performed in a formation centre for the blind. (Oliveira, et al., Technical University of Lisbon)

**CHALLENGES AMONG INDIVIDUALS WITH VISUAL IMPAIRMENT IN AN INSTITUTION OF HIGHER LEARNING IN MALAYSIA**

According to the study, Challenges Among Individuals with Visual Impairment in an Institution of Higher Learning in Malaysia (2012), they’ve found several challenges faced by the students with visual impairment inside the institution of higher learning in Malaysia.

It has been found that almost all of the materials used by the lecturers are not available in Braille. Students with visual impairments are required to seek assistance from volunteers to be their readers to translate the written notes into Braille. They found themselves restricted especially when there is a shortage of volunteer readers. However, the library has been supportive in helping the students to recruit volunteer readers.

According to Khoo (1998), the lack of textbooks and reference materials as well as the difficulties in obtaining them are among the most challenging barriers faced by individuals with visual impairment. However, this challenge is overcome with the recently introduced technology where brand new books can be scanned and converted into Braille. However, it is quite time consuming and costly. The visually-impaired students have to be very selective in this as some textbooks are changed quite frequently.

Most of the time, the visually-impaired university students depend on other student volunteers and librarians to find the reference materials before translating them into Braille or recorded in an audio tape recorder. This procedure is very time consuming and they have to manage this well as no preferential treatment is given to them in terms of assessment.

As the researchers have found the challenges of Visually Impaired people regarding Mobility on Campus, students with visual impairment are placed in a particular residential college in the university. A special van is provided to transport them from the residential colleges to their respective faculties for lectures. They may also depend on their friends for assistance in commuting from one place to another.

Regarding personal difficulties of the visually impaired, it is found that some individuals with visual impairment are too dependent on others for assistance, too quiet or fussy and so forth. However, the majority are quite independent and will only seek assistance only when they really cannot help it.

Inside the university, computer facilities are also readily available for students with impairment. According to the information gathered, computer facilities are currently available in the university includes screen readers. There are many screen readers such as Window Eyes and NVDA. NVDA is an open source software which can be downloaded by the general public. Most students with visual impairment prefer to use JAWS compared to Window Eyes and NVDA because they find it most user-friendly.

There is a need for a screen magnifier for students with long or shortsightedness. There are many computer software available in the market but they are rather expensive. Such items include the Braille Display which costs approximately RM20,000, Packmate desktop which is about RM12,000 and Braille memo which some visual impaired are currently using which costs approximately USD2500. The visually impaired students provided this information but unfortunately as the number of users is small, they understand why such equipment is not purchased.

Generally, students with visual impairment have limited opportunities to enter university compared to individuals with disabilities from other categories. Some universities are inconsistent in their intake of students with visual impairment. There have been cases where the visually impaired students are transferred to another university after the orientation week in the university. This is related by students who have personally gone through the predicament.

The visually impaired are well informed that a particular university, that is, University of Malaya, provides the best facilities to students with visual impairment compared to other universities. It is a fact that University of Malaya is the first choice for students with visual impairment to pursue higher education. The role of the Ministry of Education and the Social Welfare Department is apparent in the lives of individuals with visual impairment. However, there are other ministries in the government who are not as involved in the affairs of students with disabilities in the university. Other than the Ministry of Higher Education, the Department of Development of Individuals with Disabilities in the Ministry of Social Welfare is becoming more active in the welfare of students with disabilities in the Klang Valley. Other than sending a representative in the Committee of Development of University Students with Disabilities in University of Malaya, the officer has also been to other universities. The Department of Development of Individuals with Disabilities has also conducted courses for work preparation for students with disabilities. Work preparation courses were attended by students from the University of Malaya, International Islamic University and National University of Malaysia.

Including daily facilities that are used in the university, Za'ba Residential College was set up in September 1974. The college is equipped with facilities such as the dining and office area as well as the 'Seri Jati' building which is the block where activities are held for students with disabilities. At the beginning of the establishment, there were 600 students and currently this has increased to 800 students in which there are about 25 students with disabilities in each session.

Individuals with disabilities, namely those with visual impairment, would like to go through daily activities on campus as ordinary students. They would like to have the mobility to enter the university administration building, the faculty and the chancellery. They would like to go for recreation, have meals together and go shopping as well as enjoy the daily lifestyle on the university campus. The major barrier faced by the individuals with disabilities on the campus is to accept their own shortcomings. This is one aspect that the university needs to provide the necessary support and interventions. The university could provide the best amenities, facilities and equipment such as motorized wheelchairs, computers with voice activation and software but if individuals with disabilities are still self-captivated in their own world, their personal, social and psychological developments will still be impeded. (Cheong, Abdullah & et al., 2012)

**MOBILE ACCESSIBILITY TOOLS FOR THE VISUALLY IMPAIRED**

Visually impaired individuals traditionally relied on the assistance and good will of others for their everyday needs. This was due to the lack of basic accessibility affordances when carrying out many daily life activities. Travelling alone was hard or even dangerous due to the lack of carefully constructed sidewalks, or due to the inaccessibility of public transport, which lacked any form of audio announcements [6]. This fact made venturing outside one’s familiar place of living to be only undertaken by the truly adventurous of visually impaired individuals. Meanwhile, finding one’s way in unknown buildings was impossible due to the lack of Braille signage on building doors and elevators, in addition to the deficiencies present in safety regulations. This further exacerbated the mobility difficulties experienced by such individuals solidifying their social isolation. Any written form of communication was off-limits to blind individuals and barely usable by partially sighted people, a fact which was detrimental to the education of this segment of the population. (Nektarios Paisios, 2012)

It was given that in the study made by Nektarios about Mobile Accessibility Tools for the Visually Impaired, limits within the objects with texts are seen.

1. **Local**

**ABBYY FINEREADER HELPS RESOURCES FOR THE BLIND IN THE PHILIPPINES TO PRODUCE BRAILLE TEXTBOOKS FOR BLIND STUDENTS (2008)**

There are about 2000 blind students around the Philippines who need their school textbooks in a format they can read. Braille\* textbooks are the key to blind student’s successful integration into a regular school. With Braille textbooks, a blind child has access to all the same information that the sighted students have. This way the blind students are enrolled in schools with sighted students.

**ABBYY** is a leading provider of document recognition, data capture and linguistic software. Its products include the ABBYY FineReader line of opticalcharacter recognition (OCR) applications, ABBYY Flexi-Capture line of data capture solutions, ABBYY Lingvo dictionary software, and development tools. Paper-intensive organizations from all over the world use ABBYY software to automate time- and labor-consuming tasks and to streamline business processes. ABBYY OCR applications are shipped with equipment from the world’s top manufacturers.

By scanning the print textbooks and subsequent OCR with ABBYY FineReader, RBI can now easily convert paper pages into editable electronic format for further conversion to Braille or audio format. ABBYY FineReader OCR software proved for RBI to be the optimal alternative to manual data entry and retyping by saving a lot of RBI’s staff time and efforts when creating various documents. (Weisser, 2008)

**AN INDOOR NAVIGATION FOR THE VISUALLY IMPAIRED (2012)**

People with visual disabilities, i.e., partially or totally blind, are often challenged by places that are not designed for their special condition. Examples of these places are bus and train terminals, public offices, hospitals, educational buildings, and shopping malls. Several “everyday” objects that are present in most built environments become real obstacles for blind people, even putting at risk their physical integrity. Simple objects such as chairs, tables and stairs, hinder their movements and can often cause serious accidents.

Several proposals have tried to address this challenge in indoor and outdoor environments [1]. However most of them have limitations, since this challenge involves many issues (e.g., accuracy, coverage, usability and interoperability) that are not easy to address with the current technology. Therefore, this can still be considered an open problem.

The navigation process uses three key pieces of information to analyze the current situation and deliver useful navigation information to the user. These pieces of information are: (1) the user’s current position in the environment, (2) the direction in which the user is moving, and (3) the presence of objects in the surrounding area that may be potential obstacles.

**DEVELOPMENT OF A BOXING AUDIO GAME FOR THE VISUALLY IMPAIRED (2013)**

According to the researcher from the University of De La Salle, the development of a computer game for blind and visually impaired people that simulates the sport boxing, which, according to a Social Weather Station survey, was the country's most popular individual sport in 1999 (TxtMANIA.com), and which probably remains true today, especially with the international prominence of Filipino boxer Manny Pacquiao. In the computer game, called Shadow Boxing, the player receives audio as well as vibrotactile cues that enable him to decide on a particular action such as whether to punch the non-player character (NPC) opponent or block the NPC’s punch. Audio and vibrotactile feedback are also provided to inform the player of the effects of his action. The system processes 3D coordinate data from a Microsoft Kinect sensor to determine the player’s actions.

With this Boxing Audio Game, such equipments are very much needed.

To play the game, the user must stand in front of the Kinect sensor, less than a meter away. Headphones or earphones with Bluetooth capabilities are recommended, but speakers may also be used. The vibration motors for vibrotactile feedback are sewn into a suit or long sleeved.

With regards to the player, they are allowed to either block or punch. A punch reduces the opponent's health by 20 points unless the opponent blocks the punch. When the player's health reaches zero, the player loses a round. Whoever is the first to win three rounds wins the game.

There are two types of punches: regular and power. A power punch, which deals greater damage, has an additional gesture in which the player rotates his torso and punches out from his shoulders. However, there is a mandatory five-second period before another power punch can be executed. During this resting period, the player can execute regular punches.

There is only one type of block, which is where the player raises his or her arms presumably to protect his or her face. The arms cannot be less than one inch (70 to 80 pixels) apart to allow the Kinect device to accurately detect the different body parts.

According to the researchers, For Non-Player character (NPC) Opponent, the player fights against an NPC, which can punch and block, with a two- to five-second gap between successive punches when the game is played in Easy mode. The NPC will also attack the player continuously when the player remains in a blocking stance for six seconds or longer.

The system will primarily interact with the player through sound and vibrotactile cues and feedback. These interactions will allow the player to know the current state of the game. (Sison, Cruz & et al., 2013)

**VOISEE COMMUNICATOR: AN ANDROID MOBILE APPLICATION FOR DEAF-MUTE AND BLIND COMMUNICATIONS (2015)**

In the research made by the students of Mindanao University of Science and Technology, Cagayan de Oro City Philippines, they’ve developed a mobile application in terms of messaging, that is established to be used by deaf and blind people.

Voisee Communicator is an android type mobile messaging application designed and developed for the thorough communication between two disabled people most especially the deaf and blind people. With stable and smart Eclipse IDE and the availability of different built-in libraries in java especially the tts.speech. SpeechToText and tts.speech. RecognizerIntent has been taken advantage to create custom voice command functionalities. Creating, replying, sending and forwarding messages are among the primary and fundamental features that this study has to offer. The researchers analyzed the results of the test survey and evaluation form and proved that the application is a user friendly, efficient and accurate in delivering messages to the recipient and has the important features that the users expected. (Landicho, et al., 2015)

**DEVELOPMENT OF A COMPUTER VISION SYSTEM FOR THE BLIND AND VISUALLY IMPAIRED PERSON (2013)**

The main objective of the study is to develop a prototype that will serve as an assistance to the blind and visually impaired utilizing the Kinect technology. The study emphasizes Microsoft Kinect device for developers that will be the eye of the system and Arduino microcontroller as a complementary part of the system.

The importance of the study focuses on developing a reliable and alternative solution to cater the needs of the blind and visually impaired individuals with the use of emerging technology of computer vision. Stakeholders of the system include blind and visually impaired individuals, foundations and institutions for the blind and engineering and computer science expert.

The system initializes in Microsoft Kinect Sensors which will process the data acquired from outside environment such as image and depth stream. All processed data will be optimized to produce a significant output which will be directed to the shaft less vibration motors for object detection and Microsoft Speech API for the recognition of markers using hamming codes. (Belleza, et al., 2013)

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