

THIRD EYE FOR BLIND

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With Honours

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ENDORSEMENT

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DECLARATION

“I hereby declare that the work in this report is my own except for quotation and summaries which have been duly acknowledged”

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DEDICATION

TO MY PARENT:

MR. TAN MING WAH

MS. NGAI CHOOI HOONG

For Support And Love

SUPERVISOR:

MADAM WEE SOO LEE

For Guidance and idea

LOVELY FRIENDS:

For Their Help And Moral Support

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I would also like to give special thanks to my family for their continuous support and understanding when undertaking my research and writing my project. Your prayer for me was what sustained me this far. I would also like to thank my friends who helped me a lot in finalizing this project within the limited time frame.

Finally, I would like to thank God, for letting me through all the difficulties. I have experienced your guidance day by day. You are the one who let me finish my diploma. I will keep on trusting you for my future.

ABSTRACT

Third eye for the blind is an innovation with the help of the multidiscipline subjects like computer science, electronics engineering and health science which helps the blind people to navigate with speed and confidence by detecting the nearby obstacles using the help of ultrasonic waves and notify them with a buzzer sound or vibration. According to WHO 39 million people are estimated as blinds worldwide. They are suffering a lot of hardships in their daily life. The affected ones have been using the tradition white cane for many years which although being effective, still has a lot of disadvantages. This will be a wearable technology for the blinds. One of the main peculiarities of this device is that it will be affordable. The Arduino Pro Mini 328-15/16 MHz board is worn like a device. This will be equipped with ultrasonic sensors, consisting of module. Using the sensor, visually impaired can detect the objects around them and can travel easily. When the sensor detects any object, it will notify the user by beep or vibration. Thus, this is an automated device. Thus, this device will be of a great use for the blinds and help them travel different places.

Keyword: blind, ultrasonic sensor, sound, vibration

ABSTRAK

Third eye for blind ialah satu inovasi dengan bantuan mata pelajaran pelbagai disiplin seperti sains komputer, kejuruteraan elektronik dan sains kesihatan yang membantu orang buta mengemudi dengan pantas dan yakin dengan mengesan halangan berhampiran menggunakan bantuan gelombang ultrasonik dan memberitahu mereka dengan bunyi buzzer atau getaran. Menurut WHO 39 juta orang dianggarkan sebagai buta di seluruh dunia. Mereka mengalami banyak kesukaran dalam kehidupan seharian mereka. Mereka yang terjejas telah menggunakan tradisi rotan putih selama bertahun-tahun yang walaupun berkesan, masih mempunyai banyak kelemahan. Ini akan menjadi teknologi boleh pakai untuk orang buta. Salah satu keistimewaan utama peranti ini ialah ia akan berpatutan. Papan Arduino Pro Mini 328- 15/16 MHz dipakai seperti peranti. Ini akan dilengkapi dengan sensor ultrasonik, yang terdiri daripada modul. Menggunakan penderia, orang cacat penglihatan boleh mengesan objek di sekeliling mereka dan boleh bergerak dengan mudah. Apabila sensor mengesan sebarang objek, ia akan memberitahu pengguna melalui bip atau getaran. Oleh itu, ini adalah peranti automatik. Oleh itu, peranti ini akan sangat berguna untuk bidai dan membantu mereka mengembara ke tempat yang berbeza.

Kata kunci: buta, sensor ultrasonik, bunyi, getaran

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Chapter 1

Introduction

1.1 Introduction

With the improvement of the living standards of the people, we have become so materialistic that we have forgotten how the physically disabled people live a tough life. They undergo rigorous, apathetic, and indifferent behaviour towards them for being physically disabled. They become dependent on other people in a way for their daily routine chores. Blind and impaired persons always depend on other people for their locomotion. Eyes are prime sense of organ in perceiving the outside environment; dysfunction of such prime sense organ severely effects the knowledge perceiving capability of the outside environment. Therefore, going around to places in such environment is a very big challenge because the blind people cannot depend on their own eyes and thus face many difficulties.

The objective of this project The Third Eye for the Blind is to design a product to help those people who are visually impaired and those who often must rely on others. Third eye for Blind project is an innovation which helps the visually impaired people to move around and go from one place to another with speed and confidence by knowing the nearby obstacles using the help of the wearable band which produces the ultrasonic waves which notify them with buzz sound or vibrations. It allows them to walk freely by detecting the obstacles.

1.2 Problem Statement

According to WHO 39 million peoples are estimated as blind worldwide. They are suffering a lot of hardship in their daily life. The affected ones have been using the traditional white cane for many years which although being effective, still has a lot of disadvantages. Another way is, having a pet animal such as a dog, but it is really expensive. So the aim of the project is to develop a cheap and more efficient way to help visually impaired to navigate with greater comfort, speed and confidence.

The existing systems:

- White cane
- Pet dog
- Smart devices (eg : Vision a torch for blinds)

Problem of the Existing Systems:

- White cane - May easily crack/break, The stick may get stuck at pavement cracks of different objects.
- Pet dog - Huge cost.
- Common Disadvantages (Including the smart devices) - Cannot be carried easily, needs a lot of training to use

The features of Third eye for blind people: By wearing this device they can fully avoid the use of white cane and such other devices. This device will help the blind to navigate without holding a stick which is a bit annoying for them. They can simply wear it as a band or cloth and it can function very accurately and they only need a very little training to use it.



Figure 1.1 Existing Systems

1.3 Objective

1. To develop a low cost and more efficient way to help visually impaired people
2. To help blind navigate with greater comfort, speed, and confidence
3. To develop a wearable technology for blind people which resolves all the problems of existing technologies.

1.4 Scope of Project

1. Blind people who are not comfortable using a blind stick
2. Blind people who are looking for a cheap and affordable device to help them navigate
3. People who are visually impaired and has vision loss

1.5 Importance of Research

The 'Third eye for blind' project is the first wearable technology for blind people which resolves all the problems of existing technologies. The existing systems such as blind stick and pet dog are not a good solution for the blind to go around places. Sometimes those things just give the blind more problems and might make some of them lose hope in their life, they need a lot of training to get used to and are very inconvenient to carry around and are expensive too. But with the 'Third eye for blind' project, the entire project can be made in the form of jacket, and it can detect the obstacles around using ultrasonic sensor. It is very light and blind people can just wear it and go to places with confidence. Other than that, this project is also very cheap, everyone can afford it. Besides that, it is also very easy to use and get used to, no need a lot of training and the blind can use it comfortably within hours. The device will vibrate and make noise when obstacles is detected so the blind people can be alert of it.

Chapter 2

Literature Review

2.1 Introduction

This chapter extend the literature reviews that cater the information in accordance with the objectives of this project. The relevant information and other extra features were gathered as shown below.

2.2 Obstacles detector for blind people

Since the running of daily life of blind people is very difficult. This project helps them to run their life as usual. They can make this project as a gadget or a device in their hands which detects the obstacle. This project is more efficient than the existing system with cheaper and accurate one. Here we are using arduino UNO board to perform this operation. To make the life to be as a normal one for the blind peoples this may be very helpful project for them. By making this as a gadget or a device in their hand they can easily judge an object by their own by knowing the buzzer sound. The system uses ultrasonic sensor as a wide range of field to detect an object with its higher detection range. Based on this project we take survey in our institution.

Shovel proposed a method for the blind people. He proposed two different types of sounds. The major drawback of his work is to identification of the sound. The blind people cannot differentiate the sounds. Yuan introduced concept of active triangulation that was used in his proposed device. It will detect the object. The main disadvantage of this work is, it can only detect the object at the rate of 15 measurement/ second and also faces a surface discontinuity. JM. Benjamin proposed a three-direction detectable laser cane. The direction is 45 degrees over and parallel to the ground and with sharp deepness. It is basically a hit and trial method it is used only in indoor systems. The main disadvantage in his system is it is not suitable for outdoor activities. S. Sabarish proposed a system which is like our project nearly, but he has some vibrators in his device. It is not successful, but he keeps on working on it. MA. Espinosa & S. Ungar introduced an idea, that was costlier than the normal one. He did not consider the poor peoples who cannot afford. Pooja Sharma created a device for blind people. In that case the object has been detected but within a certain range. only within that range the object can be identified.

This was the major limitation in this paper. All the above existing system cannot satisfy the exact needs of the blind peoples. They use a white cane and pet dogs which is very costlier and difficult to maintain. To overcome those limitations this project will help. Nowadays there is a lot of technologies available for the visually challenged but our project is cheaper among them.

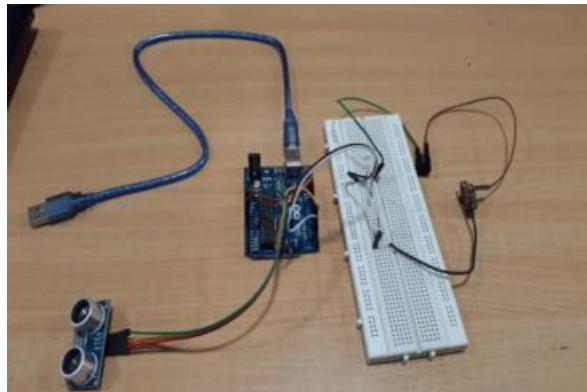


Figure 2.1: Obstacle detector for blind people

2.3 Third Eye for Blind Person

In this modern era of technology, Smartphone devices have become one of the most common consumer devices. A Smartphone plays a very important role in human life. Smartphone's make life easier with its various functionality like – communicating with others through voice calls, emails, messages, browsing the internet, taking photos, etc. With the help of Smartphone's, these all have become a matter of seconds. For example, you just have to dial the person's contact number from your phone and wait till he/she responds. But this pleasure is only for those people who do not have any disability. Blind people can live a normal life and do things according to their lifestyle but, they must face a lot of difficulties as compared to the normal people without any disabilities.

One of the biggest problems for visually impaired person, especially the one who is totally visually impaired, or blind is that they cannot use a smart mobile phone. There are no such gadgets accessible in the market that can be worn like a material and having such a minimal effort and straightforwardness. With the utilization of this extemporized gadget in a huge scale, with changes in the model, it will profit the network of the outwardly debilitated or the visually impaired individuals. The target of this task The Third Eye for the Blind is to plan an item which can overcome the problem of individuals who are outwardly debilitated and the individuals who frequently need to depend on others.

Third eye for Blind task is a development which helps the outwardly debilitated individuals to move around and move between different places with speed and certainty by knowing the adjacent hindrances utilizing the assistance of the wearable band which delivers the ultrasonic waves which inform them with the inbuilt voice assistant. In this system we are developing the navigation system for the blind persons. This is very easy to use and work as a navigator to the blind people to easily navigate. In this system the ultrasonic or sensor will detect the object and gives sound (object 'beep sound') and camera scan the object using object detection technique and predict the object and by using speech recognize the object name is convert into sound and client can know the object by the help of headset. The object and person name and data are store in the module and if the data is not present it will simply say no data image present give a beep sound.

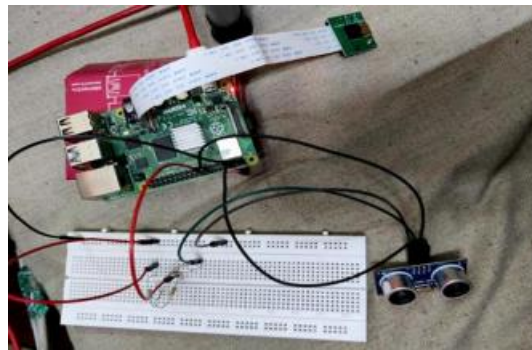


Figure 2.2: Third eye for blind person

2.4 Navigation System for Blind - Third Eye

This project proposes the design of portable AI based —guidance system for blind –Third Eye, which benefits the visually impaired community and helps in their day-to-day mobility. Third eye provides the visually impaired community a new way to visualize the world by explaining them about their surroundings. The whole system is controlled by Raspberry Pi microcontroller. Third eye harnesses the maximum capabilities of Raspberry Pi microcontroller which has enough potential to uphold the system with one advantage being the inbuilt graphic card.

The prototype uses various sensors such as IR Sensors, Sonar Sensors and a Camera module which helps the system to gather the required data. Additionally, text to speech module is used to talk to the user. Python forms the heart of the system. It is used to program the whole system which helps the raspberry pi microcontroller to communicate with all the sensors. It then processes the collected data and converts it into information which is finally delivered to the end user. The IR sensor is used to map the object's shape and size while the sonar sensors get the data about the distance of the object at regular intervals. Camera module plays an important role as it takes the pictures which is then processed using image processing technique to properly visualize the object. All the information is processed and converted to text which is then fed into a text to speech module.

The text to speech module delivers this information to the end user in his/her ear using headphones. The camera is considered the eye of this system. It continuously captures still images which are sent to the raspberry pi microcontroller. The raspberry pi microcontroller takes those images, processes them using artificial intelligence image processing algorithms and generates a matching response which is sent to text to speech module.

OpenCV framework is used to develop the AI model which gives Cafe model for the raspberry pi. Python program is used to get the input through camera and handle the interaction between the model and the input. Then, it shows the output on the screen as a text. Text to speech module takes the text as an input and converts it to an audio output which goes directly into the user's ears. The Third Eye – AI based Navigation System for Blind is developed and integrated as per the design documented in this section. The system is implemented using raspberry pi, sonar sensors, infrared sensor and camera as the hardware base, python is used to program the hardware and OpenCV is used to setup and run the object detection model with python. The system has 3 separated components, sonar sensor, infrared sensor and camera which work simultaneously. Python controls the sonar and infrared sensors. For object detection, OpenCV provides framework for python to control the camera and perform object detection.

Chapter 3

Methodology

3.1 Introduction

Methodology is the method used to carry out the project, for this hand gripper for rehabilitation process device. In this chapter are showing the flow process how the device in the making. The method and development in this project are being done with consulting by supervisor. In this project methodology are consists of block diagram, project flowchart, product flowchart, design product, schematic diagram, component that being used and figures.

3.2 Block diagram

This block diagram is showing demonstrated the operational flow chart for the proposed third eye for blind.

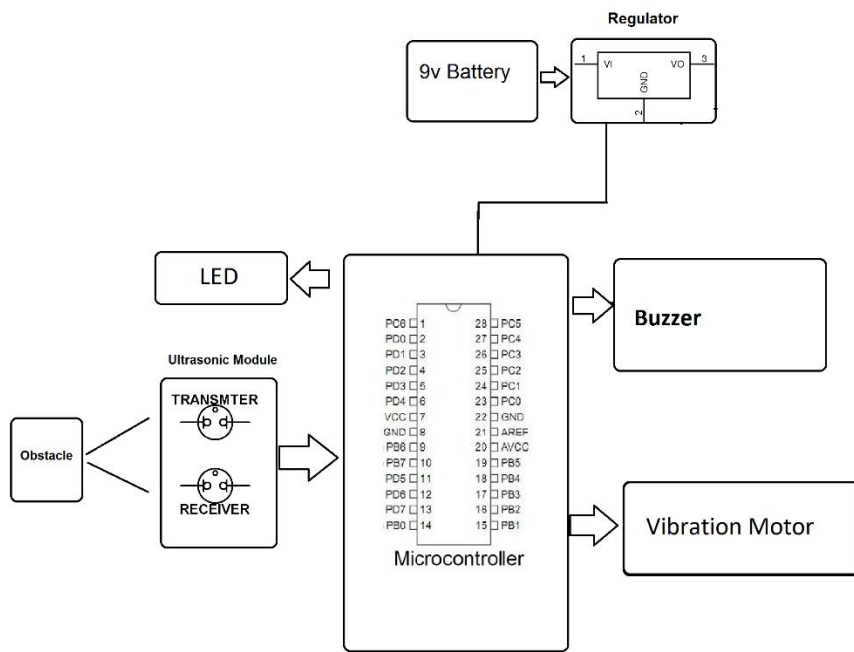


Figure 3.1: Block diagram showing the operation of third eye for blind

3.3 Flow chart

a. Process of the project

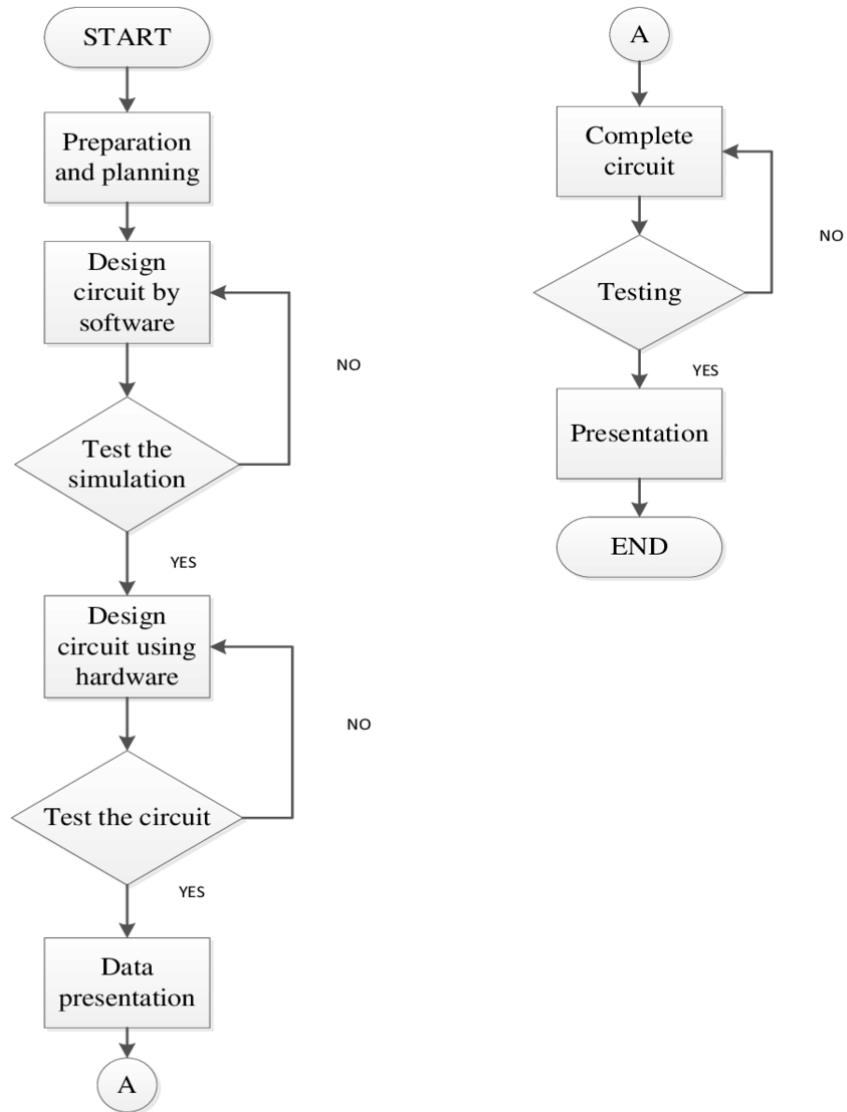


Figure 3.2: Flow chart of the process of project

b. Product development

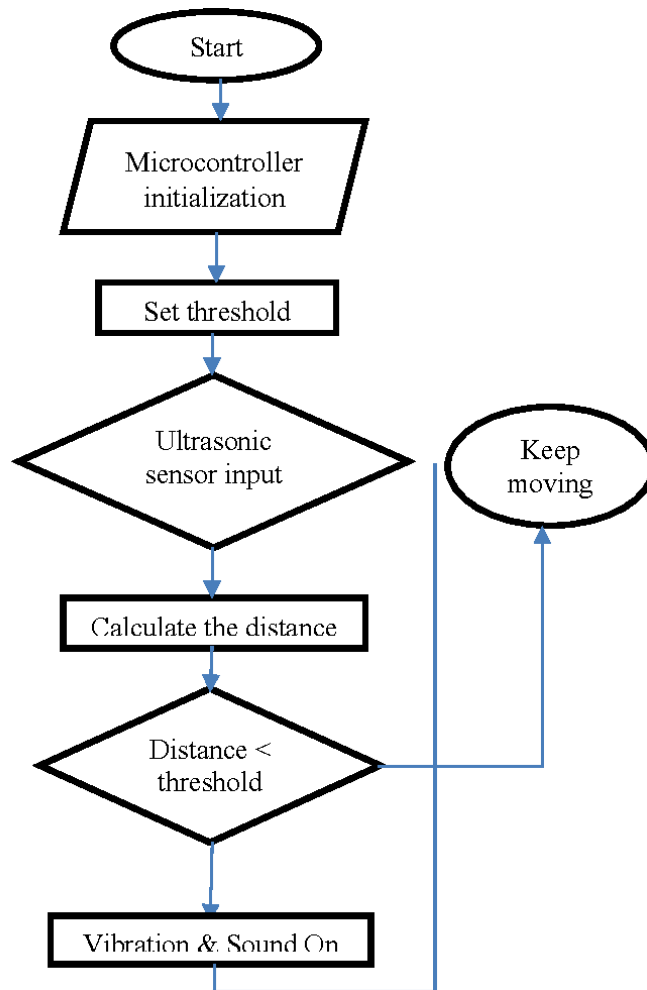


Figure 3.3 Flow chart of the Product Development

3.4 Design

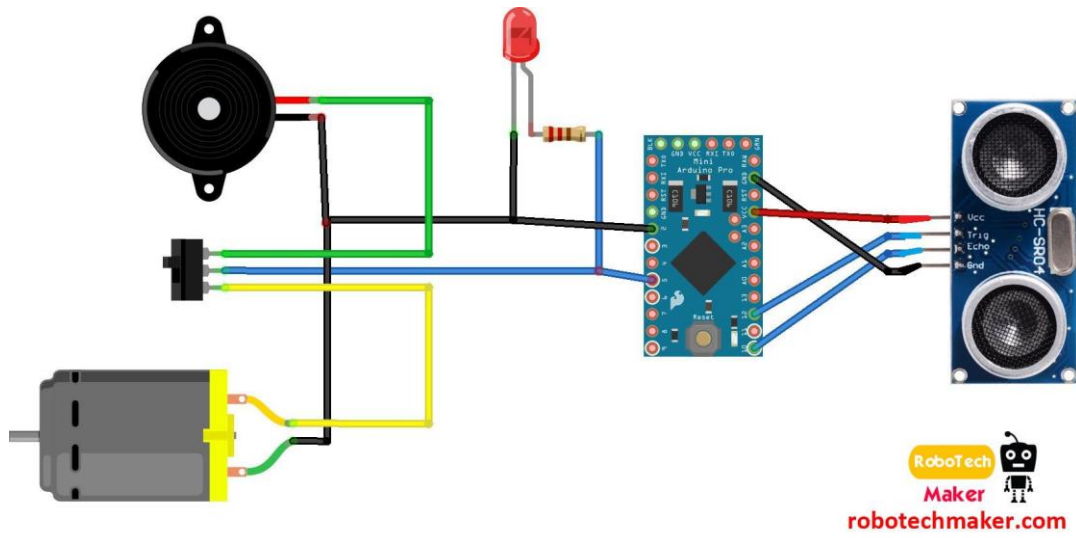


Figure 3.4: The design of project

3.5 Schematic diagram

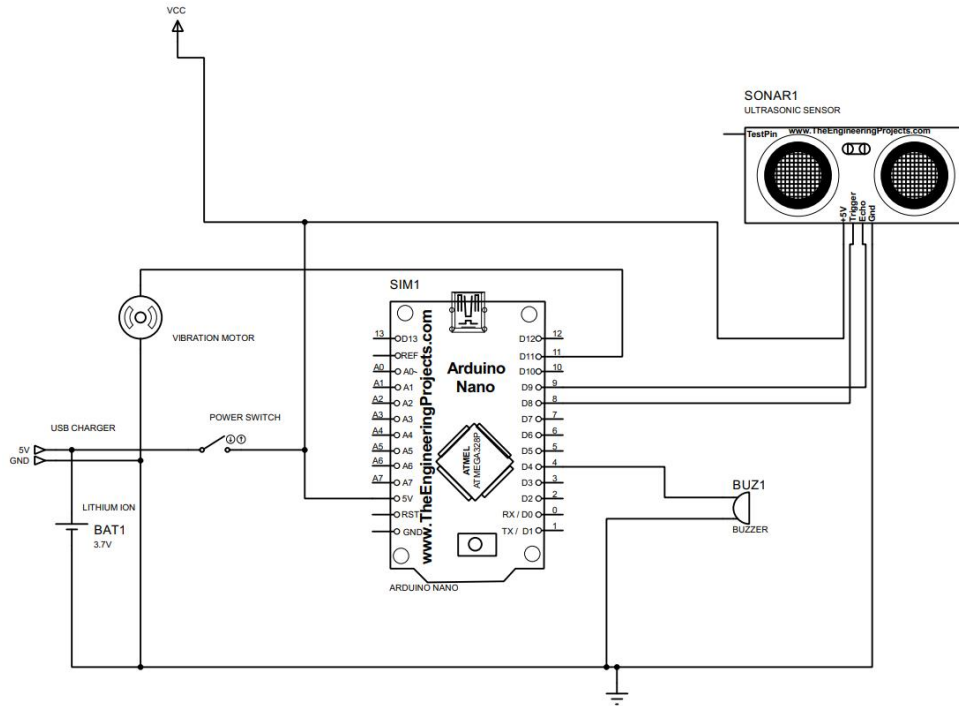


Figure 3.5: Schematic diagram 1

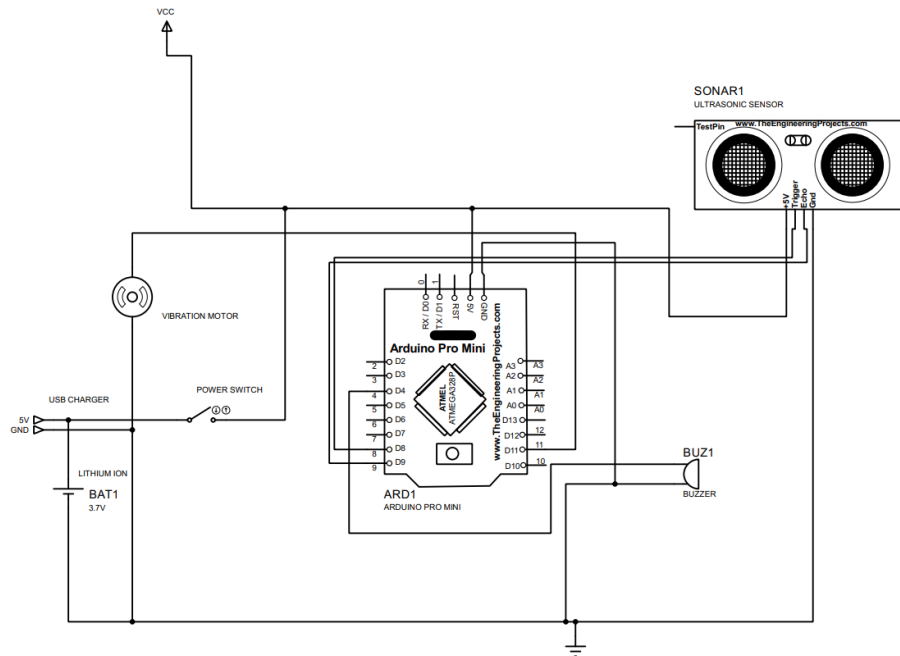


Figure 3.6: Schematic diagram 2

3.6 Components used

Hardware Products that are used consists of Arduino pro mini, ultrasonic sensor, buzzer, vibrating motor.



Figure 3.7: Arduino pro mini

The Arduino Pro Mini is a microcontroller board based on the ATmega328P.

It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, an on-board resonator, a reset button, and holes for mounting pin headers. A six-pin header can be connected to an FTDI cable or Sparkfun breakout board to provide USB power and communication to the board.



Figure 3.8: Ultrasonic sensor

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves and converts the reflected sound into an electrical signal.



Figure 3.9: Buzzer

The buzzer is a sounding device that can convert audio signals into sound signals. It is usually powered by DC voltage. It is mainly divided into piezoelectric buzzer and electromagnetic buzzer, represented by the letter "H" or "HA" in the circuit.



Figure 3.10: Vibration motor

Vibration motor is a coreless DC motor, and the size of this motor is compact. The main purpose of this motor is to alert the user from receiving the call by without sound/vibrating. The main feature of this motor is, it has magnetic properties, lightweight, and motor size is small.



Figure 3.11: Rechargeable battery

A rechargeable battery is a battery that can be recharged and used many times over. It is otherwise known as a storage battery because it is able to accumulate and store energy which then becomes available to the user when he puts the battery to use. A rechargeable battery is sometimes referred to as a secondary cell as well, which is opposed to the non-rechargeable variety which is a primary cell.

3.7 Project development

All the components are electrically connected with wires by soldering.

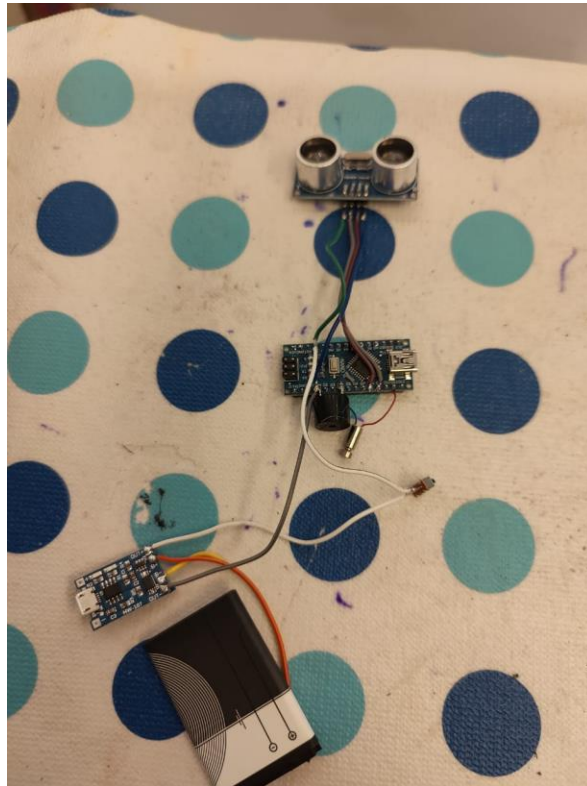


Figure 3.12: Circuit connection of project

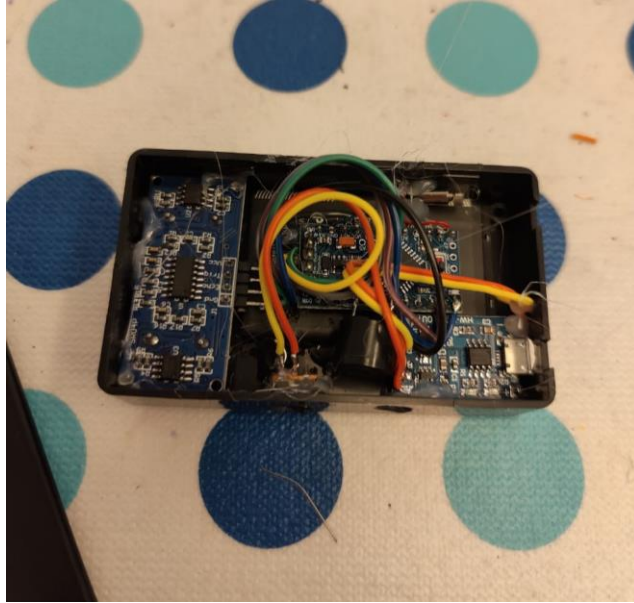


Figure 3.13: Circuit fit into casing



Figure 3.14: Final product

Chapter 4

Result, Analysis and Discussion

4.1 Introduction

In this chapter the results of the study are presented and discussed with reference to result, need analysis and discussion.

4.2 Result

The 'Third eye for blind project' is a device that help blind people to overcome the problems they face in their daily life due to their disability in vision. This device uses ultrasonic sensor to detect the obstacles and will alert the user with buzzer and vibrating motor. With the ultrasonic sensor and two alerting system, this device secures the safety and efficiency of blind people even without the help of others or other equipment such as blind stick. This is a new technology that all blind people can rely on .

Besides that, this is the first wearable technology for blind people which resolves all the problems of existing technologies. Now a days there are so many instruments and smart devices for visually impaired peoples for navigation but most of them have certain problems for carrying and the major drawbacks is those need a lot of training to use. The one of the main peculiarities of this innovation is, it is affordable for everyone, the total cost being less than RM200. There are no such devices available in the market that can be worn like a cloth and having such a low cost and simplicity. When used on a large scale, with improvements in the prototype, it will drastically benefit the community.

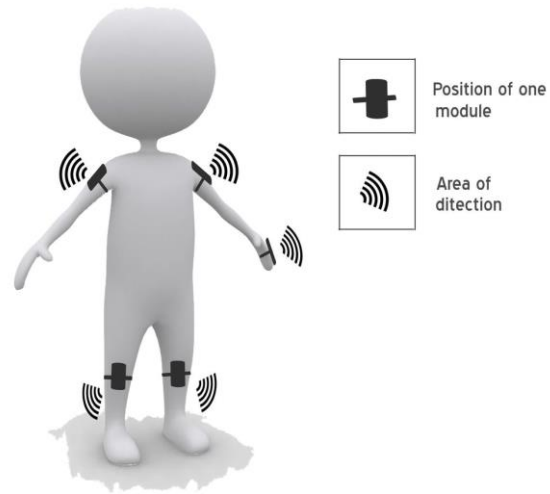


Figure 4.1 : Result

4.3 Cost of Project

Items	Quantity	Price
Arduino pro mini	2	RM60.00
Ultrasonic sensor	2	RM8.00
Perfboard	1	RM3.00
Vibrating motor	2	RM10.00
Buzzers	2	RM6.00
Red LEDs	2	RM2.00
Switches	2	RM2.00
Male header pins	2	RM2.00
Female header pins	2	RM2.00
Jumper wire	2	RM6.00
Power bank	1	RM10.00
LiPo battery	1	RM15.00
Elastic band	2	RM10.00
		Total = RM136.00

Table 4.1 Cost of project

4.4 Analysis

Globally, at least 2.2 billion people have a near or distance vision impairment. In at least 1 billion – or almost half – of these cases, vision impairment could have been prevented or has yet to be addressed. The leading causes of vision impairment and blindness are uncorrected refractive errors and cataracts. The majority of people with vision impairment and blindness are over the age of 50 years; however, vision loss can affect people of all ages. Vision impairment poses an enormous global financial burden with the annual global costs of productivity losses associated with vision impairment from uncorrected myopia and presbyopia alone estimated to be US\$ 244 billion and US\$ 25.4 billion.

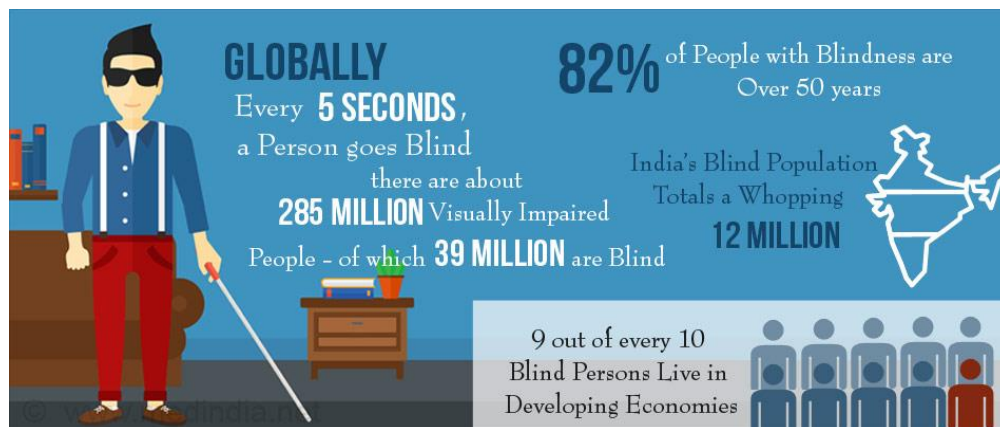
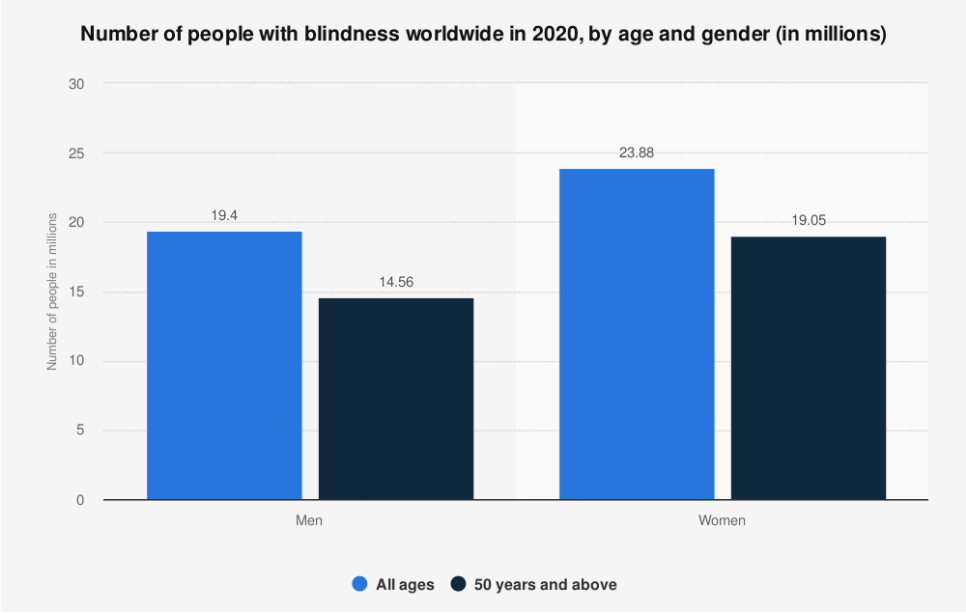


Figure 4.2: Need analysis



Graph 4.1 Number of blind worldwide

4.5 Discussion

In this system we are developing the navigation system for the blind persons. This is very easy to use and work as a navigator to the blind people to easily navigate. In this system the ultrasonic or sensor will detect the object and gives sound (object 'beep sound') and camera scan the object using object detection technique and predict the object and by using speech recognize the object name is convert into sound and client can know the object by the help of headset. The object and person name and data are store in the module and if the data is not present it will simply said no data image present give a beep sound. In this system we are using some hardware and software components which are following Also we add some extra feature like distance measurement technique to identify how far the distance between the object and the client and voice assistant for various extra features.

Function of project

- Alert blind people with sound and vibration when obstacles detected
- Made wearable for convenience
- Lower the cost to make it affordable for everyone

Features

- Uses ultrasonic sensor to detect obstacles
- Alert user with buzzer and vibrating motor
- Wearable
- Very small and light
- Portable

Parameter

- Arduino pro mini
- Ultrasonic sensor
- Power supply: 5V
- Material: Elastic band

4.6 Working principle

This proposed system consists of the equipment like Arduino UNO, ultrasonic sensor, bread board, buzzers for detecting the obstacles and letting the user know about the obstacle, Red LEDs, Switches, Jumper cable, power bank, Male and female header pins, some elastic and stickers to make the device wearable as a band for wearing for the users. The wiring of the device is done in a following manner. The Ground of LED, buzzer are connected to GND of the Arduino. The +ve of the LED and the middle leg of switch is connected to the Arduino pin 5. The +ve of the Buzzer is wired to the first leg of the switch.

The Ultrasonic sensor is wired accordingly. The Ultrasonic sensor pin VCC is connected to the Arduino pin VCC, Ultrasonic sensor pin GND is connected to the Arduino pin GND, Ultrasonic sensor pin Trig is attached to the Arduino pin 7, Ultrasonic sensor pin Echo is connected to the Arduino PIN 6. The switch used here is for selecting the mode. (Buzzer should need or not). At the end, after all the connections are done to the Arduino board upload the code to arduino board and power the other modules using a power bank or the power supply.

The Ultrasonic sensor here used as a transceiver. The ultrasonic waves are emitted by the transmitter when the objects are detected. Both the transmitter and receiver re resent inside the ultrasonic sensor. We calculate the time interval between the transmitted and received signal. The distance between the object and sensor is calculated using this.

When we increase the distance between the object and the sensor the coverage angle will decrease. Sensor has coverage of 60 degree. Thus, the objective is to cover a wide angle to detect the obstacles with the help of the ultrasonic sensors to help the blind and make it easy for them to move around easily without any hassle. Hence, the distance calculation is calculated and the sensor detects and the further procedure of the buzzing sound to the user is carried out.

Thus, this way Third Eye for Blind will be designed for the visually impaired people and will make it very easy and convenient as it will be a wearable device and thus will help the user in travelling and detecting the obstacles while walking very easy.

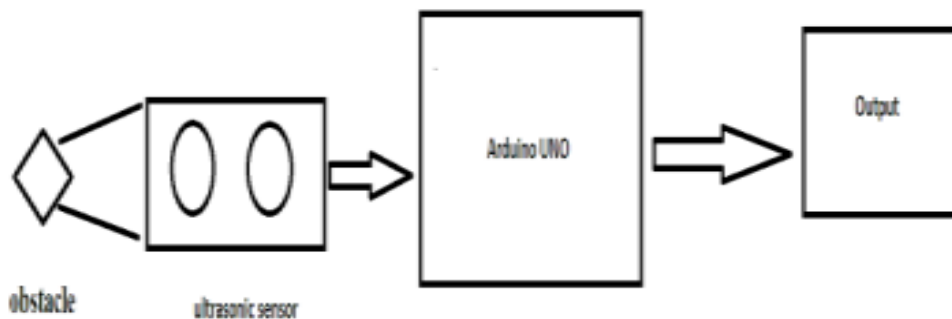


Figure 4.3: System module

4.7 Feasibility

a) Technical resources

From the courses that I have taken so far, such as Electrical Circuit, Electronic Equipment Repair, Electronic Computer Aided Design and Embedded System Application, I have developed some technical skills and knowledge that is needed to do this project. I know how to use the tools and commands of proteus software to draw the circuit diagram and PCD layout for my project. Besides that, I also have skills on using Arduino software to do programming and coding for my project. Figure 2 and Figure 3 below is the circuit diagram and PCD layout that I have completed drawing using proteus software. Moreover, The aim of this project is to help blind people to be able to find their way wherever they are even if they can't see without have to pay much and just need a little training for them to use this technology, it is easy to use and cheap.

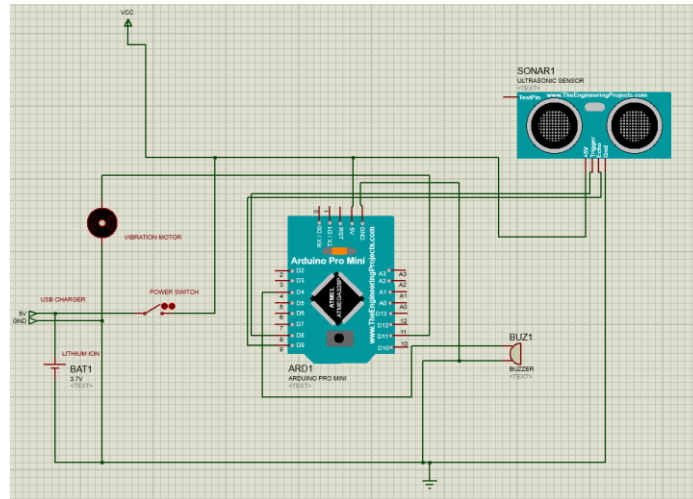


Figure 4.4: Proteus schematic diagram 1

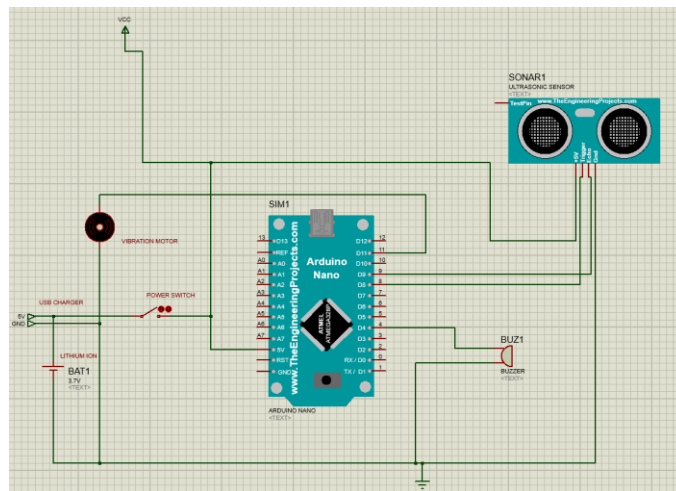


Figure 4.5: Proteus schematic diagram 2

b) Finance resources

All the materials needed for this project is easy to get through buying online or buying at a hardware shop. I have already purchased them and ready to start doing the project. The market for the blind is still small and by far there are still no products for the blind that is made common, I believe my project have a very high chance of success in helping the future of blind.

Chapter 5

Conclusion and Recommendation

5.1 Introduction

At this chapter, the conclusion was divided to three subversion which is summary to discuss overall achievement of project, recommendation of the future project and commercialization potential.

5.2 Conclusion

In today's world, disability of any kind for any person can be hard and it is the same case with blindness. Blind people are generally left underprivileged. It is very difficult to give a vision to a blind person. A major problem in blind people life is that they have to face many physical issues when they are at a place they have never been to or not used to. Their freedom are kind of restricted by physical things. And for that reason, this 'Third eye for blind' is here to hopefully allow blind people to experience a better life, this device can act as their eye and can navigate around places.

In conclusion, the 'Third eye for blind' is a wearable device that detects obstacle using ultrasonic sensor and alert user with buzzer (sound), vibrating motor (vibration) and led light. Besides that, this device is also better than any other existing systems that the blind people are using such as blind stick and pet dog. It is better in terms of adaptability of user, price, and efficiency. I believe that the 'Third eye for blind' technology will give the unfortunate blind people and people who has vision issues all around the world a better future and discover hope in life.

Although this device are trying to reduce the relying of blind people on those who are healthy and has no disabilities. It doesn't mean that the interaction between us will become less, but it actually strengthens the bond between us. Because with the device to help solving the physical obstacles and barriers of them, we can tell them more about what we see, and we have the obligation to tell them what they cannot see, for example the colour, the view, and the beauty of what we see, living or non-living things such as animals, landscape, nature and city. As person who has no disabilities and healthy, we must appreciate what we have and try to help those who are unfortunate and are born with disabilities. As human we must always help each other and bring joy to the whole world, to make this world a better place.

5.3 Recommendation

The objective of this project is Third Eye for the Blind is to design a product which is very much useful to those people who are visually impaired and those who often have to rely on others. The third eye for Blind project is an innovation which helps the blind person to move around and go from one place to another with speed and confidence by knowing the nearby obstacles using the help of the wearable band which produces the ultrasonic waves which notify them with buzz sound or vibrations. It allows the user those who are visually impaired to walk freely by detecting the obstacles. They only need to wear this device as a band or cloth on their body.

Thus, this project Arduino based obstacle detector for blind people is a new method to resolve their problems. A less complex portable, cost efficient, easy to manage an effective system with many more amazing properties and advantages are proposed to provide support for the blind. The system will be very easy to find the distance between the objects and the sensor. It can detect the objects in every directions to the blind person. Without the help of others the blind person can move from one place to other and lead their regular lives independently.

5.4 Technology transfer process

The term “technology transfer” is used to describe the process by which ideas and concepts are moved from the laboratory to the marketplace. Some authors have attempted a broader definition where they find that technology transfer is the movement of knowledge, skill, organization, values and capital from the point of generation to the site of adaptation and application.

One of the definitions that the authors consider as the most suitable for the concept of technology transfer is formulated by Association of University Technology Managers : “technology transfer is the process of designating the formal transfer to industry of discoveries resulting from university or private research, for marketing purposes under the form of new products and/or services”.

Technology transfer offices (TTOs) are essentially institutions that bridges Academia with the Industry. To improve university and commercial ties with industry, many universities operate a TTO as a vehicle to support the creation of spin-off companies. Run effectively, the TTO can define roles and responsibilities, structures and processes that support the creation and development of new ventures. The challenge for universities is to create a TTO with the right skill set.

The success of a TTO usually depends on a series of factors, of which the most important one is the involvement of academic researchers.

For this reason, it is important to emphasize that technology transfer is a process, a series of milestones to be checked in order to transfer research into commercially viable products, regardless of the industry. In this process, the researcher has a key role, working with the TTO in a structured manner, within an ecosystem that bridges research, innovation and business efforts. A TTO thus offers such a liaison that helps companies and industrial partners to better cooperate with universities in order to access new knowledge and expertise to drive innovation through research collaboration, contracted services and consultancy, to identify and license new technologies and intellectual property (IP) relevant to their business.

Center for Disease Control (CDC), for example, identifies seven steps that ascend to the transfer goals of a TTO, as shown in Figure 5.1: Technology Transfer Process



Figure 5.1 : Technology Transfer Process

1. In the invention stage, the product or service is yet in a raw form, far from becoming a commercial product. The TTO can actively engage in this stage, providing guidance to the potential applicability of the emerging technology.

2. The invention disclosure stage, the inventor closely cooperates with the TTO at an instrumental level. Here, the TTO can help with developing the invention report, which serves as an initial documentation of the invention, in order to protect the patentability of the invention.

3. During the assessment stage, the TTO discusses with the scientist in order to determine the marketability and patentability of the technology (evaluating its market potential). The activities most commonly used in this stage by the TTO specialist is the analysis of the technology and the technical details, searching patent databases and drafting a report completing the one elaborated by the researcher.

4. Protection refers to the patent application process. This is a usually long process, lasting around three years, during which the primary role is assigned to the TTO. If the product is indeed marketable, its protection allows inventors and commercial partners to recover financial investments made to commercialize the product.

5. Marketing. In this phase, the TTO drafts short non-confidential summaries for the technology that is available for licensing. Essentially, the TTO works with the inventor in order to identify potential commercial partners and potentially unmet markets.

6. As far as licensing is concerned, the TTO helps the inventor with the whole process, negotiates the licensing, responsibility, rights and terms and conditions. During this stage, the TTO negotiates the contract with the commercial partners.

7. Financial return. Efforts are made to ensure the post-license compliance. It is imperative that the TTO keeps track of the agreed upon technological developments, payment of royalties and compliance with the provisions of the agreement.

5.5 Commercialization Potential

Commercial potential is the opportunity of commercialization of the candidate technology. Every new technology to reach market needs to thrive and prosper in a continuously changing and unpredictable business environment. Determination of commercial potential of a technology is a necessary prerequisite element for defining successful commercialization strategies. Commercial potential can be determined by various methods.

Commercialization is the process of moving a technology or innovative concept from the idea stage to the marketplace. In other words; technology commercialization commonly define as the process of creating a product that is suitable for a particular market at an affordable price that fulfills the demand of the market. But more useful definition with the most coverage on our target in this article is “the process for commercialization of technology from R&D sector and laboratories to industrial companies” that is more common between experts. So emphasize in this article is on the process from “laboratories to industry” or “laboratories to market “ (8; Balachandra et al. 1997; Logar et al. 200; Ghazinoori, 2005).

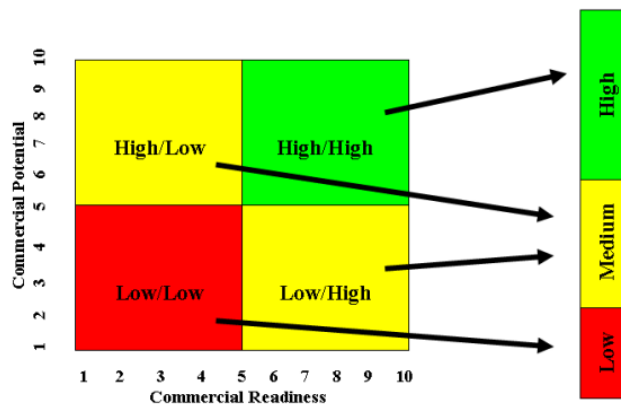


Figure 5.2: Commercialization Assessment Index

In this model the overall likelihood of a successful commercialization (i.e. commercial potential) is determined on a scale of 1 (low) to 10 (high). The likely time frame (commercial readiness) for this happening is also estimated on a scale of 1 (relatively long term, i.e. 5+ years) to 10 (short-term, i.e. a year or less).

As this approach illustrates an overall rating can be developed by combining these two factors. One way to determine the commercial potential is to evaluate strengths and weaknesses of "commercializable assets", as well as opportunities and constraints related to commercial utilization of these assets.

The commercialization potentials of Third Eye for Blind are:

- Portable
- Rechargeable
- Affordable
- Wearable

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APPENDIX

(Survey Question)

Survey of ‘Third eye for blind’ project

‘Third eye for the blind’ is a wearable innovation which helps the blind people to navigate with speed and confidence by detecting the nearby obstacles using the help of ultrasonic waves and notify them with a buzzer sound or vibration.

The objective of this survey is to collect feedback for the need of innovative assistive tools used for blind. Your cooperation is very much appreciated. Thank you for your time.

For each item, please tick (✓) the appropriate scale that represents your opinion:

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	‘Third eye for blind’ is comfortable and easy to use					
2.	‘Third eye for blind’ helps blind navigate with confidence					
3.	‘Third eye for blind’ is portable					
4.	Vibration produced by ‘Third eye for blind’ is moderate and user can feel it					
5.	Sound produced by ‘Third eye for blind’ is moderate and able to hear it clearly					

6.	Ultrasonic sensor of 'Third eye for blind' is sensitive					
7.	User is able to react to the alert (vibration and sound) produced by 'Third eye for blind' as soon as it happens					
8.	'Third eye for blind' can help visually impaired (blind) people to estimate the position of obstacles around					
9.	Willing to use 'Third eye for blind' in public area with strangers around					
10.	'Third eye for blind' does not interrupt others if used in public area					

Comment / Suggestion / Opinion:

NAME:

POSITION:

OCCUPATION: