POLITEKNIK MALAYSIA

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Department of Mechanical Engineering

THIRD EYE FOR BLIND

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JABATAN KEJURUTERAAN MEKANIKAL

SESI 1 : 2022/2023

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This report is submitted to the Department of Mechanical Engineering in partial fulfilment of the requirements for Diploma in Mechanical Engineerig

JABATAN KEJURUTERAAN MEKANIKAL

SESI 1 : 2022/2023

DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE: Third Eye for Blind

1. We, 1. Wong Yi Wen (08DKM20F1060)
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   3. Tan Yee Hong (08DKM20F1080)

   are a final year students of **Diploma in Mechanical Engineering, Department of Mechanical Engineering, Politeknik Sultan Salahuddin Abdul Aziz Shah**, which is located at Persiaran Usahawan, 40150 Shah Alam, Selangor.

2. We recognize that the 'project on' and intellectual property contained in it is the work / design our original without taking or imitate any intellectual property rights of other parties.

3. We agreed to relinquish ownership of intellectual property 'project' to 'Polytechnic' to meet the needs of the award of Diploma in Mechanical Engineering to us.

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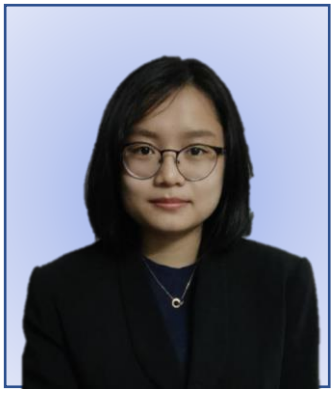

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ABSTRACT

The Third Eye for Blind (TEFB) prototype is an innovation created to help the community with vision impairment. The TEFB produced can help the blind community access obstacles at the top of the face level by warning through a buzzer beep signal by detecting a distance of 1 m. Nowadays, especially in Malaysia, the use of a white stick only focuses on obstacles below waist level and the distance according to the length of the stick only. Therefore, TEFB's innovation was specifically developed as an additional tool for the white cane to help the movement of the blind community become easier, smoother and safer. The device consists of a 3D printed frame and is equipped with an obstacle detection and warning system. When the ultrasonic sensor is activated, it can detect obstacles in front within a distance of 1m, then the signal will be received by the Arduino Nano board and then the process of sending the signal directly to the buzzer. The buzzer will produce a beeping sound to alert the user. While the safety feature matched with TEFB is to use a frame sticker that reacts to light, especially when used at night to help people around realize the existence of blind people. In general, this innovation can change the way of life of blind people in living life together with normal people comfortably with smooth movement around. In the future, the use of batteries and sensors will be replaced by smaller and lighter sizes.

Keywords: Third eye for blinds, motion detect, vison impairment

ABSTRAK

Prototaip Third Eye for Blind (TEFB) merupakan satu inovasi yang direkacipta bagi membantu golongan komuniti yang mengalami masalah cacat penglihatan. TEFB yang dihasilkan dapat membantu komuniti buta mengakses halangan di bahagian atas paras muka dengan memberi amaran melalui isyarat bunyi bip buzzer dengan mengesan jarak sejauh 1 m. Pada masa kini terutama di Malaysia, penggunaan tongkat putih hanya memfokuskan halangan di bawah paras pinggang dan jarak mengikut panjang tongkat sahaja. Oleh itu , inovasi TEFB khususnya dibangunkan sebagai alat tambahan bagi tongkat putih bagi membantu pergerakan komuniti orang buta menjadi lebih mudah,lancar dan selamat. Alat ini terdiri daripada bingkai bercetak 3D dan dilengkapi sistem pengesanan halangan dan amaran. Apabila sensor ultrasonic diaktifkan,ianya dapat mengesan halangan di hadapan dalam lingkungan jarak 1m, seterusnya isyarat akan diterima oleh papan arduino nano dan selanjutnya proses penghantaran isyarat terus ke buzzer. Buzzer akan menghasilkan bunyi bipping untuk memberi amaran kepada pengguna. Manakala ciri keselamatan yang dipadankan dengan TEFB ialah menggunakan pelekat bingkai yang memberi tindakbalas cahaya terutama pada penggunaan waktu malam untuk membantu orang sekeliling menyedari kewujudan orang buta. Secara amnya ,inovasi ini dapat mengubah cara hidup orang buta dalam menjalani kehidupan bersama dengan golongan normal secara selesa dengan kelancaran pergerakan disekeliling. Pada masa akan datang, penggunaan bateri dan sensor akan digantikan dengan saiz yang lebih kecil dan ringan.

FIGURE LIST

TABLE LIST

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CHAPTER 1: INTRODUCTION

1.1. Introduction

A person who is blind or visually impaired may frequently use a "long white cane." *Canes have been used as mobility aids by the blind for ages. In 1921, James Biggs, a Bristol photographer who went blind following an accident and was concerned about the quantity of traffic outside his home, painted his walking stick white to make it more noticeable.[1]* A white cane helps its user to scan their surroundings for obstructions or direction markings, but it also assists viewers in recognising the person as blind or visually handicapped and providing proper care. Mobility canes are frequently made of aluminium, graphite-reinforced plastic, or other fibre-reinforced plastic, and can be equipped with a variety of tips based on user desire.

The variants of long canes available on the market are Long Cane, Guide Cane, Identification cane, Support Cane, Kiddie Cane, and Green Cane. Long Cane is designed primarily as a mobility aid for detecting items in a user's route. The length of a cane is determined by the user's height and is typically measured from the floor to the user's sternum. It is the most well-known variety, while some organisations choose to utilise canes that are significantly longer. Guide cane is a shorter cane, often stretching from the floor to the user's waist, with less motion possibilities. It is used to detect kerbs and stairs. The guide cane can also be used diagonally across the body for protection, alerting the user to impending difficulties.

However, the existing cane or walking stick only allows the user to examine their environment for obstacles or directional markers. The user cannot detect the obstacles that is around their eyes' level and obstacles above their lower body. By research that had been done and survey that had been conducted we have an idea of producing a spectacle to help the visually impaired community to detect obstacle at their eyes' level. This innovation is suitable for user with different height range because there is no height limit for our innovation. The innovation includes a 3D-printed comfort glass, two ultrasonic sensors, two buzzers, battery, and an Arduino

Nano board. These sensors have been extensively examined and shown to be the most effective approach to detect obstacle at height and distance. A buzzer is also employed in this innovation to notify the surrounding people about the visually impaired person and to make them visible to everyone who is close, as well as to raise public awareness about their safety and the ability to offer proper care to this visually impaired person. Most importantly buzzer will produce sound according to the signal send out by the Arduino Nano board to notify the users there are obstacle in-front of them allowing them to take safety precautions. A LED light is also employed in this innovation to make this spectacle visible to passers-by especially the drivers at night.

1.2. Background Research

According to current research, visually impaired persons have a tough time recognising the smallest features with healthy eyes. A spectacle with sensor is a gadget that allows vision impaired people to walk and do their daily routine more effortlessly. It also serves as a guide for visually impaired people as a tool for spotting obstructions in their path at their eyes' level. *Aside from that some glasses can even function as simple augmented reality gadgets, projecting a computer screen into your peripheral vision.*[2]

The project's goal is to aid visually impaired persons in moving and walking about more simply and correctly by identifying impediments in front of their eyes' level. This is because the current Smart Glass on market only allows the mild or moderate visually impairment communities to recognise the surroundings not included the totally blind communities. And the smart glass on market do not alert the user when obstruction is detected.

1.3. Problem Statement

1. No suitable tool or means for the blind and person with vision impaired to recognize the obstruction in front of their eye level.
2. Blind and visually impaired person cannot be seen by the driver or other road user during night-time.
3. Difficulty in adapting a new environment due to lack of method of obstacle detection.

1.4. Objectives

Objective of our project are to: -

1. To design a spectacle that able to detect the obstacles on the eye level of the blind and visually impaired person and analyse the impact Smart spectacle among the blind and visually impaired society.
2. To develop a system that can identify indoor and outdoor obstruction and notify the users.
3. To test the durability and effectiveness of the innovation to the visually impaired community.

1.5. Scope & Limitation

"Third Eye for Blind" has been developed to reduce the risk of accidents happening among the visually impaired community. The scope in designing and developing the Third Eye for ds: -

1. Allow the blind and visually impaired people to detect obstruction within their eye level.
2. Obstruction detection within the range of 2-100cm only.
3. The innovation is a rechargeable device.

1.6. Importance of Research

This innovation “Third Eye for Blind” offers satisfying outcomes in decreasing the probability of accident happened among visually impaired community. Aside from that, it is also help visually impaired people to do their daily work more confident and comfortable without guidance. With the innovation of Third Eye for Blinds, it allows the visually impaired community be more confident and easier to enjoy public amenities and improve their knowledge about public utilities. In addition, it helps visually impaired communities and their family reduce their concern and helps improve their confidence in giving visually impaired communities to work or actioning alone.

1.7. Summary of Chapter

With the Smart Blind Stick, visually impaired people can keep themselves safer. Therefore, in chapter 2 there will be a study and examine of this issue more closely. Chapter 2 is a previous study that must investigate to ensure this study is accomplished.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the literature reviews that tailor the material to the project's objectives. The following information and other features were acquired.

2.2 Research on market

2.2.1. Existing Technology

Age presents a variety of issues, the most frequent of which are visual impairments and blindness. As a result, ageing seniors report more visual issues than anybody else, not only in the United States, but globally. For example, the 2017 NHIS (National Health Interview Survey) data shown approximately 10% of all individuals in America (approximately 26.9 million) suffer blindness or difficulty seeing despite wearing glasses or contact lenses. However, the existing technology only allow to help the community with low vision issue which is mild, serve ,and moderate visually impairment , and it is not suitable for the totally blindness community. *According to the Classification of Diseases 11(2018) classifies vision impairment into certain category. For instance, distance vision impairment mild visually impairment visual is acuity worse than 6/12 to 6/18 , moderate visually impairment is visual acuity worse than 6/18 to 6/60 , severe visually impairment is visual acuity worse than 6/60 to 3/60, fully blindness is visual acuity worse than 3/60.* [3]

The existing technology on the market is capturing the picture and surrounding with a camera on the front of the glasses and shown enlarged inside the lenses. It does not notify and lead the visually impaired person to the correct pathway or either avoid the obstruction. The existing device on market mostly mount or attach with a phone or camera. By using the phone or camera to capture and recognise the objects at the surroundings and magnified it back to the screen for the user. The device offers on market only suitable for poor vision person or mild visual impaired communities. This is because they still have the ability of identifying the object with their eyesight. The device that offers on the market also provide reading features some even able to read different languages. However, the device still cannot help the visually impaired to avoid from hazard.

In the table below we have done some comparison between different smart glasses on the market nowadays.

Table 2.1 Comparison of the Existing Technology on Market

IrisVision 	
Introduction	IrisVision electronic glasses is made for the visually impaired communities are a highly innovative assistive technology solution, which is registered with the FDA as a Class-1 medical device and is redefining the concept of wearable low vision aids. A combination of a Samsung's VR headset and a smartphone.
Features	- Electronic glasses for low vision, where a smartphone mounted VR headset is used to capture the scene offering a magnified view to the user in the lenses. - Offers unmatched assistance in performing a wide range of daily activities ranging from simple tasks like reading a book and watching TV to something as elaborative as painting, knitting, sewing, and seeing the faces of your loved ones. - 'IrisVision Assistant', enable users to enjoy a totally "hands-free" experience by responding to your voice commands for performing your desired actions; for instance, you can ask 'IrisVision Assistant' to "Magnify 10x" and it will provide you with a 10x zoom for an image you want to see.
Price	2950 USD ~ RM 13115.70

<table>
<tr><td colspan="2">Acesight
 
Figure 1 Acesight</td></tr>
<tr><td>Introduction</td><td>Acesight as shown in figure 1 is also one of the latest wearable low vision aids produced by Zoomax, designed to help people with low vision conditions. Based on ‘Augmented Reality’ technology, it offers an HD display floating right before your eyes, thanks to a pair of head-mounted goggles, which are connected to a controller through a wire. Provides up to 15X magnification, while the wired controller allows you to customize the colors and contrast. This electronic eyewear is designed to cater to the needs of people with visual acuity ranging from 20/100 to 20/800, as affected by a host of eye diseases like macular degeneration, glaucoma and diabetic retinopathy.</td></tr>
<tr><td>Features</td><td>- Offers AR integrated (Augmented Reality) open display
- 8 megapixels camera to capture view
- 45-degrees field of view (FOV), more than what many competitors are offering
- Up to 10 color contrast options to adjust to your individual needs</td></tr>
<tr><td>Price</td><td>4995 USD ~ RM 22225.25</td></tr>
<tr><td colspan="2">NuEyes Pro
 
Figure 2.3 NuEyes Pro</td></tr>
</table>

Introduction	NuEyes Pro as shown in figure 2.3 is a head-worn lightweight and wireless pair of smart glasses, which can be controlled either through a wireless handheld controller or a set of voice commands. It is designed to help visually impaired and legally blind see better. Glaucoma, macular degeneration, and diabetic retinopathy are some of the visual conditions NuEyes Pro can help you with. A camera on the front of the glasses captures the image and displays it magnified inside of the lenses. You can get up to 12X magnified images.
Features	- Lightweight head-worn unit mounted with a camera - Adjustable magnification up to 12x - 30-degrees field of view (FOV) - Different color and contrast options - Voice controlled - Wireless - OCR enabled Bar code and QR scanning options
Price	5995 USD ~ RM26674.75

MyEye2

Figure 2.4 MyEye2

Introduction	MyEye2 as shown in figure 2.4 these glasses designed for low vision person to make reading, writing, recognizing faces and various other daily activities easier. A light attachable camera distinguishes it from an ordinary pair of glasses, which is mounted on the frame of the glasses by the side.
Features	- Wireless operations - Can read multiple languages - Efficient colour detection - Automatic page detection enabled - Gesture enabled reading capabilities, requiring simple finger-pointing

Price	3500 USD ~ RM 15573.25
eSight  ***Figure 2.5 eSight***	
Introduction	eSight as shown in figure 2.5, these electronic glasses for low vision are designed to assist people suffering from different types of low vision issues to see better. eSight is a specially designed head-mounted unit, which is connected to a battery through a wire. This can affect your mobility to a certain degree, and you also need to be aware of the charging level of the device's battery.
Features	- 35-degrees field of view (FOV), best serving the visual acuities around 20/200 - Clinical settings can be customized Equipped with OCR (Optical Character Recognition)
Price	5950 USD ~ RM 26474.52

2.2.2. Problems with Normal Smart Glasses on Market

The current market technology captures the image and surroundings using a camera on the front of the glasses and displays them enlarged inside the lenses. It does not alert and guide the visually impaired individual to the proper pathway, nor does it avoid the obstruction. The current market devices typically mount or attach to a phone or camera. By using a phone or camera to record and recognise objects in the environment and magnifying them on the screen for the user. The item is only available on the market for people with low vision or minor visual impairment. This is due to the fact that they can still recognise the object with their eyesight. The devices on the market also include reading features, with some even being able to read multiple languages. However, the technology cannot assist the visually impaired in avoiding hazards.

2.2.3. Typical Solution of Smart Glasses

A few research on the six smart glasses available on market to identify the corresponding method to solve the problems.

First and foremost, research is done on the electronic glass IrisVision. The Co-founder Frank Werblin, Ph.D., designed this glass for his low vision daughter. The devices on the market also include reading features, with some even being able to read multiple languages. However, the technology cannot assist the visually impaired in avoiding hazards. This innovation is a electronic glasses for low vision where a smartphone is mounted with VR headset to capture the surroundings and magnified it and show it to the user by lens. Provides unparalleled support in a wide range of daily activities, from basic things like reading a book and watching TV to more involved activities like painting, crocheting, sewing, and seeing the faces of your loved ones.

Secondly, we have done research on a product named Acesight. Acesight is the most recent advancement in wearable electronic magnifier design, allowing those with low vision to see properly in the distance or up close for the first time! Because of the open design and fast refresh rate of the panels, you can even see while on the go. Acesight offer-degree field of view and 8 megapixels camera to capture view. This electronic eyewear is designed to provide to the needs of low vision community from 20/100 to 20/800.

On the other hand, we have also done a few research on many products on market. For instance, NuEyes Pro, MyEye2, eSight. NuEyes is a lightweight head worn innovation mounted with camera. The glass can support adjustable magnification up to 12 times. Besides MyEyes provides reading, writing, recognizing faces and various daily activities easier. As the other smart glasses on market MyEye2 attach camera on the side of a pair of glass. MyEye2 able to read multiple languages and efficient to colour detection. Thus the eSight share the same characteristics as the other glasses on market.

2.3 Summary of Chapter

This chapter provided an explanation of how the case studies are progressing and why this project was chosen. Many case stories are mentioned and are relevant to our invention, Third eye for blind. Many of the case studies discussed accidents involving visually challenged people and the lack of obstruction detection method at the eye level. As a result, in Chapter 3, there will be an explanation of the project methodology, which is how the project is put together

CHAPTER 3: METHODOLOGY

3.1 Introduction

The purpose of methodology is to create an underlying paradigm that justifies the research used. The research methods apply to certain data collection procedures. This chapter will discuss the study, the respondents, the methods used to collect research data from respondents such as questionnaires, interviews, observations, and so on, as well as how to evaluate the data collected from respondents. As a result, any need to study the process in order to get insights. To meet the needs of scientific, scientific methods, and quality, the methodology also necessitates a systematic process. In this chapter, methodology refers to the procedure for implementing the study or information to fulfil the study's objectives. The research will be more organised and rigorous in every way.

3.2 Fabrication of Third Eye for Blind

3.2.1. Design Flow Chart

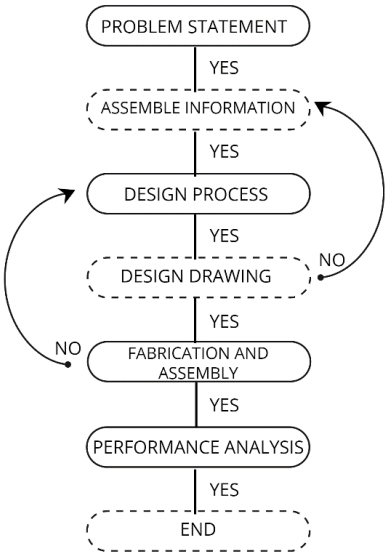


Figure 3.2.1.1 Design Flow chart

I. Identification of Problems

Identify the problem and find solution to solve it. Problem identification is vital in a project production because it will affect the result of innovation. It clearly found out that blind communities in Malaysia still do not have an alternative in identifying the obstruction at their eye level. With the results of survey that have been done at KL Sentral and Bricksfield the place that have high percentage of blind people. Results shows that more than 50% of the respondents have get injured by the obstruction on their eyes' level that cannot be detected.

II. Literature Review

The purpose of the literature review is to gather information and data from previous researchers in order to understand the background and issues of the TEFB. Every problem can be detected and handled at an earlier level of research. As a result, Third Eye for Blind was created. Any issues that have arisen in connection with smart glasses have been merged in an innovative Third Eye for blind project. Third Eye for Blind focuses on vision impaired communities. From the literature review idea of compiling a system of obstruction detection and alert the user have come to the mind.

III. Design Process

In the design process a few research have been done to ensure the design suitable for the innovation because it have to compile two system which is the obstruction detection system and alert system. TEFB is a spectacle must be light weight because it is a spectacle for the user. Material choice is important. At first Arduino Uno Board is use for TEFB first design and after proceeding to details drawing of TEFB. Problem occurs because the size of Arduino Uno is too big. After doing research online again , Arduino Nano board is chosen to be used in TEFB because the size and weight is better compare to the Arduino Uno board. Arduino Nano board is lighter and smaller in size but it has the almost same function as Arduino Uno board. For Arduino Nano board can be used to

control simple buzzer buzzling projects to the complicated project such as IOT application. It controlled by ATMEGA328 chip. Both Arduino Nano and Uno board have 14 digital I/O pins and power pins 5V,3.3V, GND and Vin pins. The Table below shows the comparison between Arduino Nano
Board and Arduino Uno board.

Table 3.2.1 Comparison of Arduino Nano and Arduino Uno board

Properties	Arduino Nano	Arduino Uno
Pinout	8 analog pins	6 analog pins
USB port	Micro-USB port	A/B USB connector
Power consumption	19mA	20mA
Dimensions	45mm×18mm	68.6mm×53.4mm
Weight	7 grams	25 grams
Processor	ATMEGA328	ATMEGA328P (lower power consumption)

IV. Details Design

Details design is done using inventor application using measurement in (mm) and drawing is produced for documentation purpose. Details design is needed because in the process of fabrication we can refer to the design to prevent mistake. To fulfil the needs and ensure comfort to the user, ergonomic design have been done. For 3D printed frame the 3D printing has become a trend among the design of glass. 3D printed glasses can be customed made according to the needs of user. 3D printed glass frame is more comfortable compared to the readymade frame. Besides, it provides more possibilities on the design it also reduces the material used to produce the frame. The frame plays an important role in this innovation because it different from the normal glasses. Our innovation has a certain weight due to the battery and other components. So, the sustainability of the frame is vital here because it takes the widest surface and area of contact between the front and the

face is located. *The bridge design should allow for a comfortable and supportive fit that keeps the lenses over your eyes with a natural gaze. [4]*

d)

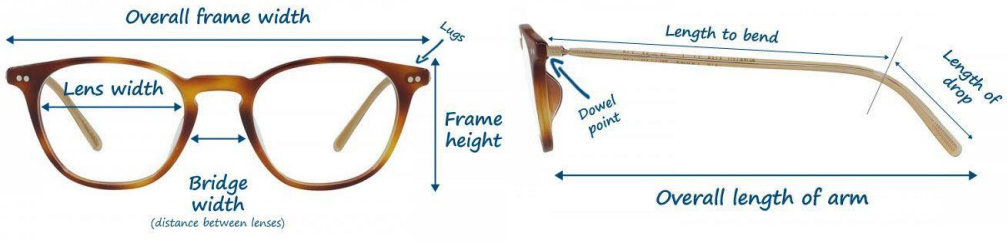


Figure3.2.1.2 The measurement of spectacle size

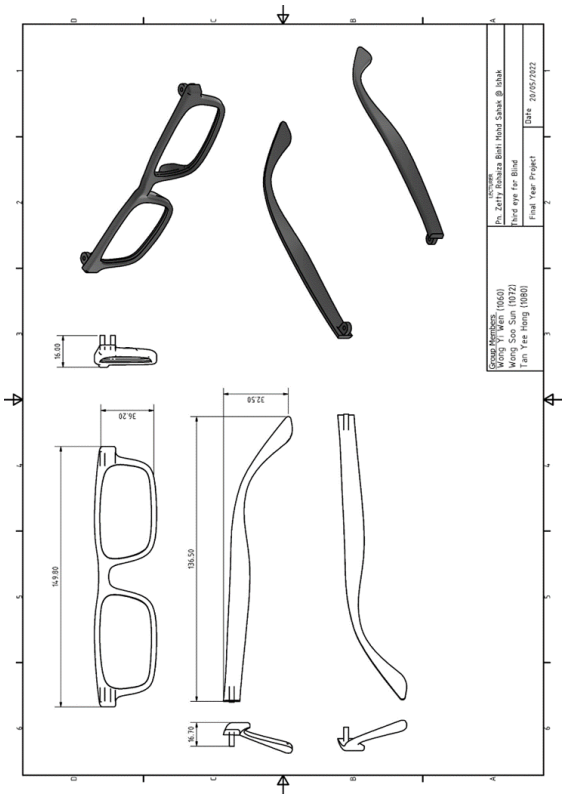


Figure 3.2.1.3 Detail drawing of 3D printed spectacle frame

V. Equipment

Equipment needed is used to assembly the 3D printed part together. Firstly, is a 3D printer and secondly is hot glue gun as a connection agent. FDM 3D printer is used in this project. The most often used technology is FDM. It is a dependable, user-friendly, and cost-effective process of forming layers that attach to one another to form an item. The computer file (often a.STL or.OBJ) contains all of the information required by the 3D printer to begin printing. The layers, however, must be formed with substance. This material is referred to as filament in FDM printers. FDM printers are capable of printing a wide range of (strong) plastic-like materials. A wire is used to inject this filament. The 3D printer warms the material, causing it to become semi-liquid. The substance is subsequently extruded back and forth via the nozzle. The following layer is placed on top of the preceding layer until the 3D item is finished.

Figure 3.2.1.3 FDM printing machine

VI. Selection Of Material

In the selection of material, we have chosen Polylactic acid (PLA) because it has low thermal expansion, high strength, smokeless characteristics, easy to print, low melting point and cheap. PLA is a eco-friendly material and recyclable and the price is cheap. Besides PLA also the best material to be print in FDM printer.

VII. Cost Of Production

Cost of the production have been controlled to not to exceed RM200 and compare the price of material before purchasing the material.

VIII. Fabrication of Project

Fabrication of project is done in the workshop by using 3D printer. The design in Inventor software is converted into STL file and setup the setting of printing. The total time of printing of the project is approximately 5 hours and the printing is done separately due to the size of box and spectacle. After the frame is printed out finishing is done by using sandpaper to ensure no sharp edge brings by the extra filaments of printing. Then the frame compartment is connected together with screw and glue. After that programming is done for the ultrasonic sensor, buzzers, and Arduino Nano board. The effectiveness of the system is tested before attach to the frame. After confirming the system can work well the Arduino system is then attach to the main frame. The Ultrasonic sensor is attached to the lens, while the battery, buzzer and Arduino nano board is attached at the arm of the frame with a customized 3D printed box. After all, the components is attached the prototype is tested again for the effectiveness.

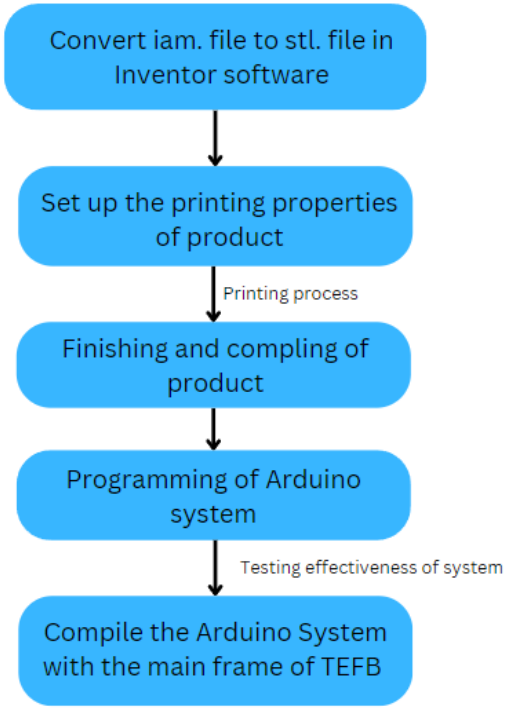


Figure 3.2.1.4 Flow chart of Fabrication process

IX. Prototype Testing

Prototype testing is done at Pertubuhan Pembangunan Orang Buta Malaysia (PPOBM). The aim of Prototype testing is aim to test the effectiveness of TEFB in the reality. 5 blind people have been invited to join the prototype testing of TEFB. The results of TEF testing is attach in Chapter 4.

3.2.2. Third Eye for Blind Components

I. Arduino Nano Board

Arduino nano board plays as the CPU of the whole system of innovation. The Arduino Nano board is a portal to receive and send out signals. Arduino Nano board is used in this innovation instead of Arduino Uno because the Nano board is smaller in size, simple, and easy to program and because of the size is small so it is suitable to be attached to our product also comfortable for users to wear because it is lightweight. The Arduino Nano is a small, complete, and

breadboard-friendly ATmega328P-based board. It has the same connectivity and specifications as the UNO board but in a smaller form factor. It used the Arduino IDE application for the program. When Arduino Pins are effaced with sensors, they act as Input Pins, but when driving a load, they must be used as Output Pins. The analog pins have a total resolution of 10 bits and measure values ranging from 0 to 5 V.V.

II. Ultrasonic Sensor

Ultrasonic sensor is the receiver also the input signal of the system. The ultrasonic senso will sensor the distance of obstacle away from user and send the data back to Arduino Nano Board. How ultrasonic sensors work Ultrasonic sensors work by producing sound waves at a frequency that humans cannot hear. They then wait for the sound to be reflected back to them, calculating distance based on the time required. This is similar to how radar measures how long a radio signal takes to return after striking with an object. The major function of this sensor is to calculate the distance to an obstruction. This ultrasonic sensor has two knobs. One knob generates a pulse, while the other detects it. This sensor cannot be used at long distances. The detecting angle is less than 15°, and the current required to drive the ultrasonic sensor is less than 2MA. The detection range is 1-100cm.

Figure 3.2.2.1 Arduino Nano Board

Figure 3.2.2.2 Ultrasonic sensor

III. Buzzer

Buzzer is one of the outputs of signal. The buzzer bill starts beeping when it receives signal from the Arduino Nano Board. As this project is designed for the blind people so the output stimulation, we choose buzzer to alert the blind people or visually impair people.

IV. 3D Printed Frame

The frame is designed according to the needs of a adult men which age group is around 15-50. The measurement of the frame and the design of the frame can design according to the needs of user, from the length, width of frame and the colour of the frame can be customised.

Compared to traditional methods like injection molding, 3D printing offers the ultimate in design freedom(flexible). From pared-down minimalism to stunningly distinctive designs, you can create shapes, patterns, textures, and interplays of materials that are otherwise impossible to produce or just too expensive. One of the reason we choose 3D printing because allows for the design and print of more complex designs than traditional manufacturing processes make strong and lightweight parts also cost effective. From that, can able to produce Hight quality product with affordable price. Lastly, why we choose 3d printing it is because its effortless print removal: Some adhesion is vital to the success of your 3D printing project. However, too much can cause problems with the removal of the object. Glass naturally has the ideal surface adhesion for 3D printing, as it holds the item steady during the project, then easily releases it when completed.

V. Power supply

Battery is used in this innovation to act as a power supply for the whole system. Power supply is needed for the Arduino Nano Board to generate signal and send out signal to the output.

Figure 3.2.2.3 Buzzer

Figure 3.2.2.4 Battery

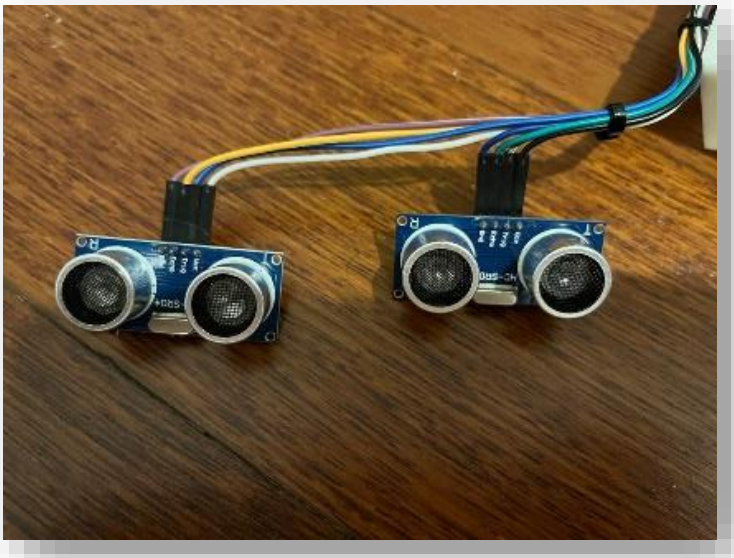


Figure 3.2.2.5 the electronic Components of Third Eye for Blinds

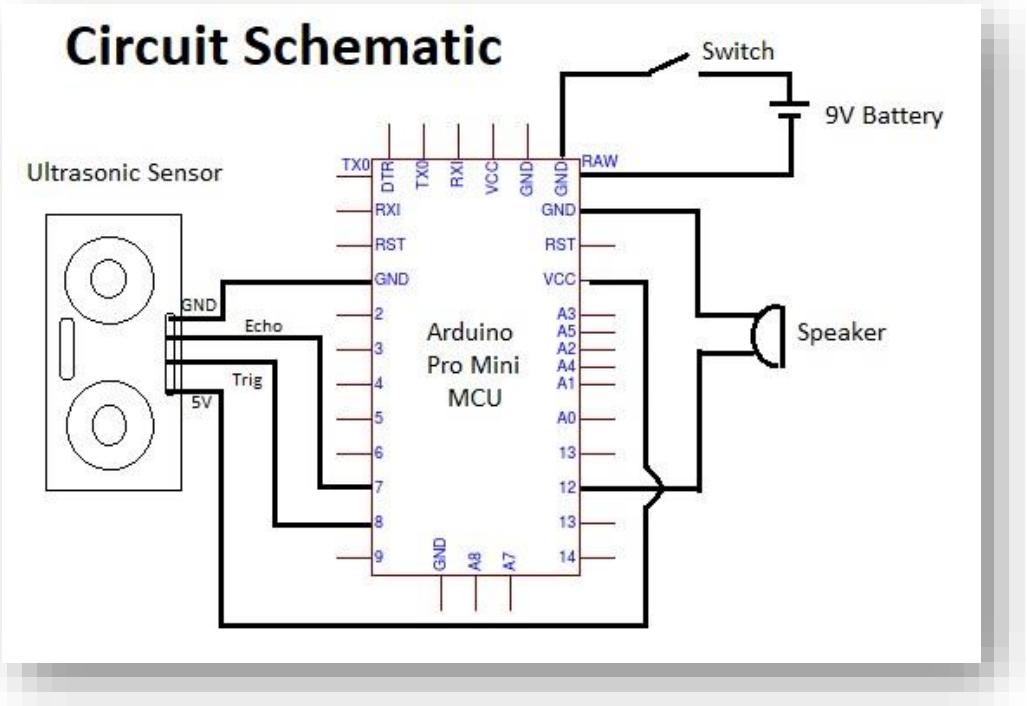


Figure 3.2.2.6 the circuit layout

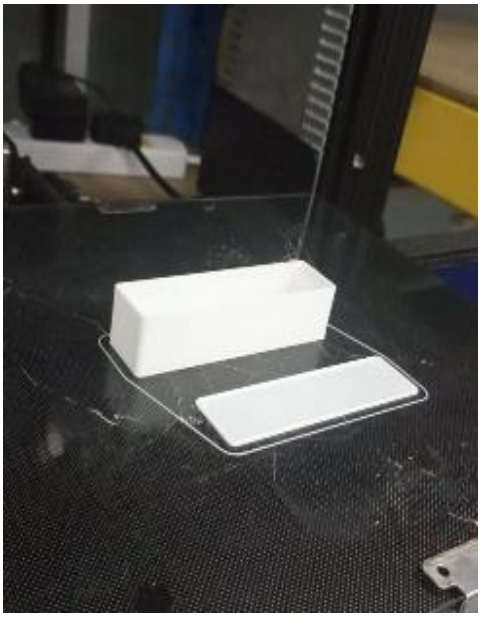


Figure 3.2.2.7 fabrication process 1: 3D printing of frame

Figure 3.2.2.8 Fabrication process 3 : compile all the components

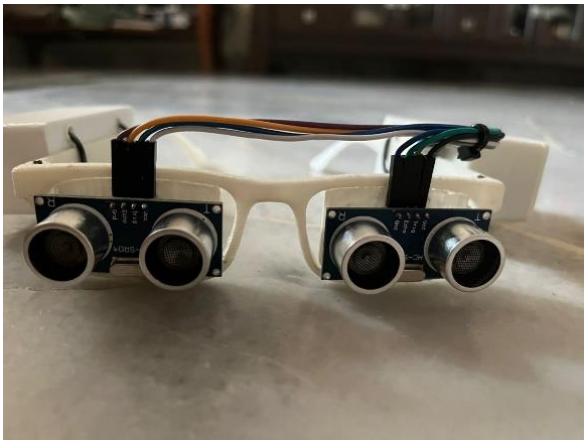


Figure 3.2.2.9 the front view of Third Eye for Blind

Figure 3.2.2.10 the top view of Third Eye for Blind

e)

Figure 3.2.2.11 the side view of Third Eye for Blind

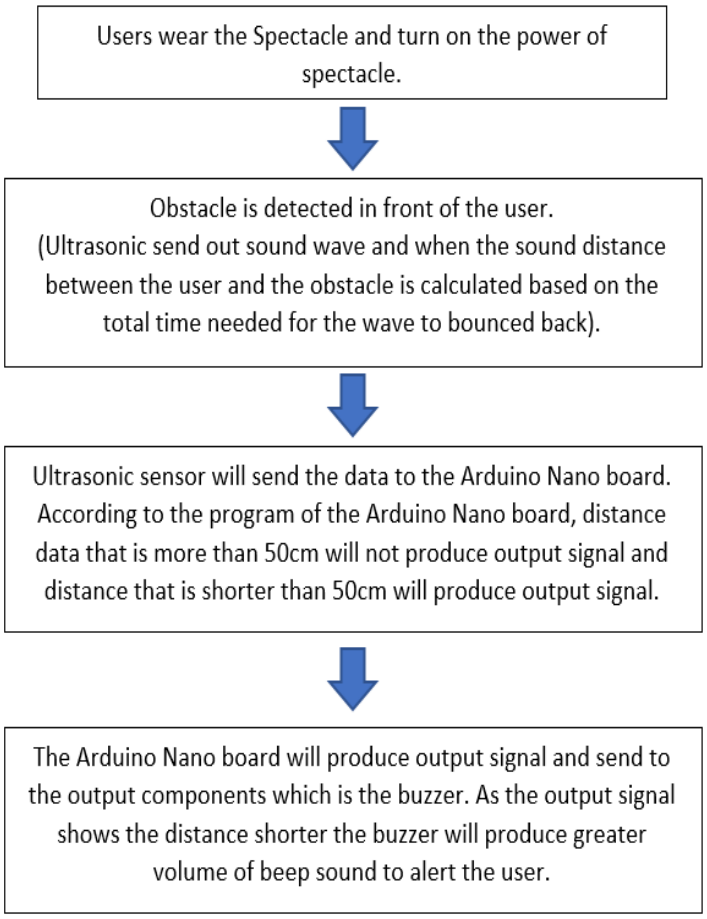


Figure 3.2.2.12 flow chart of working procedure

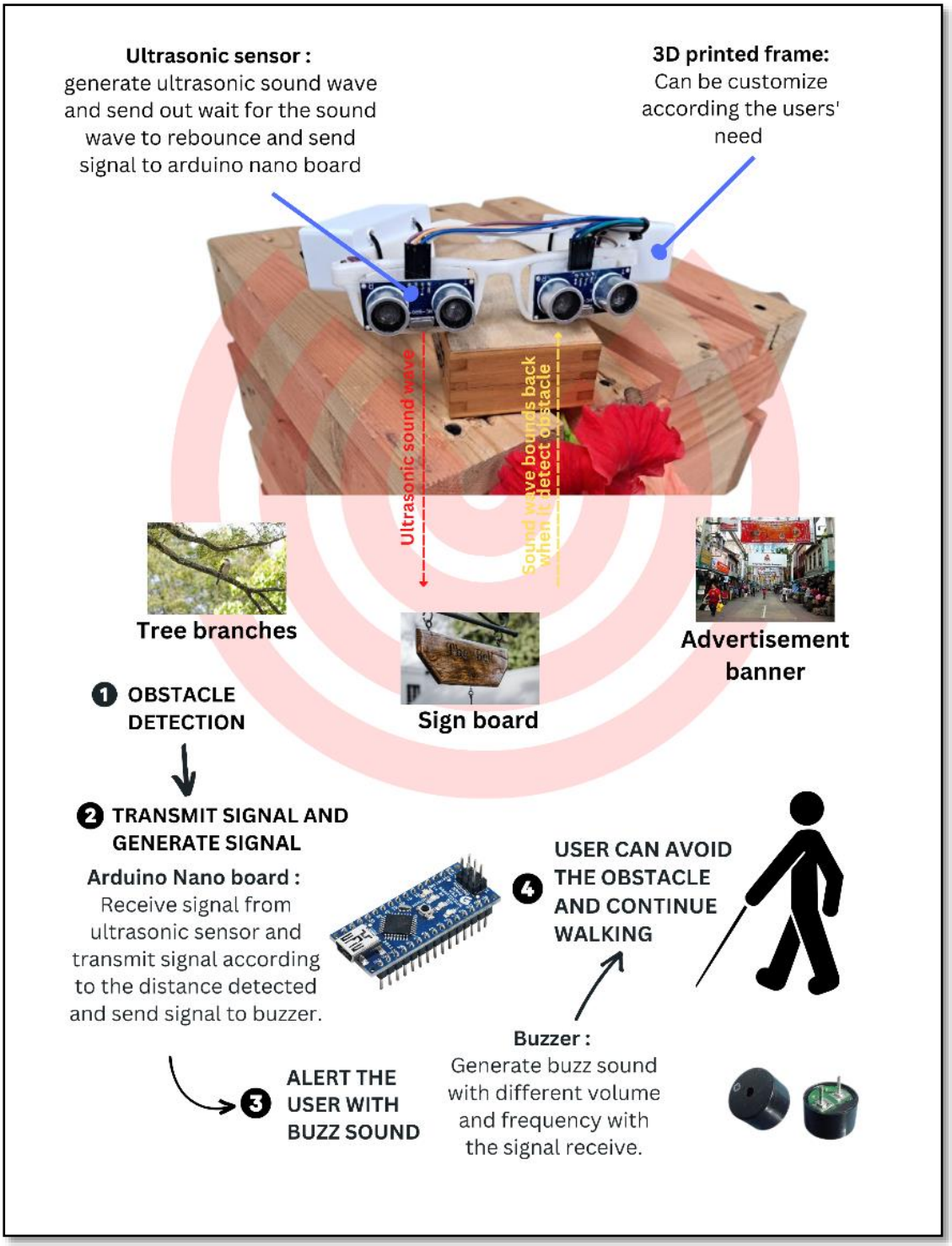


Figure 3.2.2.13 Working Principle of TEFB

The key component of this innovation is the Arduino Nano Board. The Arduino Nano board is also known as a small system for the innovation. As the switch is on the whole system will be activated, power will connect to each and every component. When the ultrasonic sensor detected obstruction like signboard, tree branchers, or pillar the sound

wave will be bounced back. As the distance of obstruction is neared to the ultrasonic sensor time taken for the sound wave to bounce back is shorter so the signal will send to Arduino Nano board, so on the other hand as the time taken is longer means the distance is longer. So, the Arduino Nano board will interpret the data of the range of distance and send out the signal to buzzer according to the range detected. The buzzer was set to emit a long beep sound to warn the visually impaired of the obstruction in front of them.

3.2.3. Coding and Programming

Coding is the process of translating codes from one language to another. It can also be considered a subset of Programming because it implements the first steps of Programming. It entails writing codes in several languages as directed.

The machine cannot communicate with human communications and understands only machine code, sometimes known as binary language. A coder's primary responsibility is to translate requirements into machine-readable language. Coders must be thoroughly familiar with the project's working language. However, they mostly code in accordance with the project's requirements and instructions. This is the first step in creating a software product. Programming is the process of creating a machine-level executable programme that can be executed without mistake. It is the practise of officially writing codes in order to keep human inputs and machine outputs in sync.

The first stage is to create code, which is then analysed and implemented to produce the appropriate machine level output. It also includes all of the key parameters, such as debugging and compilation, as well as testing and implementation. Programmers employ to evaluate and understand the various components of communication in order to generate the correct machine outputs.

The Arduino Integrated Development Environment is used to create Arduino programmes (IDE). The Arduino IDE is a piece of software that runs on your system and allows you to create sketches (Arduino jargon for programmes) for various Arduino boards.

The Arduino programming language is built on processing, a very simple hardware programming language that is akin to the C language. The sketch should be uploaded to the Arduino board for execution after it has been written in the Arduino IDE.

```
int trigpin1 = 8; // Defines Tirg pins of the Ultrasonic Sensor 1
int echopin1 = 7; // Defines Echo pins of the Ultrasonic Sensor 1

int trigpin2 = 10; // Defines Tirg pins of the Ultrasonic Sensor 2
int echopin2 = 9; // Defines Echo pins of the Ultrasonic Sensor 2

int BUZZpin = 3; // Defines BUZZER pins
int Vmotor = 2; // Defines Vibrating motor pins

void setup()
 {
  Serial.begin (9600);
  pinMode(trigpin1,OUTPUT); // Sets the trigPin1 as an Output
  pinMode(echopin1,INPUT);  // Sets the echoPin1 as an Input

  pinMode(trigpin2,OUTPUT); // Sets the trigPin1 as an Output
  pinMode(echopin2,INPUT);  // Sets the echoPin1 as an Input

  pinMode(BUZZpin,OUTPUT); // Sets the BUZZER as an Output
  pinMode(Vmotor,OUTPUT); // Sets the BUZZER as an Output

 }

 void loop()
 {
   // measure distane using ultrasonic sensor 1 and Print sensor deta in serial monitor
   long duration1, distance1;
   digitalWrite(trigpin1,LOW);
```

```
  delayMicroseconds(2);
  digitalWrite(trigpin1,HIGH);
  delayMicroseconds(10);
  digitalWrite(trigpin1,LOW);
  duration1 = pulseIn(echopin1,HIGH);
  distance1 = (duration1/2) / 29.1;
  Serial.print("distance1:");
  Serial.println(distance1); // TO Print sensor deta in serial monitor
 // delay(500); // delay for clearly shown in serial monitor

  // measure distane using ultrasonic sensor 2 and Print sensor deta in serial monitor
  long duration2, distance2;
  digitalWrite(trigpin2,LOW);
  delayMicroseconds(2);
  digitalWrite(trigpin2,HIGH);
  delayMicroseconds(10);
  digitalWrite(trigpin2,LOW);
  duration2 = pulseIn(echopin2,HIGH);
  distance2 = (duration2/2) / 29.1;
  Serial.print("distance2:");
  Serial.println(distance2); // TO Print sensor deta in serial monitor
 // delay(500); // delay for clearly shown in serial monitor

  //if any sensor senses distance less than 80 cm then the buzzer generates sound and the
motor starts vibrating.
  if(distance1 <= 80 || distance2 <= 80 )
  {
    digitalWrite(BUZZpin,HIGH);
    delay(100);
    digitalWrite(BUZZpin,LOW);
    delay(100);
```

```
    digitalWrite(Vmotor,HIGH);
    delay(100);
    digitalWrite(Vmotor,LOW);
    delay(100);
   }

 //if any sensor senses distance less than 40 cm then the buzzer generates sound and the motor starts vibrating faster
   if(distance1 <= 40 || distance2 <= 40 )
   {
    digitalWrite(BUZZpin,HIGH);
    delay(50);
    digitalWrite(BUZZpin,LOW);
    delay(50);
    digitalWrite(Vmotor,HIGH);
    delay(50);
    digitalWrite(Vmotor,LOW);
    delay(50);
   }
  // else the buzzer generates sound after every 3 seconds for indicating the device is on
   else
   {
    digitalWrite(BUZZpin,LOW);
    digitalWrite(Vmotor,LOW);
    }
  }
```

3.3 Summary of chapter

Finally, we have explained briefly in this chapter the block plan and flow chart for coding that we have created for the project. This coding enables the development of the relevant project output level, which includes all critical factors ranging from debugging and encoding to testing and executing.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction

In this chapter it discussed the testing results of the innovation Third Eye for Blinds. This also include the preparation and the execution of innovation. As we did a survey among the visually impair community, they prefer a obstacle detection cap or a spectacle that able to detect obstacle. Thus, we did comparison between the Arduino Nano and Arduino Uno board.

4.2 Results of Comparison of Arduino Nano and Uno board

I. Results of data analysis from internet website

Research have been conducted between the Smart IR spectacle on market with the innovation Third Eye for Blind. The research focused the price, design, availability and the suitability. The results of research have presented in Table 4.2 Data Analysis for 2 different types of obstacle detection spectacle.

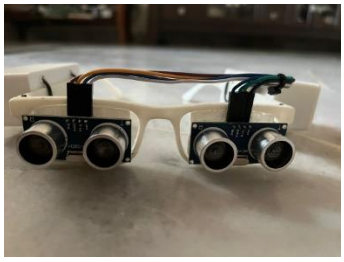
Table 4.1: Data Analysis for 2 different types of obstacle detection spectacle

Properties	VR spectacle on market	Third Eye for Blind
Price	Starting from 500USD ~ RM2318	RM200
Design	• Fixed design, no customisation • Did not alert the user when there are obstacle in front of it	• Can be customised according to the user • Using 3D printing technology

		• Use buzzer to alert the user when there are obstacle in front of the user
Availability	Not available in Malaysia, have to order from the company and shipped to Malaysia	Not available yet
Suitability	Suitable for fully blind and partially blind people.	

II. Results of data analysis of Obsvoid and Third Eye for Blind (TEFB)

Table 4.2: Data Analysis for 2 different types of obstacle detection tools

Name	Obsvoid	Third Eye for Blind
Price	RM350	RM200
Weight	174g	150g
Power Source	2000mAh battery	9V
Design	• Fixed design, no customisation • Bigger in size	• Can be customised according to the user • Using 3D printing technology
Microprocessor	• Arduino UNO • Bigger in size	• Arduino Nano • Smaller in size and more convenient
Function	• Sound alert • Vibration alert	• Sound alert
Picture		
Suitability	Suitable for fully blind and partially blind people.	

III. Results of testing of prototype at 5 blinds from PPOBM

5 blinds are invited for the prototype testing of TEFB. First of all they are required to walk with the normal white cane at the road without obstacle and time is taken. The same procedure for white cane with Obsvoid and white cane with TEFB. Next is distance 100m with obstruction. The line in Figure 4.2.1 shows the time needed by the blinds to walk 100m with helps of TEFB and white cane used the least time.

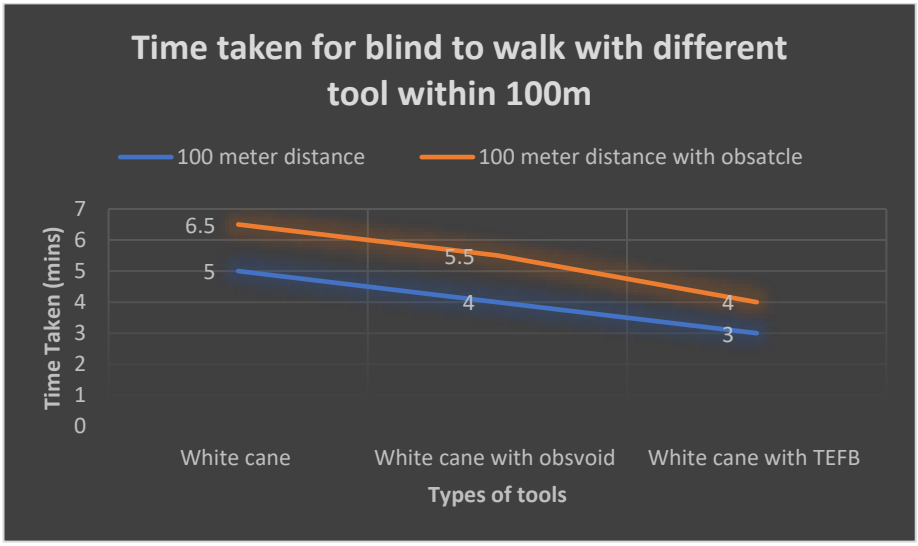


Figure 4.2.1 Line graph of blinds to walk 100m with different tools

Table 4.3 Table of comparison of blinds to walk 100m with different tools

Tool	Time taken to walk 100 meter distance (mins)	Time taken to walk 100 meter distance with obsatcl(mins)
White cane	5	6.5
White cane with Obsvoid	4	5.5
White cane with TEFB	3	4

IV. Survey form on respondents and user of Third Eye for Blinds

In the process of obtaining the opinion and suggestion of total of 20 respondents, the survey form consist of 12 question that is related to the innovation. As the survey is did among the visually impaired community, so the survey is done like an interview. From the result of survey form it shows that the visually impairment community have faced a lot of problem while they cannot detect the obstacle that is on their eye level. From the survey, the obstacle that the visually impaired community find it difficult to detect the obstacle like pillar, notice or advertisement board and tree branches.

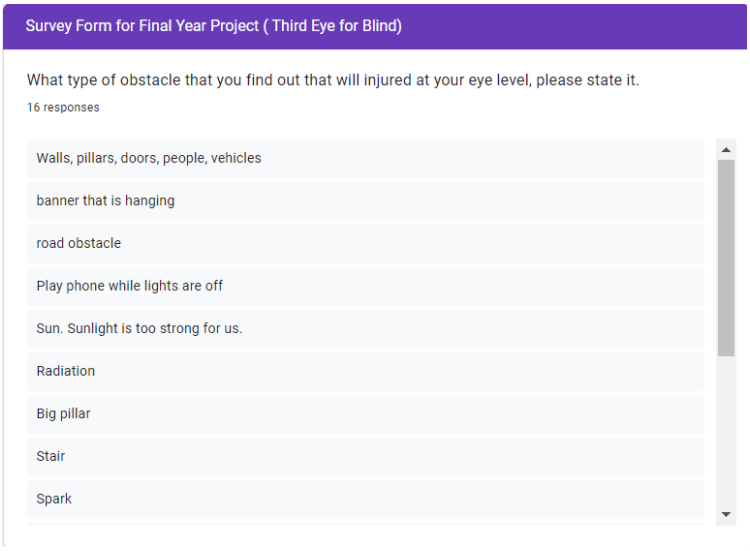


Figure 4.2.2 Results of Google form for question "What types of obstacles that you find out that will be injured at your eye level."

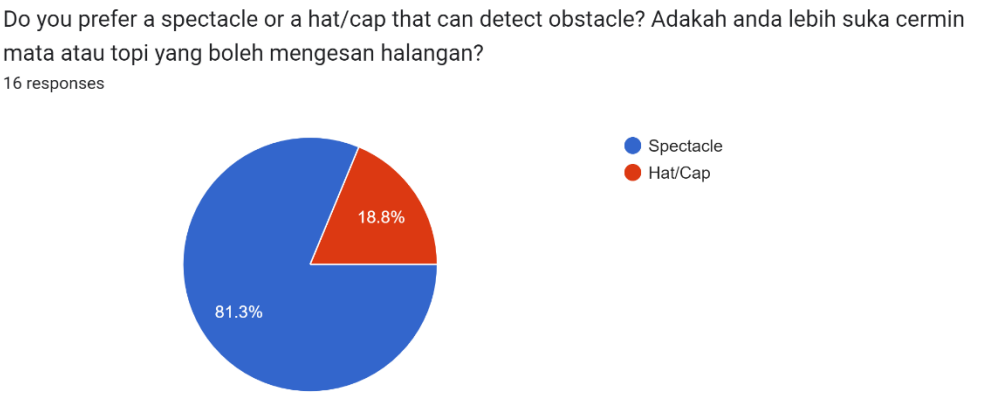


Figure 4.2.3 shows 81.3% of blind communities prefer spectacle more than a hat or cap

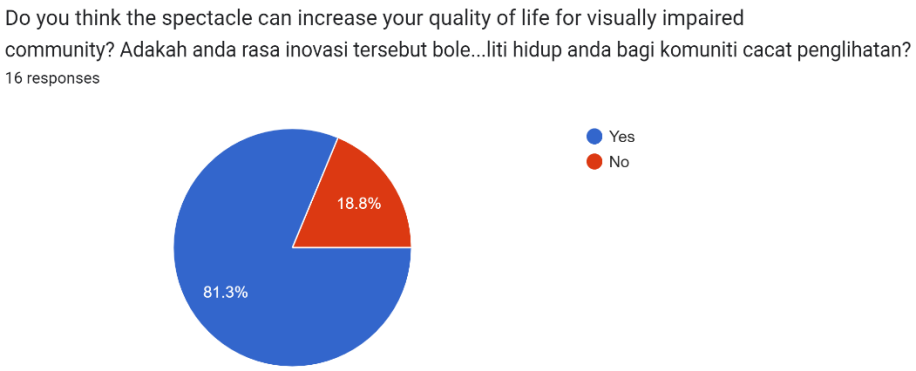


Figure 4.2.4 shows 81.3% of blind communities thinks an innovation like TEFB can improve their quality of life

The survey has been conducted at KL Sentral one of the places the place that many visually impaired communities will visit daily.

Figure 4.2.5 Group members doing survey at KL Sentral

Figure 4.2.6 Survey at Pertubuhan Pembangunan Orang Buta Malaysia PPOBM

4.3 Business model canvas (BMC)

Business Model Canvas is a strategic management used to develop new models or product. For TEFB the main supplier is from online platform such as Shopee or Lazada. The main selling point of TEFB to provide aid to the blind communities in Malaysia with reasonable price and easy access for any maintenance work. Friendly customer services also provided. As Figure 4.3.1 shows the BMC of selling TEFB to the user.

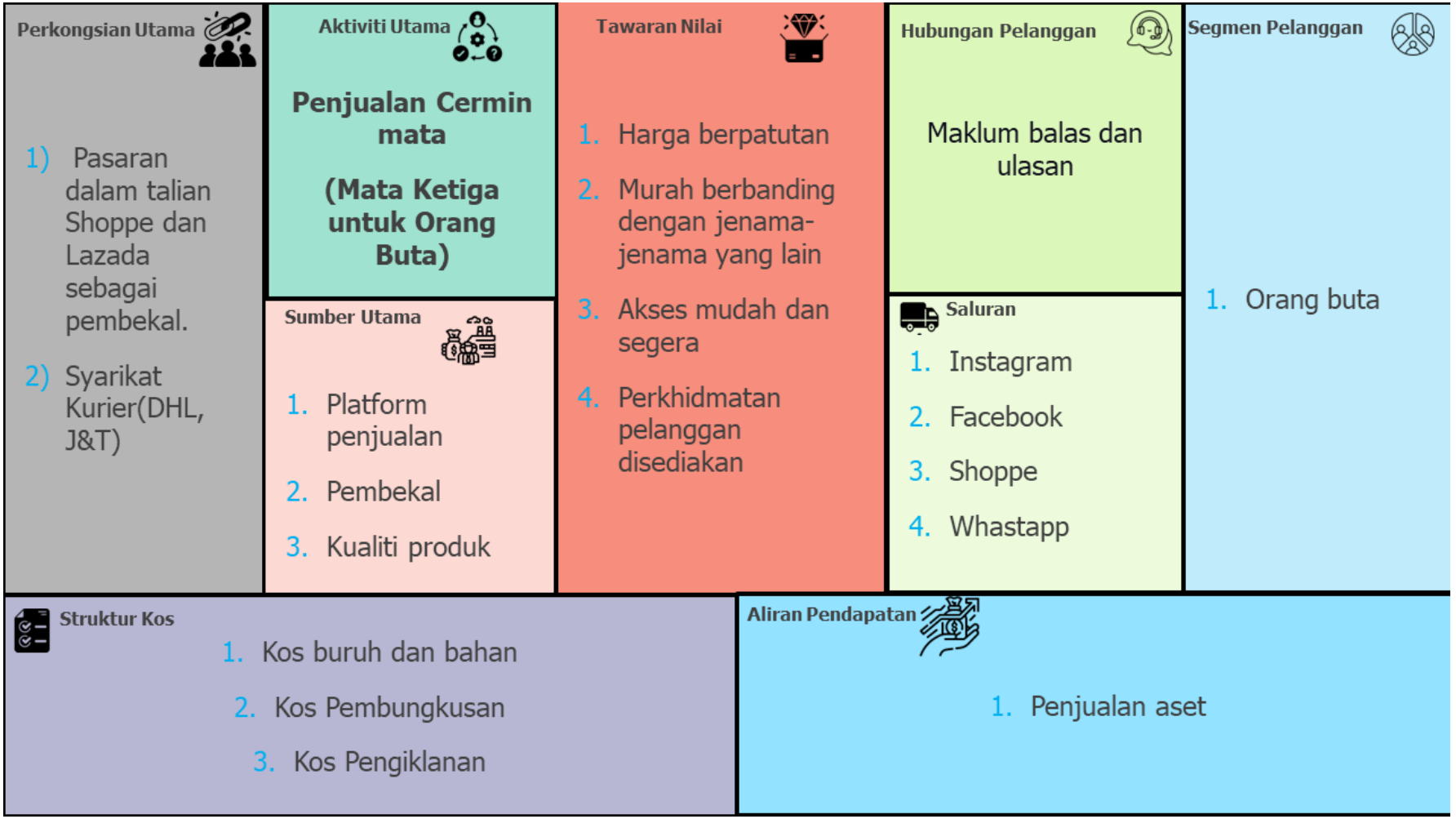


Figure 4.3.1 BMC of TEFB

4.4 Discussion

After the assessment process and respondent feedback, our final product Third Eye for Blinds has finally fabricated with Arduino Nano board and buzzer system. This innovation is aimed to help the visually impaired person to detect the obstacle on their eye level not including the obstacle below and above the eye level. When there is obstacle detected the buzzer at the side of the spectacle will produce a buzz sound to acknowledge them there is an obstacle in-front of them. The usage of long cane still a must for the visually impaired person. Based on the literature review that have been made on chapter 2, a few research have been conducted for this project. First and foremost, the research of method of identifying obstacle for visually impaired community in daily life, then is the smart glasses and VR spectacle that are available on market. Testing also have been done to identify which Arduino board is more suitable to use in this project. We have successfully achieved the objective of this project as stated in the chapter one.

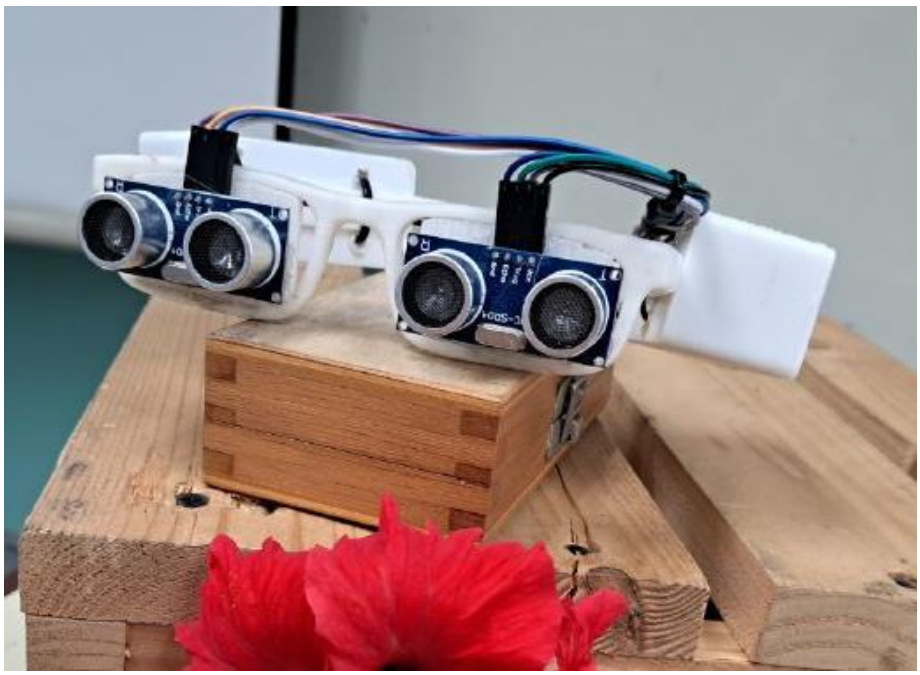


Figure 4.3.1 The finish product of innovation Third Eye for Blinds

4.5 Summary of Chapter

The proposal report went over the details of the project introduction, findings project, results comparison between Arduino Nano board and Arduino Uno board in this innovation. Lastly Arduino Nano board is chosen to use in this innovation because it is more suitable from the mass and size aspect.

CHAPTER 5: CONCLUSION

5.1 Introduction

Conclusion and discussion will be drawn of Third Eye for Blinds will be drawn out in this chapter. Thus, this chapter also explain the recommendations, impact towards the community and the potential market for this innovation.

5.2 Conclusion

The safety for visually impaired community should be emphasize and bring up in our daily life. More facilities or special help should be prepared for them to ensure their safety in daily life. As conclusion this innovation Third Eye for Blind is an innovation that able to increase the quality of life of the visually impaired community by reducing the risk of getting injured. This innovation aimed to alert the visually impaired community when there are obstacles in-front of their eye-level.

This study described the construction, design process, and specifics of the prototype of Third Eye for Blind, which helps blind people move more safely. The prototype is constructed on the Arduino platform using its software to combine suitable assembly codes, resulting in the essential intelligence to boost the mobility of visually impaired people.

In general, using this project innovation, we will help blind people complete their daily activities and walk more confidently.

In a nutshell, the objectives of the study have been achieved. A system to detect the indoor and outdoor obstruction is developed and the impact of TEFB to the communities also have been analysed through the visit to PPOBM. Besides the durability and effectiveness of the innovation to the visually impaired community is tested also.

5.3 Recommendation for improvement

The current feature of this innovation still not fully mature as user-friendly. Improvement that can be made is by adding GPS connector and connect to the user's friends or family's phone and they can track the movement of user anywhere and anytime. Besides the size of ultrasonic sensor also can be reduced with the micro sensor. Thus the battery can be change to a smaller size of batter and the wiring of ultrasonic sensor and buzzer can be tidy out.

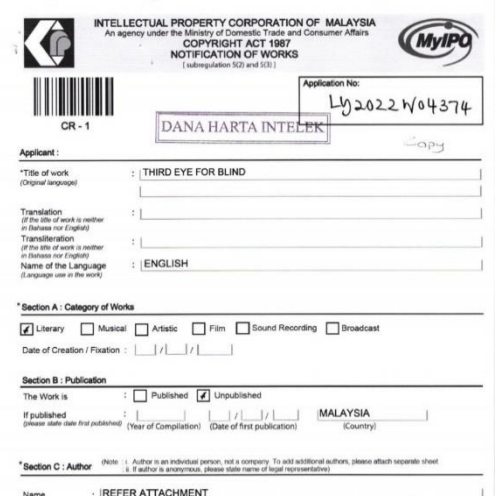
5.4 Project limitation

This project has a few limitations, and this also consider as the scope of this innovation. The limitation is stated as below:

- Angle of detection for obstacle is not more than 15°
- Range of detection for ultrasonic sensor is 1-100cm

5.5 Product Originality

Third eye for blind is registered under Intellectual Property Corporation of Malaysia MyIPO with a serial number LY2022W04374. As the figure 5.1 shows the documents of MyIPO.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COPYRIGHT ACT 1987
NOTIFICATION OF WORKS
[subregulation 5(2) and 5(3)]

CR - 1

Application No: LY2022W04374

DANA HARTA INTELEK

Applicant :

*Title of work (Original language) : THIRD EYE FOR BLIND

Translation (If the title of work is neither in Bahasa nor English) :

Transliteration (If the title of work is neither in Bahasa nor English) :

Name of the Language (Language use in the work) : ENGLISH

*Section A : Category of Works

☑ Literary ☐ Musical ☐ Artistic ☐ Film ☐ Sound Recording ☐ Broadcast

Date of Creation / Fixation : __/__/____

Section B : Publication

The Work is : ☐ Published ☑ Unpublished

If published (please state date first published) : ____ (Year of Compilation) __/__/____ (Date of first publication) MALAYSIA (Country)

*Section C : Author (Note : i. Author is an individual person, not a company. To add additional authors, please attach separate sheet ii. If author is anonymous, please state name of legal representative)

Name : REFER ATTACHMENT

Figure 5.1 MyIPO Application number

5.6 Impact to the communities

This innovation mainly aimed to improve the quality of life of visually impaired community. Thus, it will reduce the risk of injured for blind people to hit the tree branches, advertisement board or any others possible hazard in their daily life that cannot be detected by using only the white cane.

5.7 Summary of chapter

This chapter explain about the project improvements that need to be done to make this project work better as well as the many advantages this flash cutter will do.

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[3] World Health Organization. (n.d.). *Vision Impairment and blindness*. World Health Organization. Retrieved July 29, 2022, from https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment

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[5] Merriam-Webster. (n.d.). *Operation definition & meaning*. Merriam-Webster. Retrieved December 7, 2022, from https://www.merriam-webster.com/dictionary/operation

Attachment

Attachment 1: Grant chart Project 1

WEEK / ACTIVITIES		1	2	3	4	5	6	7	8	9	10	11	12	13	14
SUPERVISOR SELECTION	PLAN														
	ACTUAL														
IDEA AND PROJECT SEARCH	PLAN														
	ACTUAL														
PROPOSAL DEVELOPMENT	PLAN														
	ACTUAL														
TITLE SELECTION	PLAN														
	ACTUAL														
PROPOSAL PRESENTATION	PLAN														
	ACTUAL														
METHODOLOGY RESEARCH/SURVEY ON PRESENT INDUSTRY(FEASIBLITY)	PLAN														
	ACTUAL														
FINAL PRESENTATION	PLAN														
	ACTUAL														

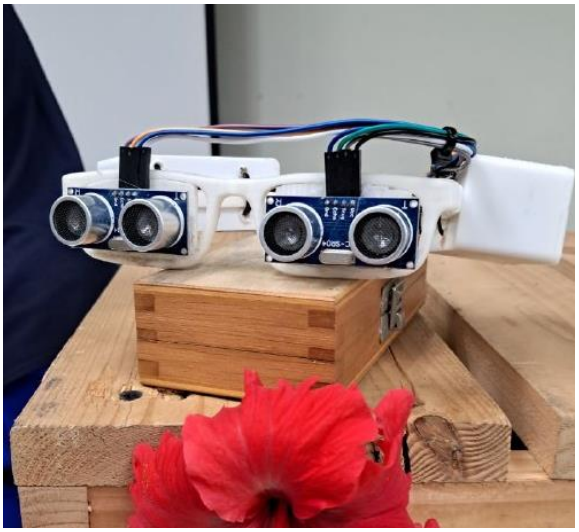
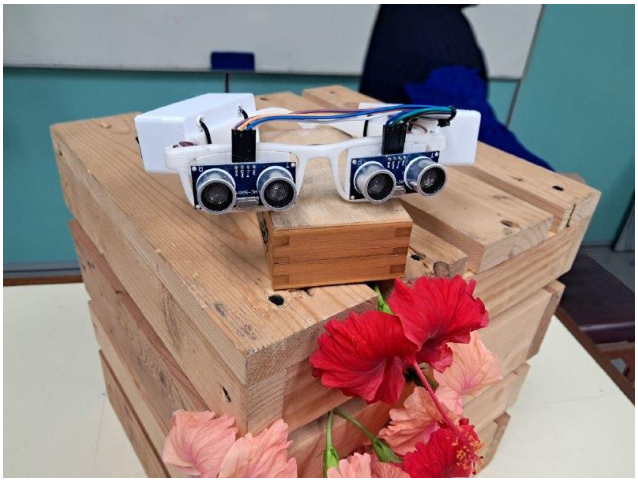
Activity	Status	Aug	Sep				Oct				Nov				Dec
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
Briefing of Project 2	P														
	A														
Planning of execution project 2	P														
	A														
Preparation of Log book	P														
	A														
Dicussion for improvement of project	P														
	A														
Improvement work	P														
	A														
Talk for Arduino	P														
	A														
Prepare Introduction	P														
	A														
Prepare Methodology	P														
	A														
Filming picture of project	P														
	A														
Recording video for usuage of project	P														
	A														
Ask Permission to visit PPOBM	P														
	A														
Visit PPOBM for analyse of Project	P														
	A														
Prepare analyse of project and results of analyse	P														
	A														
Create Project Poster and Brochure	P														
	A														
Presentation of of Project 2 in PITEC3	P														
	A														
Submission of Final Year	P														
	A														

Attachment 2: Grant Chart Project 2

Attachment 3: Costing of Product

Components	Price /per unit (RM)	Unit	Total (RM)
Arduino Nano Board	33.00	1	33.00
Buzzer	1.50	2	3.00
Ultrasonic sensor	3.50	2	7.00
3D printed frame and box	0.10/1gram	500	50.00
Copper wire	4.00/1meter	1	4.00
Battery	15.00	1	15.00
Overhead cost	-	-	68.00
		Total Cost	**RM 180.00**

Attachment 4: Specification of TEFB

Name	Third Eye for Blind
Price	RM200
Weight	150g
Range of detection	1-100cm
Power Source	9V
Processor	ATMEGA328
Pinout	8 analog pins
USB port	Micro-USB port
Design	• Can be customised according to the user Using 3D printing technology
Microprocessor	• Arduino Nano Board
Function	• Sound alert when obstacle detected
Picture	 

Attachment 5: Certificate of Appreciation of PITEC 3

Attachment 6: Certificate of Gold Award of PITEC 3

Attachment 7: Publication of Journal

AVRASYA SOSYAL VE EKONOMİ ARAŞTIRMALARI DERGİSİ (ASEAD)
EURASIAN JOURNAL OF SOCIAL AND ECONOMIC RESEARCH (EJSER)

THIRD EYE FOR BLINDS

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ABSTRACT

Nowadays, improvements in technology regularly result in the replacement of outdated things with newer ones. A white cane has been used for years by people who are blind to mark their route. Despite its drawbacks, the white cane has been useful for blind persons who need to navigate around. One limitation of the white cane is that it can only detect barriers that are in its contact zones. Due to insufficient time to detect and warn of new obstructions in front of the blind person, this problem may occasionally put the blind person in danger. Our project work outlines the design work completed to provide an innovative spectacle for blind individuals to detect the barrier in front of their line of sight. The purpose of this innovation is to suggest a system with two ultrasonic sensors installed on 3D-printed comfort eyewear, each of which is tasked with spotting impediments up to 1 m away. The Arduino Nano Board serves as a signal and programming portal for transmission. The ultrasonic sensor will send a signal to the board when it detects obstructions, and the board will provide an output signal to the buzzer. The buzzer will make a "bip,bip" sound in response to the signal it receives.

Keywords: Third Eye For Blinds, Motion Detect, Vison Impairment

Attachment 8: Achieve 3rd place in place in Pertandingan Usahawan Innovasi Piala Menteri Pengajian Tinggi2022

Attachment 9: Brochure of Third Eye for Blind

Problem Statement

- No suitable tool or means for the blind and person with vision impaired to recognize the obstruction in front of their eye level.
- Blind and visually impaired person cannot be seen by the driver or other road user during night-time.Difficulty in adapting a new environment due to lack of method of obstacle detection.

OBJECTIVES OF TEFB

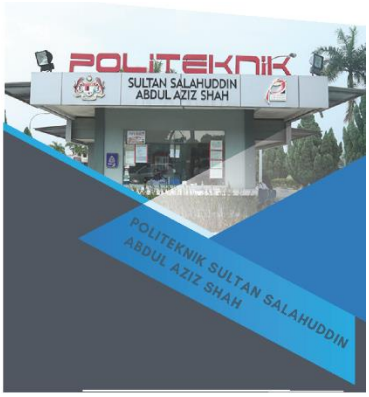
- To develop a system that can identify indoor and outdoor objects, notify the users, and send all information to a remote server repeatedly at a fixed time interval and test the durability and effectiveness of the innovation
- To analyses the impact Smart spectacle among the blind and visually impaired society.

INTRODUCTION OF TEAM *INNOVADOR*

Innovador is a Spanish term that describe innovative. Our team consist of student and lectures from Politeknik Sultan Salahuddin Abdul Aziz Shah. Our aim is to innovate product to assist the People with Disabilities(PWD) communities.

PRODUCT DESCIPTION

Our project work outlines the design work completed to provide an innovative spectacle for blind individuals to detect the obstacle in front of their eyesight which is eyelevel. The purpose of this innovation is to suggest a system with two ultrasonic sensors installed on 3D-printed comfort eyewear, each of which is tasked with spotting impediments up to 1 m away. This spectacle will alert the user with buzz sound , so the user can avoid from the obstacle.



THIRD EYE FOR BLINDS (TEFB)

Innovated by *Innovador*

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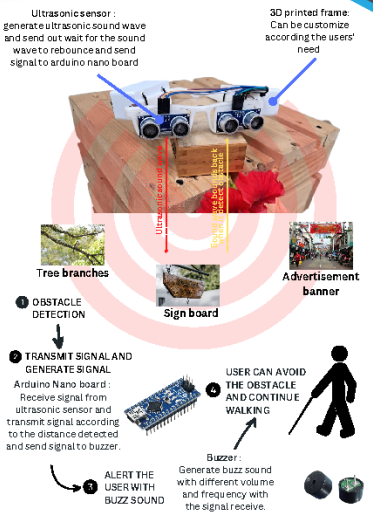
PORTAL RASMI POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH (MYPOLYCC.EDU.MY)
https://psa.mypolycc.edu.my/

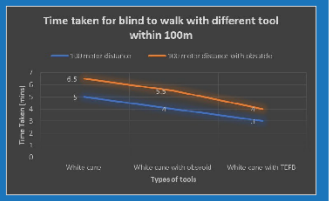
DETECT , ALERT !

WORKING PRINCIPLE OF TEFB



PERFORMANANCE OF TEFB

One analysis comparison of performance of TEFB to other alternatives is done. As the graph shown , time taken for TEFB to assist the blind to cross the road with obstacle used the shortest time. Analysis have been done using white cane, Obsvoid cap and TEFB.



- Assist the visually impaired communities to avoid from obstacles
- Detect obstacle within range of distance *1-100cm* and angle of *15 degrees*
- Raise the awareness of communities about the benefits of People with Disabilities(PWD) communities
- Increase the quality of life of visually impaired communities

Our Orniginality

Registered under MYIPO :

LY2022W04374

Contact Us

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Attachment 10: Poster of Third for Blind

POLITEKNIK MALAYSIA
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THIRD EYE FOR BLINDS

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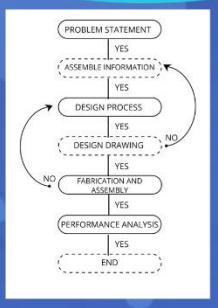
ABSTRACT

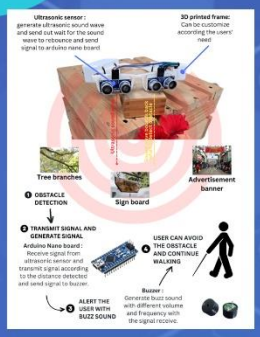
A white cane has been used for years by people who are blind to mark their route. Despite its drawbacks, the white cane has been useful for blind persons who need to navigate around. One limitation of the white cane is that it can only detect barriers that are in its contact zones.Due to insufficient time to detect and warn of new obstructions in front of the blind person, this problem may occasionally put the blind person in danger. Our project work outlines the design work completed to provide an innovative spectacle for blind individuals to detect the barrier in front of their line of sight. The purpose of this innovation is to suggest a system with two ultrasonic sensors installed on 3D-printed comfort eyewear, each of which is tasked with spotting impediments up to 1 m away. The Arduino Nano Board serves as a signal and programming portal for transmission. The ultrasonic sensor will send a signal to the board when it detects obstructions, and the board will provide an output signal to the buzzer. The buzzer will make a "bip,bip" sound in response to the signal it receives.

OBJECTIVE

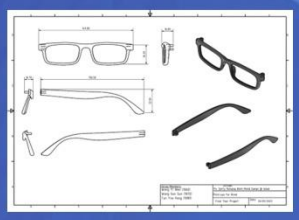
i. To develop a system that can identify indoor and outdoor objects, notify the users, and send all information to a remote server repeatedly at a fixed time interval and test the durability and effectiveness of the innovation
ii. To analyses the impact Smart spectacle among the blind and visually impaired society.

METHODOLOGY





PRODUCT DESCRIPTION



RESULT

Name	Obsvoid	Thard Eye for Blind
Price	RM350	RM200
Weight	174g	150g
Power Source	2000mAh battery	9V
Design	• Fixed design, no customisation • Bigger in size	• Can be customised according to the user • Using 3D printing technology
Microprocessor	• Arduino UNO • Bigger in size	• Arduino Nano • Smaller in size and more convenient
Function	• Sound alert • Vibration alert	• Sound alert
Suitability	Suitable for fully blind and partially blind people.	

Table of comparison of time taken for different tool

Graph of comparison of time taken for different tool

IMPACT

I. assist the visually impaired communities to avoid from obstacles
II. this innovation able to detect obstacle within range of distance *1-100cm* and angle of 15°
III. raise the awareness of communities about the benefits of People with Disabilities(PWD) communities
IV. Increase the quality of life of visually impaired communities

ORIGINALITY

• LY2022W04374

CONCLUSION

I. In conclusion a system that able to identify indoor and outdoor obstacle and alert the users is fabricated.
II. The durability and effectiveness of the innovation TEFB is analyzed among the blind and visually impaired communities.

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