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ELECTRONIC WALKING STICK BY USING ULTRASONIC SENSOR AND HEARING AID

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ENDORSEMENT

"I hereby acknowledge that I have read this report and I find that its content meet the requirements in terms of scope and quality for the award of the Diploma in Electronic Engineering (Medical)"

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DECLARATION

"We hereby declare that the work in this report is our own except for quotation and summaries which have been duly acknowledge"

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ABSTRACT

God gifted sense of vision to the human being is an important aspect of our life. But there are some unfortunate people who lack the ability of visualizing things. The visually impaired have to face many challenges in their daily life. The problem gets worse when they travel to an unfamiliar location. In this project, we proposed an innovation of ultrasonic sensor with adding in hearing aid for blind people. This project are using ultrasonic sensor and Bluetooth module for hearing aid. The use of ultrasonic sensor is to detect object in front of the person to avoid the person from violate it. For Bluetooth module, there are two types that are being using in this project. First is master and the second is slave. These components are used to connect to hearing aid. The purpose of using hearing aid is to tell the person in the ear the size of the object that is located in front of them. This project is also lighten the burden of a blind people because even they had this in their own, they no need to buy the whole cane and can choose whether want to use it or not because it is reassembled. This project presents a system concept to provide an electronic device for blind people. We propose to design device which alerts the person on occurrence of obstacles based on distance between the person and the obstacle. Here, this device not only alerts but also informs the person the size of obstacles in front of them.

DEVELOPMENT OF ELECTRONIC WALKING STICK BY USING ULTRASONIC SENSOR AND HEARING AID

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Among numerous forms of disability, blindness is one of the most suffering
That can strike people of all ages and it affects the victim's life. Nowadays, many researchers have been conducted in designing and inventing tools that may protect the blind from dangerous situation. Majority of the visually impaired people today still use the white cane as the tool to assist their movements especially when they are moving around outdoor. Recent advancements in embedded systems can help the blind to move around more easily and comfortably. There are many studies that relate to this innovation of walking stick which use different design implementation such as infrared sensor, radio signal and ultrasonic sensor detection for various applications.

1.2 PROBLEM STATEMENTS

There are many blind persons that use the white stick to help their daily movement. The stick helps them to detect obstructions around them and to avoid them from danger.

The function of the common walking stick usually used by the blind is limited. So, there is need to develop a new walking stick that can detect any obstacles before the user hit it with the end of the stick.

1.3 OBJECTIVES

- To develop a smart walking stick that can sense obstacles around the visually impaired person.
- The walking stick will be able to sense different distances between the user and the obstacles.
- To help the movement of blind person in their daily activities. Nevertheless, this project also targets to develop a low cost, sturdy and robust walking stick.

1.4 STUDY POPULATION

. Visual impairment and blindness have a significant impact on the socioeconomic development of individuals and societies. Their consequences are an important public health issue with greater impact in the developing countries, where 80% of the world blindness occurs. Visual impairment, which may be defined as blindness or low vision, is one of the most common disabilities: currently, there are worldwide an estimated 37 million people with blindness and 124 million people with low vision. Most of them have lost their sight to diseases that are treatable or preventable.

The World Health Organization (WHO) estimates that, worldwide, 140 million people have low vision and 45 million are blind. Visual impairment in childhood is underestimated, and its prevalence is only partially known, ranging from 0.3 to 1.5/1,000, depending on the regional socioeconomic development (between 80 and 100 blind children per 1 million in industrialized countries and 400 blind children per 1 million in the poorest areas of the world).There are an estimated 1.5 million blind children in the world, with three fourths of this total living in the poorest areas of Asia

and Africa; of these, 40% of the cases could be avoided, either by prevention or treatment. The worldwide incidence of blindness in childhood is 500,000 new cases each year, of which 60% to 80% of the children will die before the end of the second year of life from problems related to the causes of blindness or as a consequence of it.

1.5 SAMPLE SIZE AND SAMPLING TECHNIQUE

In this study, *Krejcie and Morgan theory* has been used to determine the sample size. The population of limitations for this study is 30 subjects, so that the sample size will be 31 subjects including blind and visual impair for the analysis of technical and evaluation test.

Table 3.1

Table for Determining Sample Size of a Known Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size *Source: Krejcie & Morgan, 1970*

Table 1: Sample size and sampling technique

1.6 SIGNIFICANT OF STUDY

The study of blindness and electronic walking stick can be a learning paradigm in the society that everyone should be aware about their surroundings. This is but a small contribution by us with our lecture that only basic education that can be learning by society. The project goal is designed to help blind people to a have a better life and normal again. This goal can be an achieved through many medium and process. The output of this study is a source material that the societies can learned and aware about blind people.

1.7 THEORITICAL OF THE STUDY

Blindness is the state or condition of being unable to see because of injury, disease, or a congenital condition. Blind people use auditory information to locate sound sources and sound-reflecting objects (echolocation). Sound source localization benefits from the hearing system's ability to suppress distracting sound reflections, whereas echolocation would benefit from "suppressing" these reflections. To clarify how these potentially conflicting aspects of spatial hearing interact in blind versus sighted listeners we make study of 30 subjects among Polytechnic student and a few subject of blind and visually impaired people.

CHAPTER 2

LITERATURE REVIEW

2.1 ELECTRONIC BLIND WALKING STICK

Electronic blind walking stick is an innovative stick designed for visually disabled people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer. We also have panic button for emergency cases to alert people around blind people when they face danger.

With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Recently there has been a lot of *Electronic Travel Aids (ETA)* designed and devised to help the blind navigate independently and safely. Also high-end technological solutions have been introduced recently to help blind persons to navigate independently. Many blind guidance systems use ultrasound because of its immunity to the environmental noise. Another reason why ultrasonic is popular is that the technology is relatively inexpensive, and also ultrasound emitters and detectors are small enough to be carried without the need for complex circuit. Blind people have used canes as mobility tools for centuries.

With the advancement in technology, the development of the electronic walking cane has made navigation for visually impaired people easier by increasing their independence and safety. In an electronic walking stick prototype was designed and implemented. This walking stick is capable of detecting obstacles in every direction through the network of infrared sensors. However, the walking stick can only alert the user of the presence of obstacles through beeping and cannot specify the direction of the obstacle(s). Apart from these design flaws, the stick cannot be used in the dark due to the absence of the alerting light.

In an intelligent stick with ultrasonic sensor was proposed. This stick through the ultrasonic sensor gathered information on the user's pathway. This information is used to generate an artificial intelligent which would be used to control the movement. The user of the stick has little or no contribution to the navigation thereby makes the user look like a zombie and a brakeless truck-pushed; Few of visually impaired persons like this scenario. This system used proximity sensors, ultrasonic sensors, as well as vibratory circuit to locate obstacles and inform the user on the present and distance of the obstacles on the pathway.

In embedded system development distance, measurement is vital and has wide application especially in robotic movement. Reference highlighted this and proposed a cost effective method of determining distance of an object(s) using ultra sonic sensor and microcontroller. This method can be used to determine the distance of an obstacle in the pathway, therefore, giving a blind person pre knowledge of the obstacle's distance.

Another smart walking stick which detects and warns the user was proposed in. This is similar to the one proposed in this paper, it contains voice and vibration alert, however, it can not specify the actual direction of the obstacle(s). Also in Arduino Uno was used to build a voice alert walking stick for visually impaired using ultrasonic sensors.

2.2 BLINDNESS

Complete blindness is characterized by a complete and total loss of vision. *Merck Manuals* reports that legal blindness is defined as having equal to or worse than a 20/200 visual acuity in the better eye. Having a visual acuity of 20/200 means that someone with normal vision can see an object at 200 feet, and a person with impaired vision can see at a distance no further than 20 feet. Several different diseases can cause complete blindness; some develop later in life and some are present at birth. The leading cause of blindness in the United States is diabetes, according to the National Eye Institute. *Diabetes* causes diabetic retinopathy, which results in destruction of the retina. Other causes of complete blindness include age-related macular degeneration, which the National Eye Institute calls the most common cause of blindness in adults who are 60 or older; cataracts, which obstructs light from hitting the retina because of opaque patches on a lens; and glaucoma, which causes blindness due to damage to the optic nerve.

The statistics by the World Health Organization (WHO) in 2011 estimates that there are 285 billion people in world with visual impairment, 39 billion of people are blind and 246 billion are with low vision, a person who cannot see at 6 meter nor has a field vision of 10° or less is considered legally blind. 95% of people classed as legally blind have some vision. To be classed as blind, there is a total loss of vision. Low vision cannot be corrected by visual aids such as glasses and contacts The World Health Organization expects this number to increase in the coming years.

There are number of blind people in the society, who are suffering while exercising the basic things of daily life and that could put lives at risk while travelling. There is a necessity these days to provide security and safety to blind people. There have been few devices designed so far to help the blind.

Blindness or visual impairment is a condition that affects many people around the world. The usage of the blind navigation system is very less and is not efficient. The blind traveler is dependent on other guide like white cane, information given by the people. Many virtually impaired people use walking sticks. When a visually impaired person uses a walking stick, he waves his stick and finds the obstacle by striking the obstacles in his way.

Visual impairment is the loss of vision (of a person) or a significant limitation of visual capability resulting from either disease, trauma, or congenital or degenerative conditions that cannot be corrected by conventional means, such as refractive correction, medication, or surgery. The following terms are used to describe the different levels of visual impairment: Partially sighted which occurs as a result of some type of visual problems. Low vision generally refers to a severe visual impairment, not necessarily limited to distance vision. Low vision applies to all individuals who are unable to read the newspaper at a normal viewing distance, even with the aid of eyeglasses or contact lenses. This can also be divided into two levels: *Myopic* - unable to see distant objects clearly, commonly called nearsighted or short-sighted, *Hyperopic* - unable to see close objects clearly, commonly called far-sighted or long-sighted. Blindness is a total or partial inability to see due to some physiological or neurological deficits. The levels of blindness are scaled according to the extent of vision loss. A situation where one is unable to see forms or sense light is referred to as total blindness. The following are a few eye disorders which can lead to visual impairments; retinal degeneration, albinism, cataracts, and glaucoma, muscular problems that result in visual disturbances, corneal disorders, diabetic retinopathy, congenital disorders, and infection. For a visually impaired person to navigate an environment without human assistance, the person must have adequate information about the travel path and also be able to detect obstacles within his/her navigation range. Without any form of assistance, most visually impaired people have to stress their other senses mostly the ears in an attempt to detect any possible obstacles in their path.

2.2.1 TYPES, CAUSES AND SYMPTOM

I. GLUOCOMA

Glaucoma is an eye disease that can damage your optic nerve. The optic nerve supplies visual information to your brain from your eyes.

Glaucoma is usually, but not always, the result of abnormally high pressure inside your eye. Over time, the increased pressure can erode your optic nerve tissue, which may lead to vision loss or even blindness. If it's caught early, you may be able to prevent additional vision loss.

The most common type of glaucoma is primary open-angle glaucoma. It has no signs or symptoms except gradual vision loss. For that reason, it's important that you go to yearly comprehensive eye exams so your *ophthalmologist*, or *eye specialist*, can monitor any changes in your vision.

Acute-angle closure glaucoma, which is also known as *narrow-angle glaucoma*, is a medical emergency. See your doctor immediately if you experience any of the following symptoms severe eye pain, nausea, vomiting, redness in your eye, sudden vision disturbances, seeing colored rings around lights, sudden blurred vision.

Fluid called aqueous humor. As this fluid is made, it fills the front part of your eye. Then, it leaves your eye through channels in your *cornea* and *iris*. If these channels are blocked or partially obstructed, the natural pressure in your eye, which is called the *intraocular pressure (IOP)*, may increase. As your *IOP* increases, your optic nerve may

become damaged. As damage to your nerve progresses, you may begin losing sight in your eye.

What causes the pressure in your eye to increase isn't always known. However, doctors believe one or more of these factors may play a role dilating eye drops, blocked or restricted drainage in your eye, medications, such as *corticosteroids,* poor or reduced blood flow to your optic nerve high or elevated blood pressure

II. CATARACTS

A *cataract* is a dense, cloudy area that forms in the lens of the eye. A *cataract* begins when proteins in the eye form clumps that prevent the lens from sending clear images to the retina. The *retina* works by converting the light that comes through the lens into signals. It sends the signals to the optic nerve, which carries them to the brain.

It develops slowly and eventually interferes with your vision. You might end up with cataracts in both eyes, but they usually don't form at the same time. *Cataracts* are common in older people. Over half of people in the United States have *cataracts* or have undergone cataract surgery by the time they're 80 years old, according to the National Eye Institute. Common symptoms of *cataracts* include blurry vision, trouble seeing at night, seeing colors as faded, increased sensitivity to glare, halos surrounding lights, double vision in the affected eye and a need for frequent changes in prescription glasses

There are several underlying causes of *cataracts*. These include an overproduction of *oxidants,* which are *oxygen molecules* that have been chemically altered due to normal daily life, smoking, ultraviolet radiation, the long-term use of steroids and other medications, certain diseases, such as *diabetes*, trauma and radiation therapy

III. RETINAL DETACHMENT

The retina is a light-sensitive membrane located at the back of the eye. When light passes through the eye, the lens focuses an image on the retina. The retina converts the image to signals that it sends to the brain through the optic nerve. The retina works with the cornea, lens, and other parts of the eye and the brain to produce normal vision.

Retinal detachment occurs when the retina separates from the back of the eye. This causes loss of vision that can be partial or total, depending on how much of the *retina* is detached. When your *retina* becomes detached, its cells may be deprived of oxygen. *Retinal detachment* is a medical emergency. Call your doctor right away if you suffer any sudden vision changes.

There's a risk of permanent vision loss if *retinal detachment* is left untreated or if treatment is delayed.

There's no pain associated with *retinal detachment*, but there are usually symptoms before the *retina* becomes detached. *Primary* symptoms include blurred vision, partial vision loss, which makes it seem as if a curtain has been pulled across your field of vision, sudden flashes of light that appear when looking to the side, areas of darkness in your field of vision and suddenly seeing many floaters, which are small bits of *debris* that appear as *black flecks* or strings floating before your eye

There are three types of retinal detachment *rhegmatogenous, tractional* and *exudative*

- Rhegmatogenous Retinal Detachment

If you have a *rhegmatogenous retinal detachment*, you have tears or holes in your retina. This allows fluid from within the eye to slip through the opening and get behind the retina. The fluid separates the retina from the membrane that provides it with nourishment and *oxygen*. The pressure from the fluid can push the *retina* away from the *retinal pigment epithelium*, causing the *retina* to detach. This is the most common type of *retinal detachment*.

- Traction Retinal Detachment

Traction retinal detachment occurs when scar tissue on the *retina*'s surface contracts and causes the *retina* to pull away from the back of the eye. This is a less common type of detachment that typically affects people with *diabetes. Diabetes* can lead to issues with the retinal vascular system and cause scar tissue in the eye that could cause detachment.

- Exudative Detachment

In *exudative detachment*, there are no tears or breaks in the retina. *Retinal diseases* such as an *inflammatory disorder* or *Coats' disease*, which causes abnormal development in the blood vessels behind the *retina*, cause this type of detachment.

IV. RETINAL VASCULAR OCCLUSION

Retinal vascular occlusion affects the eye, specifically the *retina.* The *retina* is the light-sensitive layer of tissue that lines the back of your eye. It's covered with special cells called rods and cones that convert light into *neural signals* and send these signals on to the brain so you can see. The *retina* is vital for vision. The vascular system includes blood vessels called arteries and veins, which transports blood throughout your body, including your eyes.

Your *retina* requires a constant supply of blood to make sure your cells get enough nutrients and oxygen. Blood also removes the waste your retina produces. However, it's possible for one of the vessels carrying blood to or from the *retina* to become blocked or have a *blood clot*. This is called an *occlusion.*

The *occlusion* can cause blood or other fluids to build up and prevent the *retina* from properly filtering light. When light is blocked or fluids are present, a sudden loss of vision can occur. The severity of vision loss may depend on where the blockage or clot occurred.

Retinal vascular occlusion is a potentially serious condition, especially if hardening of the *arteries,* or *atherosclerosis*, already exists. It most often occurs in middle-aged and elderly people.

There are two types of *retinal vascular occlusions*. The type depends on which type of blood vessel is affected:

- Retinal Artery Occlusion

Retinal artery occlusion is a blockage of one of the *retinal arteries*, which are *blood vessels* that carry oxygenated blood from the heart to your retina. A blockage in the main *artery* of your *retina* is called a *central retinal artery occlusion*. A *branch retinal artery occlusion* happens when the blockage occurs further along in the smaller branches of your *artery.*

- Retinal Vein Occlusion

Retinal vein occlusion is blockage of one of your *retinal veins*, which are blood vessels that carry *deoxygenated* blood back to your heart. Retinal vein occlusion is also divided into two types:

- *Central retinal vein occlusion (CRVO)* is a blockage in the main vein of your retina, which is called the c*entral retinal vein*
- *Branch retinal vein occlusion (BRVO)* occurs when the blockage is in a smaller branch of veins throughout the retina.

Blockages in your main vein or artery are often more serious than blockages in your branch veins or arteries.

The specific cause of vascular blockage or blood clots in the retina is unknown. It may occur when the veins of the eye are too narrow. However, other factors that affect blood flow can put you at a higher risk of having *retinal vascular occlusion*. These risk factors include a*therosclerosis*, or hardening of the arteries, blood clots, which often travel from elsewhere in the body to the eye, a blockage or narrowing in the carotid arteries of the neck, heart problems, including *irregular rhythm* or *valve issues*, *diabetes*, high blood pressure, high cholesterol, being overweight, *intravenous (IV)* drug use, being over the age of 60, *glaucoma,* which is a condition that damages your optic nerve, smoking, rare blood disorders and *macular edema*, which is fluid buildup, swelling, and thickening of the central part of the retina

The primary symptom of *retinal vascular occlusion* is a sudden change in vision. This could include blurry vision, or a partial or complete loss of vision. The vision symptoms usually only occur in one eye. Physical pain is not a symptom of retinal vascular occlusion. The changes in eyesight could be short term or permanent,

depending on how quickly you seek treatment and if you have other health conditions. You should make an appointment with your *optometrist,* or eye doctor, right away if you experience any changes in your vision.

2.2.2 RELATIONSHIP BETWEEN ELECTRONIC WALKING STICK AND BLINDNESS

The relationship between electronic walking stick and blindness is that we development this electronic blind walking stick to help the blind people to upgrade the way they live their life.

2.2.3 TYPES OF WALKING STICK

Walking sticks are used to provide walking assistance for those with problems of balance or with weakness or pain in their hip, leg or foot. A walking cane can instead be a fashion accessory or carried as a defensive weapon. Here are common kinds of walking canes.

Walking sticks tend to be used by those with moderately reduced balance. The hand they should be held in will depend on whether you have one leg or side stronger than the other and on whether you are right or left handed so you need individual advice on this. Likewise, there are also different ways of using them such as stick and involved leg moved first or sticks first

I. WOODEN WALKING STICK

These traditionally have a crook handle and are cut to the correct height. They are available in various diameters and strengths which are designed to take different loads. They are not as adaptable for use by different people as metal sticks

Wooden walking stick

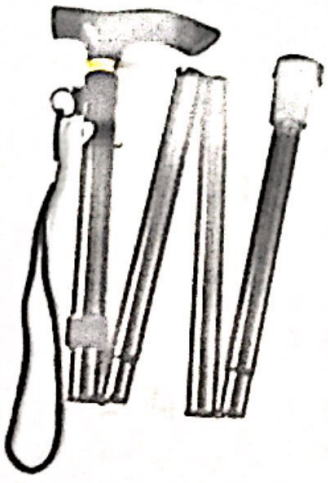
II. METAL WALKING STICK

These tend to be stronger than wooden walking sticks. Some are fixed length, others are height adjustable. Metal sticks are available with right angled handles, crook shaped handles or anatomically shaped handgrips. The ferrules of metal sticks must incorporate a metal disc to prevent the end of the stick cutting into the rubber of the *ferrule*.

Metal walking stick

III. FOLDED WALKING STICK

These are lightweight metal sticks with sectioned shafts that enable them to be folded up for storage, for example in a handbag. Strong elastic runs inside the shaft to ensure that in its open position the stick remains stable. Fixed height or adjustable height versions are available. Some are provided with a plastic, storage wallet.



Folded walking stick

IV. WALKING STICK WITH A SEAT

These are particularly useful for people who need to rest periodically, for example for those with breathing difficulties or a heart condition. However, they are not recommended for people who need to take a lot of weight through the stick as the addition of a seat alters the balance of the stick.

The weight of stick seats and the amount of strength needed to open and close the seat varies

Walking stick with a seat

V. WALKING STICK FOR BLIND OR PARTIALLY SIGHTED USERS

A white cane is used by many people who are blind or visually impaired. Its primary uses are as a mobility tool and as a courtesy to others, but there are at least five varieties, each serving a slightly different need.

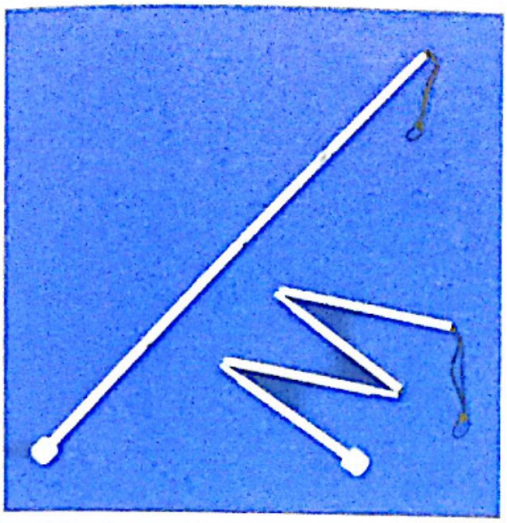
1. Long cane

This traditional white cane, also known as a *Hoover* cane, after Dr. Richard Hoover, is designed primarily as a mobility tool used to detect objects in the path of a user. Cane length depends upon the height of a user, and traditionally extends from the floor to the user's sternum. Some organizations favor the use of much longer canes.

Long cane

2. Guide cane

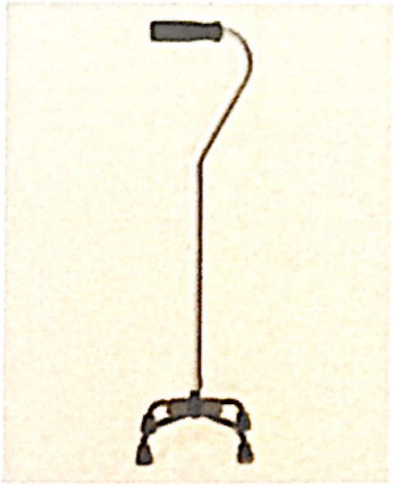
This is a shorter cane - generally extending from the floor to the user's waist - with a more limited mobility function. It is used to scan for kerns and steps. The guide cane can also be used diagonally across the body for protection, warning the user of obstacles immediately ahead.



Guide cane

3. Support cane

The white support cane is designed primarily to offer physical stability to a visually impaired user. By virtue of its color, the cane also works as a means of identification. This tool has very limited potential as a mobility device.

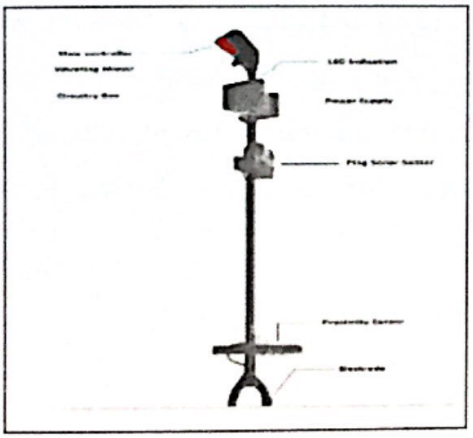


Support cane

2.2.4TYPES OF ELECTRONIC WALKING STICK

1. SMART WALKING STICK

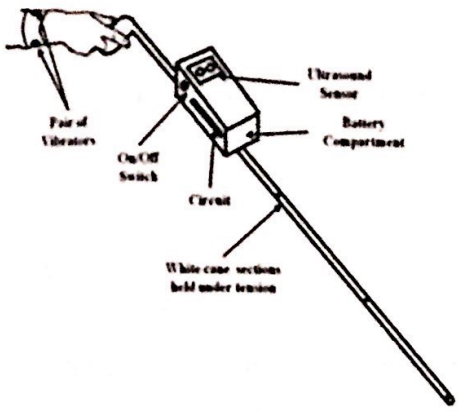
The walking stick mentioned above is a stick that consists of a circuit board that contains a PIC micro controller, a LED for indication, input from micro-pager motor, inputs from sensors that are installed at proper. The micro-controller is code protected so its security bridge cannot be override except the vendor or owner. Here one micro-controller is used, that is PIC16F690. All sensors' data are taken by the micro-controller and it produces different Pulse Width Modulation (PWM) based on the sensors output to operate pager motor.



Smart walking stick

2. SMART CANE ASSISTED MOBILITY FOR VISUALLY IMPAIRED

The main reason for designing the Obstacle Detector Systems is to make the visually impaired person acknowledged about the obstructions beforehand. Such aid gives user more knowledge about the milieu and enables them to make decisions much more quickly, thus allowing them to move around more confidently and effectively. The designed assisted device helps a visionless person to visualize the surrounding using the sensor and vibrations. Used ultrasound sensor module and Arduino module.



Smart assisted

3 21st CENTURY WALKING STICK

It works by giving users adequate warning of obstacles ahead of them, both in their path and at head height. The handle of the cane is a handset fitted with transmitters and sensors. Buttons in the handle vibrate when the sensors detect that an obstacle is near. The strength of the vibration indicates the proximity of the obstacle, helping the user to walk around it easily and independently.

21st century walking

2.3 MATERIAL FOR WALKING STICK

2.3.1 ALUMINIUM

Aluminum is a relatively soft, durable, lightweight, ductile, and malleable metal with appearance ranging from silvery to dull gray, depending on the surface roughness. It is nonmagnetic and does not easily ignite. A fresh film of aluminum serves as a good reflector (approximately 92%) of visible light and an excellent reflector (as much as 98%) of medium and far infrared radiation. The yield strength of pure aluminum is 7–11 MPa, while aluminum has yield strengths ranging from 200 MPa to 600 MPa. Aluminum has about one-third the density and stiffness of steel. It is easily machined, cast, drawn and extruded.

Aluminum atoms are arranged in a face-centered cubic (fcc) structure. Aluminum has stacking-fault energy of approximately 200 mJ/m^2.

Aluminum is a good thermal and electrical conductor, having 59% the conductivity of copper, both thermal and electrical, while having only 30% of copper's density. Aluminum is capable of superconductivity, with a superconducting critical temperature of 1.2 kelvin and a critical magnetic field of about 100 gauss (10 milliteslas). Aluminum is the most common material for the fabrication of superconducting qubits

2.3.2 FIBERGLASS

A type of fiber-reinforced plastic where the reinforcement fiber is specifically glass fiber. The glass fiber may be randomly arranged, flattened into a sheet (called a chopped strand mat), or woven into a fabric. The plastic matrix may be

a thermoset polymer matrix – most often based on thermosetting polymers such as epoxy, polyester resin, or vinyl ester - or a thermoplastic.

The glass fibers are made of various types of glass depending upon the fiberglass use. These glasses all contain silica or silicate, with varying amounts of oxides of calcium, magnesium, and sometimes boron. To be used in fiberglass, glass fibers have to be made with very low levels of defects.

Fiberglass is a strong lightweight material and is used for many products. Although it is not as strong and stiff as composites based on carbon fiber, it is less brittle, and its raw materials are much cheaper. Its bulk strength and weight are also better than many metals, and it can be more readily molded into complex shapes. Applications of fiberglass include aircraft, boats, automobiles, bath tubs and enclosures, swimming pools, hot tubs, septic tanks, water tanks, roofing, pipes, cladding, casts, surfboards, and external door skins.

Other common names for fiberglass are glass-reinforced plastic (GRP),[1] glass-fiber reinforced plastic (GFRP)[2] or GFK (from German: *Glasfaserverstärkter Kunststoff*). Because glass fiber itself is sometimes referred to as "fiberglass", the composite is also called "fiberglass reinforced plastic." This article will adopt the convention that "fiberglass" refers to the complete glass fiber reinforced composite material, rather than only to the glass fiber within it.

2.3.3 COMPARISON BETWEEN ALUMINIUM AND FIBERGLASS

Firstly fiberglass is heavier than aluminum. Secondly there is a limit to how far aluminum can be stretched to form complex shapes. Aluminum is strong and forgiving. Hence aluminum stick withstands impact much better than their fiberglass counterparts. An impact that results in only a scratch or slight bend for an aluminum hull will likely result in some major gelcoat damage and possible cracking for its fiberglass counterpart. Generally speaking you can get a cheaper aluminum stick with similar specification compared to fiberglass. Many modern aluminum stick are made

with plate aluminum which is more expensive than traditional stretch form aluminum stick. Of course you get what you pay when it comes to both aluminum and fiberglass stick. There is excellent example of value for money in both fields. Fortunately both aluminum and fiberglass boats can be repaired. Most aluminum stick manufacturers have a wider variety of hulls available options and features available.

2.4 SENSOR

- ULTRASONIC SENSOR

Ultrasonic proximity sensors are used in many automated production processes. They employ sound waves to detect objects, so color and transparency do not affect them (though extreme textures might). This makes them ideal for a variety of applications, including the long range detection of clear glass and plastic, distance measurement, continuous fluid and granulate level control, and paper, sheet metal, and wood stacking.

The most common configurations are the same as in photoelectric sensing: through beam, retro-reflective, and diffuse versions. Ultrasonic diffuse proximity sensors employ a sonic transducer, which emits a series of sonic pulses, then listens for their return from the reflecting target. Once the reflected signal is received, the sensor signals an output to a control device. Sensing ranges extend to 2.5 m. Sensitivity, defined as the time window for listen cycles versus send or chirp cycles; may be adjusted via a teach-in button or potentiometer. While standard diffuse ultrasonic sensors give a simple present/absent output, some produce analog signals, indicating distance with a 4 to 20 mA or 0 to 10 Vdc variable outputs. This output can easily be converted into useable distance information.

Ultrasonic retro-reflective sensors also detect objects within a specified sensing distance, but by measuring propagation time. The sensor emits a series of sonic pulses that bounce off fixed, opposing reflectors (any flat hard surface — a piece of machinery, a board). The sound waves must return to the sensor within a user-adjusted time interval; if they

don't, it is assumed an object is obstructing the sensing path and the sensor signals an output accordingly. Because the sensor listens for changes in propagation time as opposed to mere returned signals, it is ideal for the detection of sound-absorbent and deflecting materials such as cotton, foam, cloth, and foam rubber.

Similar to through-beam photoelectric sensors, ultrasonic through beam sensors have the emitter and receiver in separate housings. When an object disrupts the sonic beam, the receiver triggers an output. These sensors are ideal for applications that require the detection of a continuous object, such as a web of clear plastic. If the clear plastic breaks, the output of the sensor will trigger the attached PLC or load

2.4.1 Characteristics of ultrasonic waves

Ultrasonic waves are sounds which cannot be heard by humans and are normally, frequencies of above 20 kHz. The basic characteristics of ultrasonic waves are explained below.

I. Wavelength and radiation

Velocity of wave propagation is expressed by multiplication of frequency and wavelength. The velocity of an electromagnetic wave is 3×108m/s, but the velocity of sound wave propagation in air is as slow as about 344m/ s (at 20°C). At these slower velocities, wavelengths are short, meaning that higher resolution of distance and direction can be obtained. Because of the higher resolution, it is possible to get higher measurement made large accuracy. The surface dimension of the ultrasonic device can be easily to obtain accurate radiation.

II. Reflection

In order to detect the presence of an object, ultrasonic waves are reflected on objects. Because metal, wood, concrete, glass, rubber and paper, etc. reflect approximately 100% of ultrasonic waves, these objects can be easily detected. Cloth, cotton, wool, etc. are difficult to detect because they absorb ultrasonic waves. It may often be difficult, also, to detect objects having large surface undulation, because of irregular reflection.

III. Effects of temperature

Velocity of sound wave propagation "c" is expressed by the following formula. $c=331.5+0.607t$ (m/s) where t=temperature (°C) That is as sound velocity varies according to circumferential temperature, it is necessary to verify the temperature at all times to measure the distance to the object accurately

IV. Attenuation

The strength of ultrasonic waves propagated into the air attenuate proportionally with distance. This is caused by diffusion loss on a spherical surface due to diffraction phenomenon and absorption loss, that energy is absorbed by medium. As shown in Fig.1, the higher the frequency of the ultrasonic wave, the bigger the attenuation rate and the shorter the distance the wave reaches.

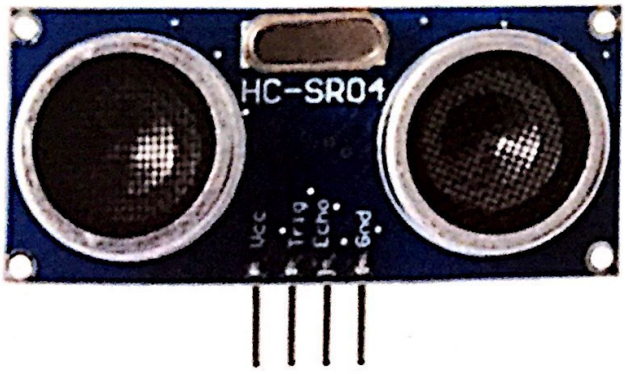
2.4.2 Working Principle

The basic concept of ultrasonic sensor is to determine distance of an object. In this project, an ultrasonic sensor is used to measure the distance between the obstacles and

the blind. The sensor enables to warn the blind when facing any dangerous circumstances. The ultrasonic sensor works by generating high frequency sound waves and evaluates the echo which is received back by the sensor. The sensor calculates the 5 time interval between sending the signal and receiving the echo to determine the distance of the obstacle. That signal is sent to the microcontroller and it decides which output must be triggered.

2.4.3 Characteristic of Ultrasonic Sensor

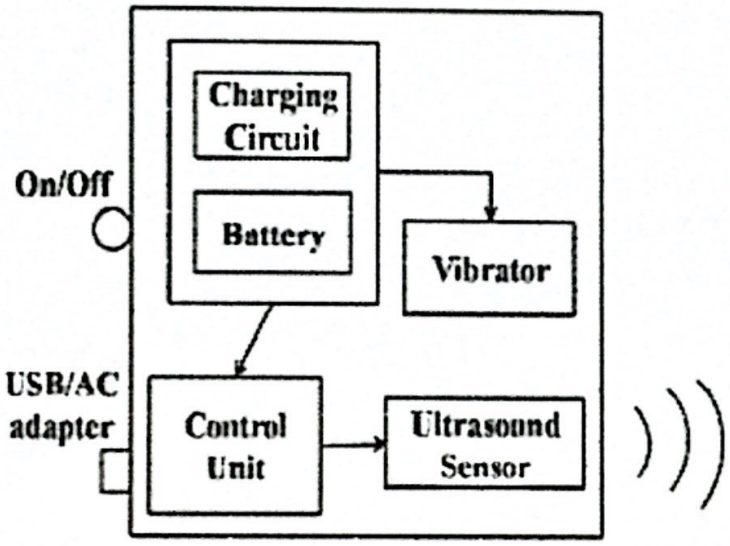
The ultrasonic model used in this project is SRF-04. It was designed to be just as easy to use as the Polaroid sonar. The sensor is able to compute the distance of obstacles in maximum range of 10.7 m. It consists of 5 terminals, namely the power terminal, the ground terminal, trigger pulse terminal, echo pulse terminal and do not connect terminal. An analog voltage signal is produced as output which is proportional to the distance. The current consumption for the sensor is about 2.5A during the sonic burst and the power desired to turn it on is 5 V. The sensor needs to supply a short 10μS pulse to the trigger input to start the ranging. Then the module will send out an 8 cycle burst of ultrasound at 40 kHz and raises its echo line high. The module is quite large to fit into small systems.



Ultrasonic sensor

2.4.4 Hardware Part

There are five main components in the system which are a charging circuit, a battery, a vibrator, an ultrasonic sensor and a control unit ultrasonic module will emit ultrasonic waves which bounce back when hit an object or an obstruction in the path of the user. The received signal will be sent to the control unit which consists of an Arduino Board. Arduino will do the calculation and then it triggers the vibrator as the indicator to warn the user of the obstacles.



2.5 THE PROGRAMMING OF INPUT AND OUTPUT FOR ARDUINO

The blind stick is integrated with ultrasonic sensor and Arduino module. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles, the sensor passes this data to the Arduino Uno. The Arduino Uno then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the Arduino Uno sends a signal to sound a buzzer. The signal also sends to Bluetooth *master* and its send the signal to Bluetooth *slave*. After that to Arduino Nano so Arduino Nano send signal to audio module and send it to hearing aid

CHAPTER 3

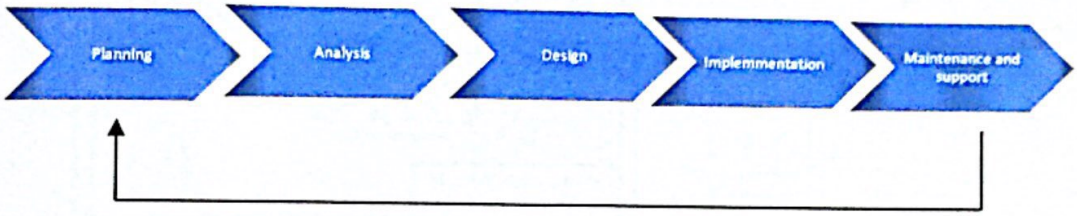
METHODOLOGY

3.1 INTRODUCTION

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretic analysis of the body of methods and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative techniques. A methodology does not set out to provide solutions- it is, therefore, not the same as a method. Instead, a methodology offers the theoretical underpinning for understanding which method, set of methods, or so-called best practices can be applied to specific case, for example, to calculating a specific result.

3.2 PLANNING

To identify all the information and requirement such as hardware and software, planning must be done in the proper manner. The planning phases have two main elements namely data collection and the requirements of hardware and software.



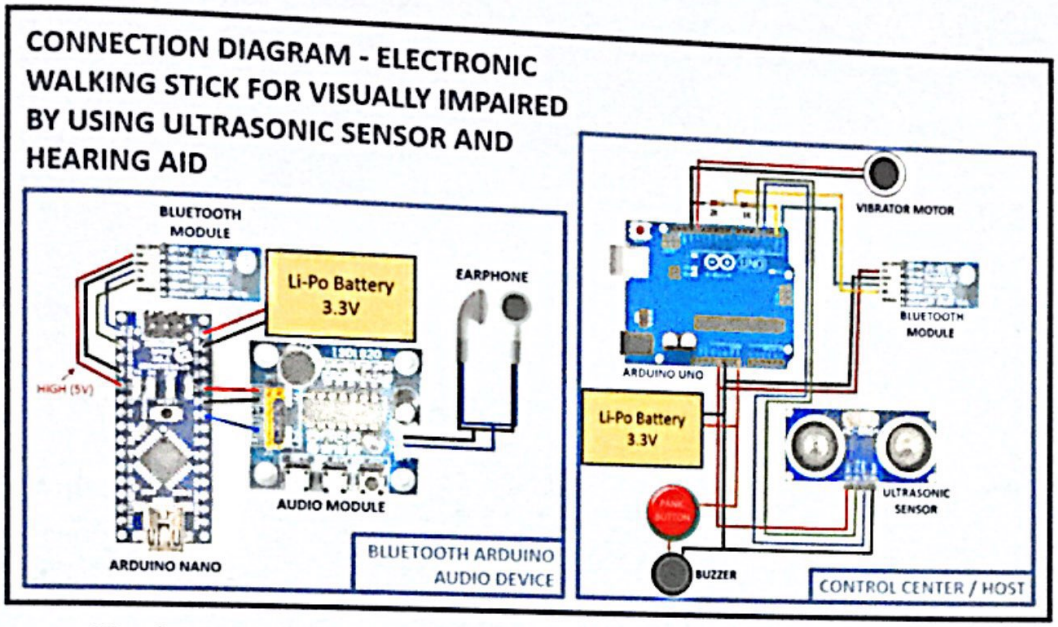
3.2.1 DATA COLLECTION

Data collection is a stage in any area of study. At this stage we planned about the projects resources and requirements, literature studies and schedule to get more information in this study. All the materials are collected from journal, texts book and research papers gathered from libraries and Internet.

Within the data collection period I have found the study about the walking stick by using ultrasonic sensor in the Internet and do some research about the project related. Once I got the project manual, I tried to find out the electronic component and other materials and some of equipment to be used.

While planning, I have done the research about the project related, which including with study about the electronic component such as capacitor, resistor, inductance, transistor and diode. The study is not just for the function of the component but the types of small circuit build by each component related.

3.2.2 REQUIREMENT OF HARDWARE AND SOFTWARE



Hardware connection diagram

Control Centre / Host

Based on the figure , the main component in our connection diagram is using arduino UNO.as a host in the circuit. It is programmed by using Arduino software. The rest of the component is connected to it. Lithium Polymer (Li-po) battery, 12volt and 350mAh is use in this circuit.

Bluetooth Arduino Audio Device

Based on the figure, aduino Nano is the main component for this connection. This connection will receive data from control centre / host for it work. It also use the same battery as control centre / host use that is Lithium polymer(Li-po) 12volt and 350mAh.

Below is the list of the entire electronic components and the other material that will support to complete this project.

Control Centre / Host

- Arduino Uno

- Bluetooth Module
- Ultrasonic Sensor
- Vibrator Motor
- Buzzer
- Li-po battery

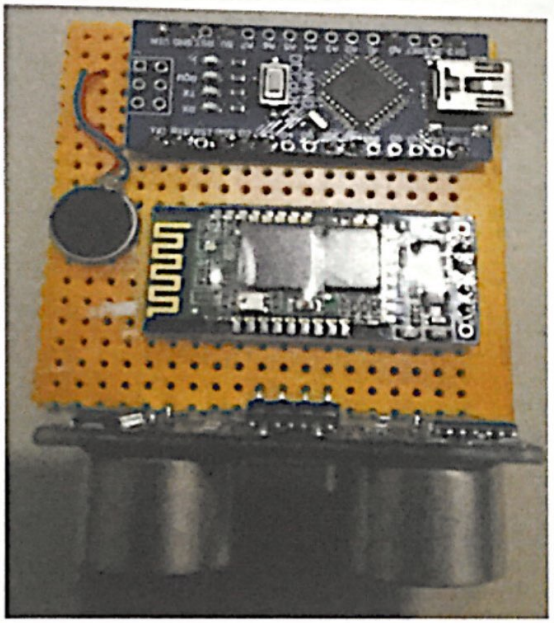
Bluetooth Module Arduino Audio Device

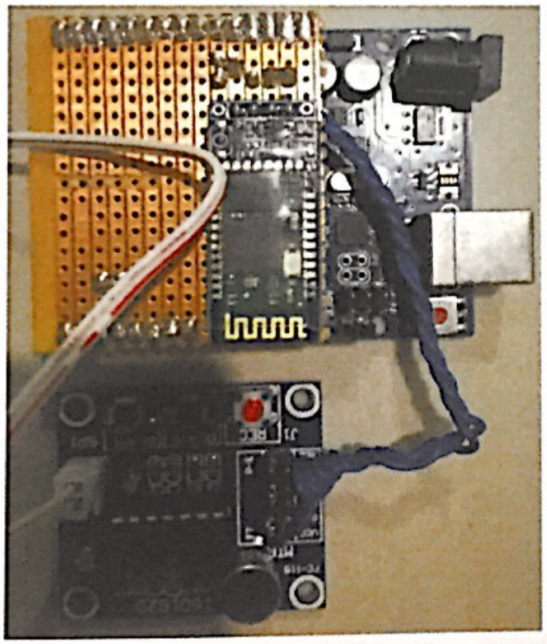
- Arduino Nano
- Audio Module
- Bluetooth Module
- Li-po battery

For the software requirement, we are choose to use arduino software. Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

In our project, we does not use any of simulation software because of there is no arduino board in it. For the circuit to success, we had to do a lot of research and try an error on a bread board.



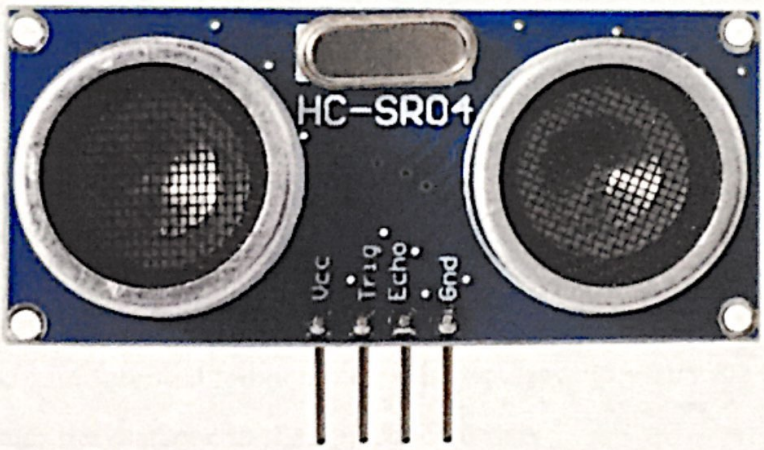


3.3 IMPLEMENTING

3.3.1 Ultrasonic Sensor

Ultrasonic sensors "are based on the measurement of the properties of acoustic waves with frequencies above the human audible range," often at roughly 40 kHz. They typically operate by generating a high-frequency pulse of sound, and then receiving and evaluating the properties of the echo pulse.

Three different properties of the received echo pulse may be evaluated, for different sensing purposes. They are time of flight (for sensing distance), they also for doppler shift (for sensing velocity), and it also for amplitude attenuation (for sensing distance, or directionality, or attenuation coefficient).



Features

Wavelength and Radiation

Velocity of wave propagation is expressed by multiplication of frequency and wavelength. The velocity of an electromagnetic wave is 3×108m/s, but the velocity of sound wave propagation in air is as slow as about 344m/ s (at 20°C). At these slower velocities, wavelengths are short, meaning that higher resolution of distance and direction can be obtained. Because of the higher resolution, it is possible to get higher measurement made large accuracy. The surface dimension of the ultrasonic device can be easily to obtain accurate radiation.

Reflection

In order to detect the presence of an object, ultrasonic waves are reflected on objects. Because metal, wood, concrete, glass, rubber and paper, etc. reflect approximately 100% of ultrasonic waves, these objects can be easily detected. Cloth, cotton, wool, etc. are difficult to detect because they absorb ultrasonic waves. It may often be difficult, also, to detect objects having large surface undulation, because of irregular reflection.

Effects of Temperature

Velocity of sound wave propagation "c" is expressed by the following formula. c=331.5+0.607t (m/s) where t=temperature (°C) That is as sound velocity varies according to circumferential temperature, it is necessary to verify the temperature at all times to measure the distance to the object accurately

Attenuation

The strength of ultrasonic waves propagated into the air attenuate proportionally with distance. This is caused by diffusion loss on a spherical surface due to diffraction phenomenon and absorption loss, that energy is absorbed by medium. As shown in Fig.1, the higher the frequency of the ultrasonic wave, the bigger the attenuation rate and the shorter the distance the wave reaches

The main advantage of ultrasonic sensors is that measurements may be made without touching or otherwise impeding the target. In addition, depending on the distance measured, measurement is relatively quick (it takes roughly 6ms for sound to travel 1m). However, many factors such as temperature, angle, and material may affect measurements.

Here is a list of pitfalls in ultrasonic sensing:

- **Weather.** Temperature and humidity affect the speed of sound in air. Therefore, range finders may need to be recalibrated to make accurate measurements in a new environment. (Or, an on-board temperature sensor may be incorporated.)

- **Currents.** Temperature variations and air currents can create invisible boundaries that will reflect ultrasonic waves, so care must be taken to avoid these.

- **Angle.** For the transmitted wave to echo back to the receiver, the target surface must be perpendicular to the transmitter. Round objects are therefore most easily sensed since they always show some perpendicular face. When targeting a flat object, care must be taken to ensure that its angle with respect to the sensor does not exceed a particular range.

- **Dead-zone.** Ultrasonic sensors typically have a "dead zone" immediately in front of them in which objects cannot be detected because they deflect the wave back before the receiver is operational. (This is because reverberations from the transmitter force the receiver to pause a moment before beginning to listen for the echo.

- **Material.** Some materials are more absorbent than others, and these will reflect less ultrasound. This complicates using the attenuation method to measure the distance of arbitrary objects.

3.3.2 Arduino Module

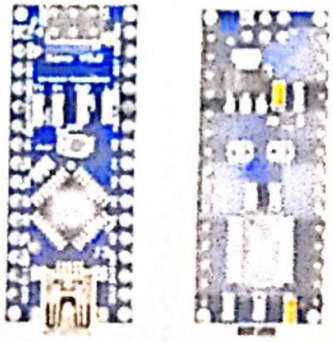
Hardware and software company, project, and user community that designs and manufactures computer hardware, open-source software, and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices.

The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed *shields*) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named *Processing*, which also supports the languages C and C++.

The first Arduino was introduced in 2005, aiming to provide a low cost, easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x) or ATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package.

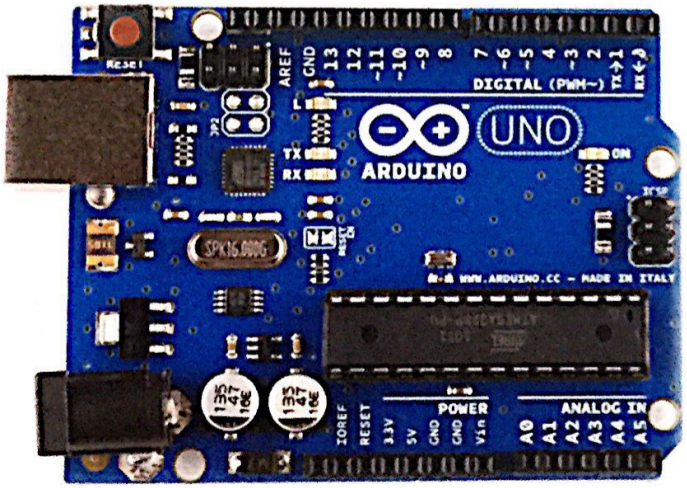


Arduino Nano

Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions



Arduino Uno

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40mA
DC Current for 3.3V Pin	50mA
Flash Memory	32 KB (ATmega328) of which 0.5 KB used by boot loader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16MHz

Table 2: Arduino Uno

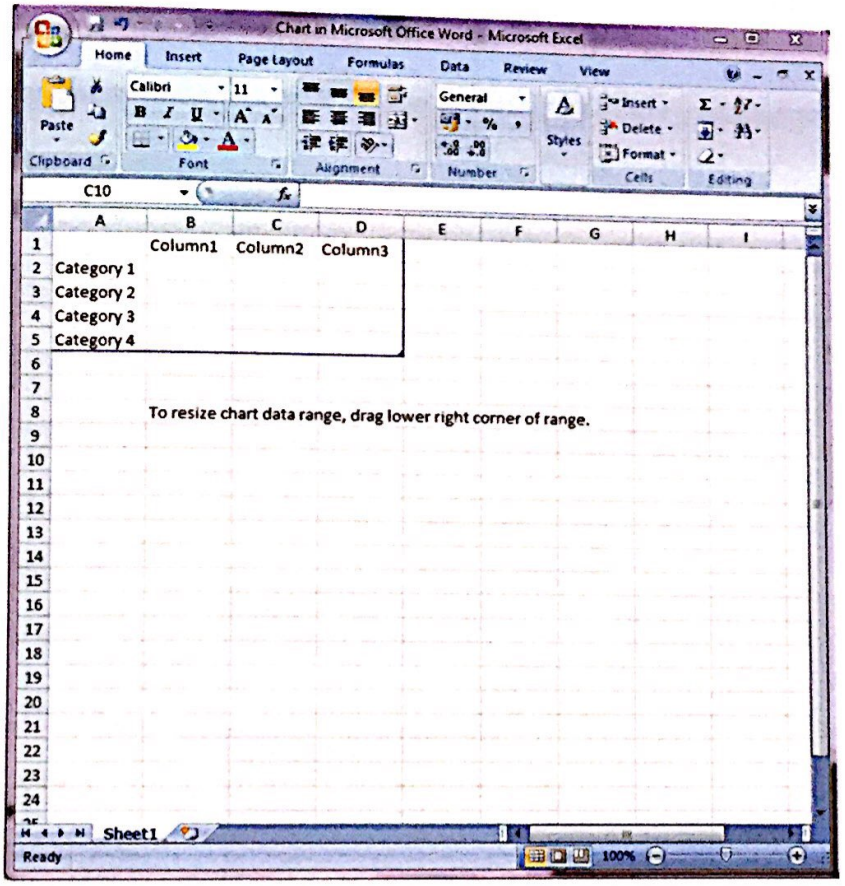
3.3.3 Project Testing

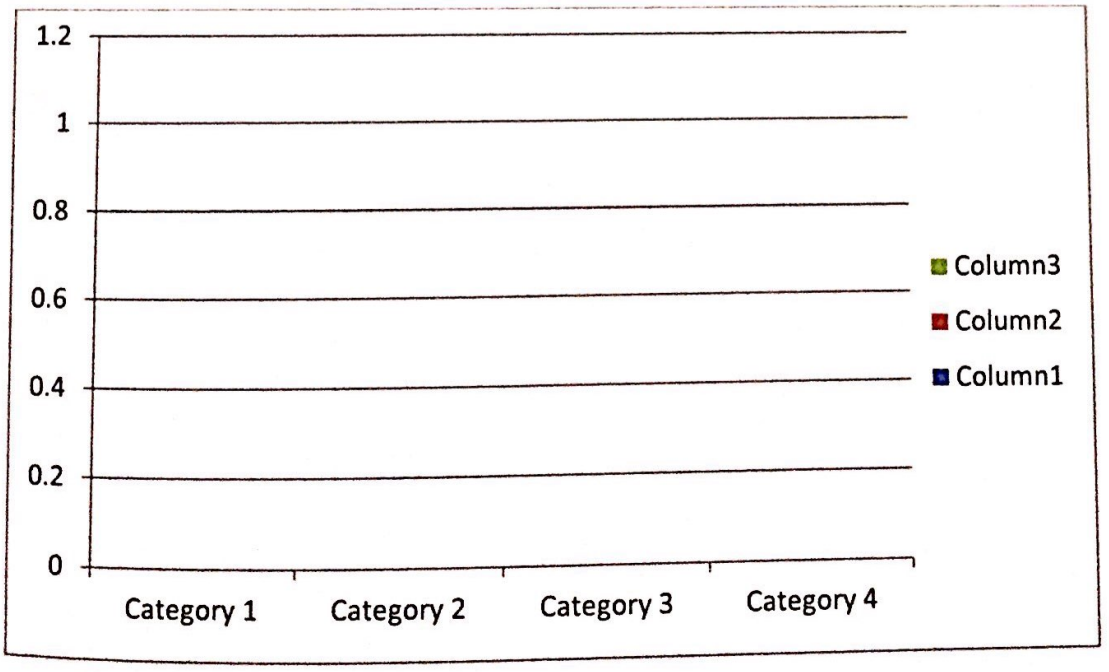
The procedure of testing is beginning with switch on the power. Then determine if the ultrasonic sensor is detecting an object in range by feel a vibration on the hand. When the sensor is trigger an object, the Bluetooth module is working on by sending a signal to Arduino Uno. So, that, the audio module that we've set a voice can functions through hearing aid.

If that not the case, the range to detect an object are adjusted until it on a range that satisfying. The range is adjusted at the program in this project.

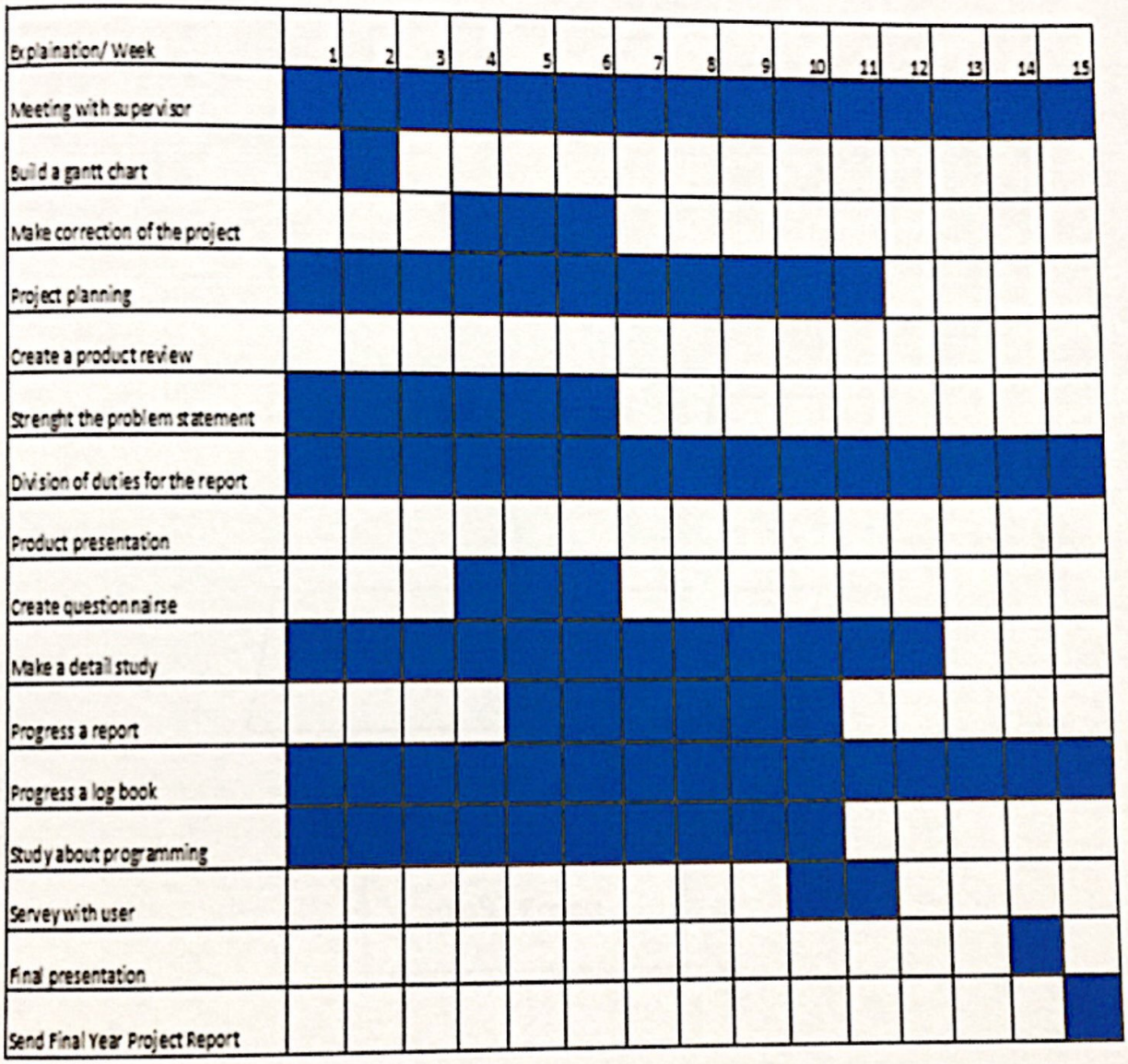
3.4 DATA ANALYSIS

In this study, we are using Microsoft Excel to key in the data. The data then will convert into a graph at Microsoft Word.

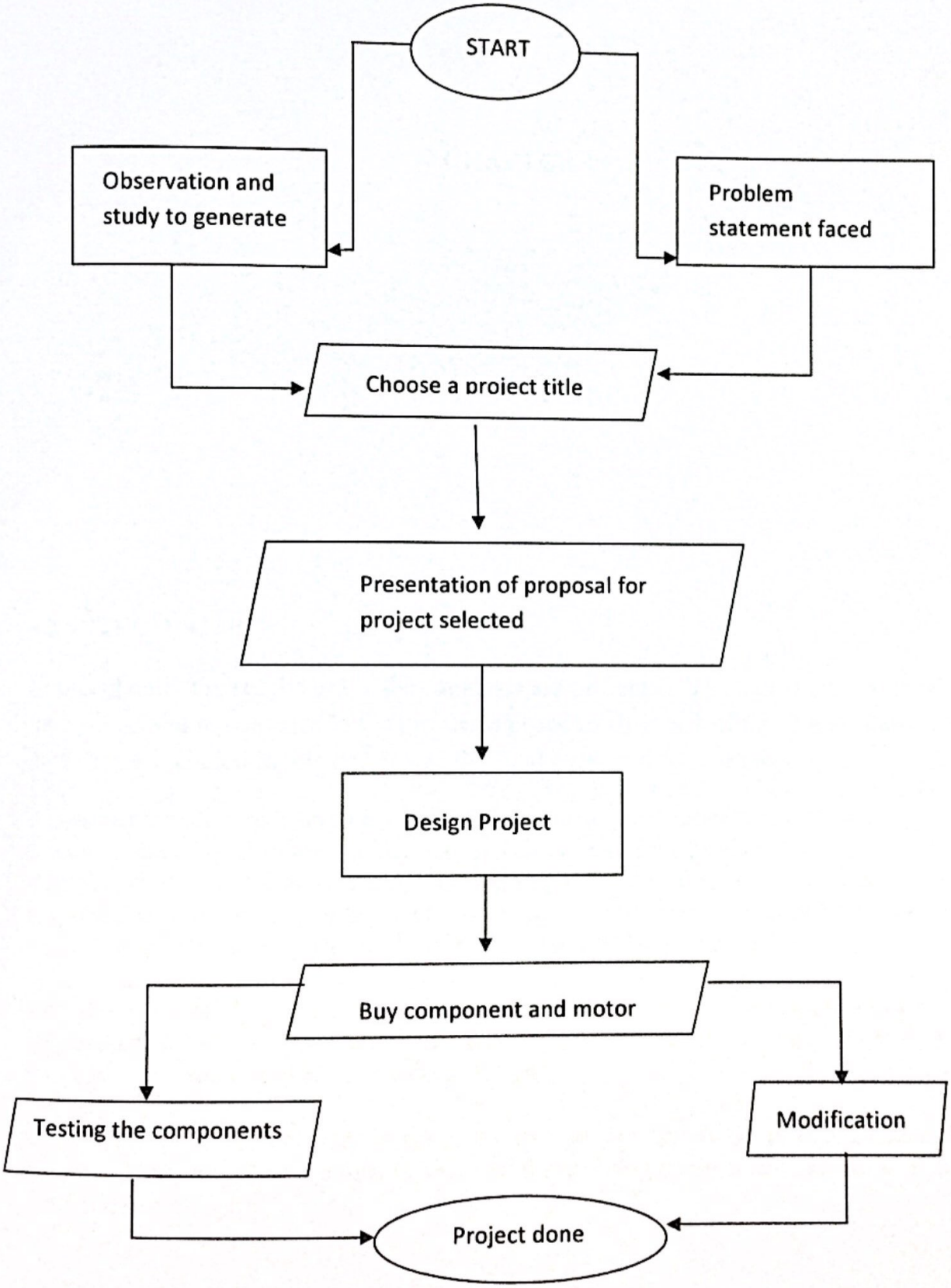




3.5 THE TIMELINE OF STUDY



3.6 FLOWCHART OF METHODOLOGY



CHAPTER 4

DATA ANALYSIS

4.1 INTRODUCTION

In this chapter the results of the data analysis are presented. The data were collected and then processed in response to the problems posed in chapter 1 of this dissertation. The data that is included in this report was the final answered for our project.

Customer satisfaction survey is one of the measuring instruments to review the effectiveness of quality service delivery to customers of the product. We have been targeting students of Electrical Engineering Department of semester one to semester six respondents to the survey in the next few lecturers in the Department of Electrical Engineering. This survey successfully received a total of 30 respondents.

The aim of the study was conducted and the report is to look at the response of the respondents to the use of the electronic walking sticks. In addition, the study was also to know are they satisfying enough of our design.

Finally, this report can be used to suggest measures to improve the products that have been produced based on the results obtained through suggestions and feedback received from the survey form

4.2 RELATIONSHIP BETWEEN DISTANCES AND TIME TO RESPOND

The relationship that is taken in this project is between the distance of the ultrasonic sensor can sense and the time of people to response. The table below is showing how the relationship is being measured.

DISTANCES (cm) / TIME TO RESPONSE (s)	2	4	6	8	10
50					
100					
150					
200					

4.3 EVALUATION TEST BY USING USABILITY (QUESTIONNAIRE)

4.3.1 Questionnaire before the project proceed (Public)

Based on the questionnaire that we have made, the results that we get are from 30 students of Polytechnic Sultan Salahuddin Abdul Aziz Shah. They are 15 people from male, and 15 people from female. Other than that, the age of the students that was surveyed is between 18-21 years old

QUESTION 1
As human beings that have a cleared eyes, are you concern about them that are blind?
YES / NO

QUESTION 2
From your opinion, are they need a blind stick in their daily lives?
YES/NO

QUESTION 3
Do you think that, the characteristic on the blind stick are quite enough?
YES/NO

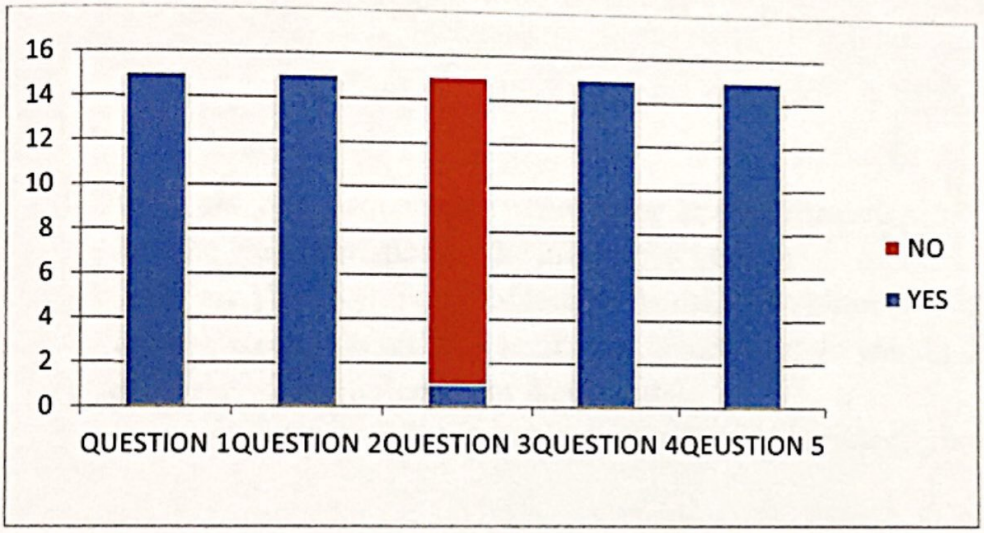
QUESTION 4

Are you agreeing if this development of electronic walking stick is introduced?
YES/NO

QUESTION 5

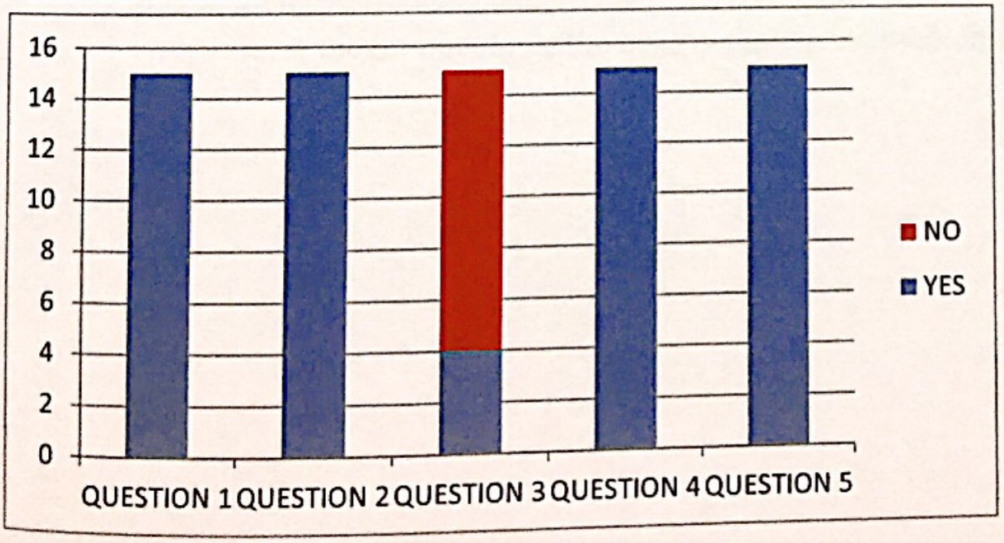
If this project is succeeding, do you think that you are going to introduced it to the community?
YES/NO

Chart 1 Male



By referring the graph, as you can see there is 15 people of male and it is all of the male are saying YES for the first question. It is the same for the question number 2. At the question 3, only one people are saying YES and the other 14 people are saying NO. Other than that, there is also all of the male student are agreeing or saying YES for the question number 4 and 5.

Chart 2 Female



By referring of the chart 2, there is no much difference with the chart 1 that is male chart. For the question number 1 and 2, it is 15 people of female people than being surveyed are saying YES. Different from chart1, there are 4 people that are saying YES, and the other 11 are saying NO. However, for question 4 and 5 all the female student is saying YES.

4.3.2 Questionnaire before the Project Succeed (Blind People)

There are three people that we had a conversation with. They are worked at massage Centre at Kuala Lumpur. They are naturally born in this way. So, they did give us some answer for the question that we've made for them.

QUESTION:

1. What are your experiences while using an existence stick?
2. Are the characteristics on the blind stick enough?
3. What are your common problem while using the blind stick in your daily lives?
4. If these electronic walking sticks are succeeding, do you think it will help decrease your problems that faced with?
5. Do you think you will be considerate to buy this product when the times come?

ANSWER:

1. Most of these blind people have used the blind stick for long time.
2. There is one people are saying that it is adequate, and the other said not enough and still need to innovate.
3. The common problem that they always have to face is fall down the drain.
4. They think, if this project is succeeding, it will help them and other blind people to face their problems in daily lives.
5. They said, if the product have the quality there is no problem to buy it.

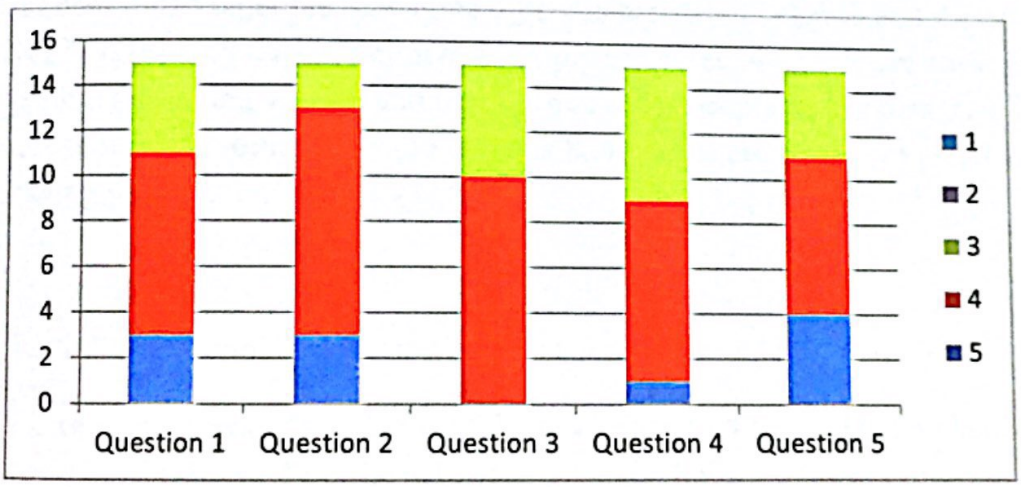
4.3.3 Questionnaire after the project succeed (Public)

5	4	3	2	1
Strongly Agree	Agree	Yes/No	Disagree	Strongly Disagree

Question

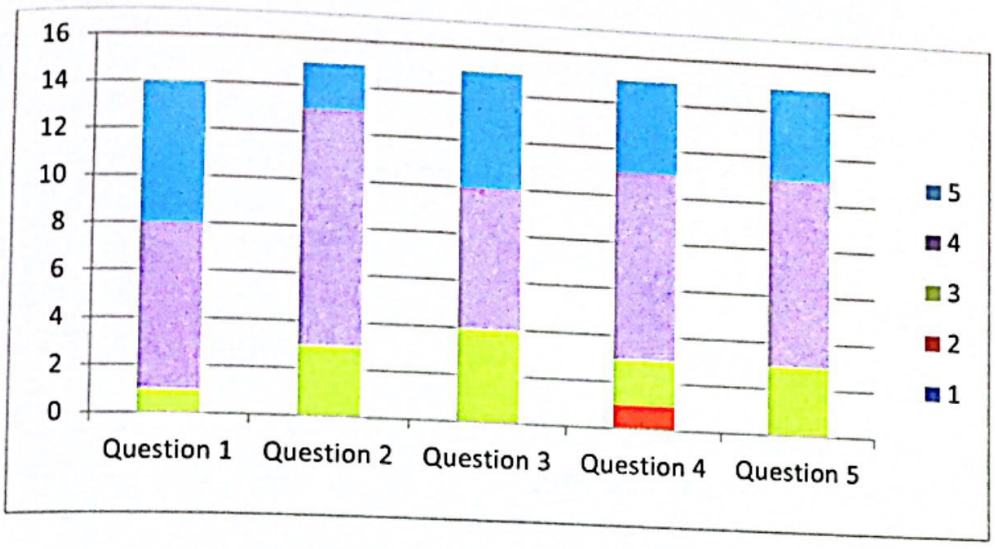
1. I think that it will help blind people
2. I think they will use it frequently
3. It has a good design
4. I think I would introduce it to other people
5. I think there is something more to be upgraded for the next time.

Chart 3 Male



Based on research, for the entire question, the most answer that is answered by male are Agree (4). In question 1, people are agreeing (4) is 8 people, 4 people are saying yes/No (3), and other 3 people are strongly agree (5). For question 2, there is 10 people are agree, 3 people are strongly agree, and the other 2 are saying Yes/No. There is 10 people are agree, and 5 other people are saying Yes/No for the question 3. Other than that, question 4 the number of people agree is 8, 6 people are saying yes/No the other 1 are strongly agree. Last but not least, 7 people of male are agree with this last question, and 4 people are strongly agree and saying yes/No.

Chart 4 Female



For chart 4 that is female results, based on the research there is no big difference from the chart 3 male results. This chart also most of the people is answering Agree (4) for the entire question. For question 1, there is 7 people are agree, 6 people are strongly agree and the other 1 are saying yes/No. In question 2, the people that agree are 10 people, 2 people are strongly agreed, and 3 other are saying yes/No. Other than that, question number 3 had 6 people that agree 5 people are strongly agree and the other 4 are saying yes/No. However, in question 4, 8 people are agree, 4 people are strongly agree, 2 people are saying yes/No and there is one other people that is disagree. For the last question, the number o people agree is 8, 4 people are strongly agreed and 3 other are saying yes/No.

4.3.2.2 Questionnaire after the project succeed (Blind People)

There is one respondent that we take as our product tester. He had been naturally blind since he was born. After he using our product, he had answer those questions.

Question:

1. How long have you been using walking stick?
2. Do you think this product can detect the object?
3. Do you think it useful for your daily lives?
4. How do you feel after using it?
5. Do you think you would by it, if the product is on market?

Answer:

1. I've been using the walking stick since I'm in primary school.
2. Yes, it can detect an object.
3. I think it is useful. But, I need to use every time to comfort myself with it.
4. I feel more confident to walk alone since it has panic button on it.
5. If this product on market, I will buy it with a suitable price.

4.4 EVALUATION TEST REFERRING TO RESPONDER

We have tested our project on two persons. First person are a normal person that is had a pair of clear eyes but in this test, this person have to close her eyes so that we would know how long that she takes to respond. The other person is a blind person that is blind since he was born.

4.4.1 Test in Normal Person

DISTANCES (cm) / TIME TO RESPONSE (s)	2	4	6	8	10
50	/				
100		/			
150			/		
200				/	

4.4.2 Test in Blind Person

DISTANCES (cm) / TIME TO RESPONSE (s)	2	4	6	8	10
50	/				
100	/				
150		/			
200			/		

4.5 CONCLUSION FOR EVALUATION TEST

Overall, this Electronic Walking Stick product is very suitable for all blind people that have face many problems while using the blind stick.

Other than that these projects have achieves the objectives by using the ultrasonic sensor (sense obstacle) that is functioning to trigger an object in front of it that will avoid an accident occur. It also makes the blind people to respond earlier than before.

Last but not least, the percentage of respondent that is interested in this product is high. It makes this product is suitable and it also have advantage that it's a good innovation.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The duration of this project, we have a lot of experience and knowledge in the areas of mechanical, electrical and electronic equipment. Besides that, also we always had been strong in facing all the problems that occur in the process of completing this project. Between the problems we face are the difficulty in obtaining Bluetooth module, clip and some mechanical things. We have referred to lectures, our parents and friends for solving this problem. Thank God, the problems that we had face were been solved.

As a conclusion, this project was implemented to do some innovation to the electronic walking stick to help blind people had an easy daily lives. Furthermore, it will also help family and friends of blind people let them independence. The '*Electronic walking stick* will gives benefit to our target users as it can be used anywhere because our project is helping blind people. We feel that our project is very useful for everyone especially for the blind people. The objectives of this project were being achieved.

5.2 RECOMMENDATION

Our project '*Electronic walking stick*' is to help blind people had an easier life. We were giving a lot of effort to do the mechanical part such as the design of the circuit. We were also gave more attention in choosing a good sensor that need specific criteria. After testing our product, the results is blind people used it smoothly and successfully. However, this innovation still needed an improvement. We plan to reduce the size of the casing, more simple circuit and reduce the weight. Based on the analysis of the study, the creation and completion of this project, it was found that the resulting project objectives have been achieved successfully. In addition, it can be beneficial to blind and visual impaired people.

5.3 REFERENCES

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