IOT BASED SMART BLIND STICK TO HELP BLIND PEOPLE

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This report submitted in partial fulfillment of the requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This project titled "IOT Based Smart Blind Stick to Help Blind People" submitted by *Md. Ashiqual alam* and *Md. Alimuzzaman* and *Khandakar Inzamamul Haque* to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering (BSc) and approved as to its style and contents. The presentation has been held on *06-01-2022*.

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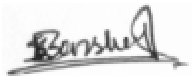

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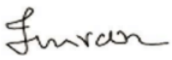

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We hereby declare that, this project has been done by us under the supervision of **Ms. Nasrin Akter, Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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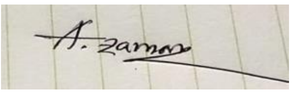

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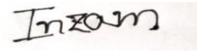

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With the help of Allah and the help and supervision of Ms. Nasrin Akter, lecturer in the Faculty of Science and Information Technology, we have been able to finish this project. Gratitude to her for being so willing to help, motivate, and guide us through this project. It was impossible to finish this project without her help and advice. Thanks for giving us the chance to choose this project. When we graduated from this university this year, we want to show our family all our love and thanks for their strong support and encouragement.

ABSTRACT

Currently the blind or visually impaired persons are using a simple helping stick to walk on the street or elsewhere and facing different problems regarding identifying obstacles. We came up with an idea of providing a smart blind stick to help them with identifying obstacles and walk safely. In this paper we have introduced a cost efficient and useful smart blind stick which will assist them to identify different obstacles and provide seamless walking. We were motivated to develop a smart blind stick to overcome these limitations. After designing the circuit in FRITIZING software we executed it into hardware. The smart blind stick is based on ultrasonic sensor and ESP-32 for visually impaired people. Ultrasonic sensors provide information about the environment to the user by activating the buzzer sound. Microcontroller (ESP-32) has been used to receive the signals from ultrasonic sensors and process them to a specific short pulses to the ESP-32 pins where buzzer is placed. Our proposed IOT based smart blind stick works at a range of given distance to detect obstacle and can deliver data to an android app. We tried to make a low cost smart blind stick by our project which is suitable for low income people and also it is light in weight. Our device can detect obstacles within the distance of about 30cm from the user.

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LIST OF ABBRIBATION

WHO	World Health Organization
LED	Light Emitting Diode
GPS	Global Positioning System
VCC	Voltage Common Collector
GND	Ground
IDE	Integrated Development Environment
TTL	Transistor–transistor logic
VLSI	Very Large Scale Integration
PCB	Printed Circuit Board
RF	Radio Frequency
RCA	Root Cause Analysis
USB	Universal Serial Bus
PC	Personal Computer
PWM	Pulse Width Modulation
SPI	Serial peripheral interface
TWI	Two wire interface
DC	Direct Current
DB	Decibel
IC	Integrated Circuit
AT	Assistive Technology

CHAPTER 1

Introduction

1.1 Introduction

1.1.1 Problem Definition

Vision loss is a common physical problem that cannot be corrected with spectacles or lenses and causes permanent visual damage to those who suffer from it. People who do not have access to glasses or contact lenses are also considered visually impaired. A visual acuity of less than 20/40 or 20/60 is commonly used to define vision loss or blindness. Blindness is a term that refers to total or nearly total vision loss. Uncorrected refractive errors (43 percent), cataracts (33 percent), and glaucoma are some of the most common causes of visual impairment worldwide (2 percent). Refractive errors include nearsightedness, farsightedness, presbyopia, and astigmatism. Cataracts are also among the most common causes of blindness. Other conditions that can cause vision problems include diabetic retinopathy, corneal clouding, childhood blindness, and a variety of infections, which are also responsible for vision loss. The World Health Organization (WHO) estimates that 80 percent of visual impairment is either preventable or treatable. River blindness and trachoma infections, cataracts, glaucoma, diabetic retinopathy, uncorrected refractive errors, and some cases of childhood blindness are still on the list. According to WHO statistics on blindness for 2018, there are 1.30 billion people worldwide who have some degree of vision loss. There are 217 million people who have low vision and 36 million who are blind. The majority of people with poor vision live in developing countries and are over the age of 50. The prevalence of visual impairment has decreased since the 1990s. Visual impairments have a direct economic impact due to the cost of treatment, as well as an indirect impact due to decreased ability to work.

1.1.2 Problem Identification

Visually challenged people usually use cane to detect obstacle and walk around which causes different problems for them as they cannot identify obstacle around them. This particular problem with normal cane often causes accidents and create frustration among victims as visually challenged people. Another choice that provides the best travel aid for the visually challenged people is guide dog. But guide dog is a costly solution and requires routine care.

Furthermore, many public transport facilities and areas like busses and malls prohibit pets to enter, creating problems for guide dog owners.

1.1.3 Counter Measures

While encountering with various problems with aiding visually impaired people we have come up with a cost efficient yet effective smart solution. This project will aid visually impaired people to lead their life properly. The Smart Stick is integrated with sensors and a high performance microcontroller (ESP-32). All these hardware all together will create a Smart Blind Stick which will aid visually impaired people in a cost effective and better way.

1.2 Problem Statement

Though the Smart Stick responses affirmative to aid visually impaired people, it has some negative issues as well. Firstly distance sensor is able to detect objects but it is not as detail oriented as human vision. Secondly, sounds of various pitches is being used to code the spatial information to be esoteric and hard to understand for users. Thirdly, renewable energy generation on the smart stick cannot be directly compared with the power utility.

1.3 Objectives

The main objective is to aid visually impaired people to roam around easily using this technology. This project proposes a smart blind stick for blind people to help them gain personal independence. In case user of the stick forgets where he kept the stick then he can press a button of the remote and find the stick by hearing the sound of the buzzer. In case of emergency user can send a notification to his family member’s cell phone by just pressing an alert button in the remote. Current location and a danger alert will be sent to the android application previously installed on the phone.

- **Cost**

As, targeted customer for this device are low income to middle income people, this device is prepared with incurring minimum level of costing.

- **Portability**

This device is very light and easy to carry which ensures high portability. Stick’s weight is around 1 kilogram.

- **Ease of Use**

User friendly technology increases ergonometric and in terms it will be efficient to use anywhere as well as for people with every age.

- **Power Consumption**

This device consumes very low amount of energy as it is comprised with 5V battery.

1.4 Scopes and Limitation

A variety of future extensions are available that can be used with the smart walking stick, for example, the use of Global Positioning System can assist the visually impaired person individually with sourcing to goal course data. Water sensor that detects any type of water, allowing visually impaired individuals to walk safely and avoid slipping. More applications, such as vehicle detection, oncoming vehicle identification, and fire or smoke warning, can also be included. Now, IoT-based developments are being implemented, but in the future, image processing and machine learning can be used to make this device more efficient and useful.

1.5 Methodology

The way this smart blind stick works is that it's used as a detection board for people who are blind for certain reasons. An ultrasonic sensor is used in this system to identify obstacles in the path of a person who is blind. ESP-32 uses the information from the ultrasonic sensor to determine whether or not an obstacle exists and then sends that information to the ESP-32 in order to determine the distance between sending the flag and receiving it back.

We know that,

$$\text{Distance} = (\text{Speed} \times \text{Time})$$

$$S = V \times T$$

Speed of sound in air medium, $V = 340$ m/s

$$= (340/10{,}000)\ \text{cm}/\mu\text{s}$$

$$= 0.034\ \text{cm}/\mu\text{s}$$

So, the formula is,

$$S = (0.034 \times T)\ \text{cm}$$

Ultrasonic signals of the sensor travel through air in a speed of 341m/s. The time indicates the total time for sending the signal and receiving it back. Whereas the distance travelled by the signal is double, it is divided by two for finding out the actual distance.

$$\text{Distance} = (\text{Distance} \div 2)$$

$$S = ((0.034 \times T) / 2)\ \text{cm}$$

Ultrasonic sensor HC-SR04 is a 4 pin board which is set on the keen strolling stick. The Vcc of ultrasonic sensor is associated with 3.3v power supply, the Echo pin of the sensor is associated with pin number 33 of ESP-32 to receive the signal sent from trig pin of the ultrasonic sensor. Trig pin of the ultrasonic sensor is associated with pin number 32 of ESP-32 and The Ground pin of the sensor is associated with GND of ESP-32. The microcontroller processes the information that originating from ultrasonic sensor and activates alarms through Buzzer.

User of the stick will have a personal remote. Different buttons will have different functions. The user can use those buttons as the need of the concurrent situation.

GPS module will remain turned on after powering up the device.

Clear sky-view is mandatory for the GPS module to lock available satellites and keep updating the current location of the user.

Esp-32 collects the value of latitude and longitude from the GPS module and transfers the data to the Blynk app server through internet connection.

The command condition is as follows:

- If the distance between the obstacle and the smart walking stick is less than or equal 30cm, it will send the command as the obstacle is close to the smart walking stick.
- If the distance between the obstacle and the smart walking stick is greater than 30cm, it will send the command as the obstacle is far away from the smart walking stick.
- If the user forgets where he kept the stick then he will press the a button of the remote a buzzer will start beeping in a specific pattern and the user will start searching the stick in the room or somewhere outside.
- If the user faces a critical situation or get lost in the roadside then he will press button to send an emergency notification to the application which is installed into his family member's mobile.

1.6 Project Outline

This project report comprises six sections which are Introduction, Background, Description of Components, Analysis and Simulation, Result and Discussions and Conclusions.

Part 1 is the presentation of the primary thought and imperative of this project. In this part, we initially clarify the issue of outwardly debilitated individuals at that point and depict the current arrangement of its. What's more, after that we portray out proposed answer for outwardly disabled individuals. Likewise we talk about the question of our undertaking. And after that portray the future extension and working approach.

Part 2 is the foundation of the undertaking. In this part audits of some related deals with outwardly disabled strolling helps.

Part 3 is the Description of segments which portray all segments that are utilized in the undertaking.

Part 4 is the Analysis and recreation of the task that shows the proposed answer for outwardly hindered individuals with the square graph and flowchart. Additionally in this section concentrated on equipment and programming structure of the undertaking.

Section 5 is the Result and Discussion where all the tried outcome is acquired. Additionally examine about that outcome. In this part likewise talk about the cost investigation of the project.

Part 6 is the Conclusions. In this section we talk about the end, impediment of the project and future work of the undertaking.

CHAPTER 2

LITERATURE REVIEWS

2.1 Related Works and Existing System

For people who appear to be feeble, this section displays what's appropriate, tackling the progress made by magnificent sticks. People who struggle with a sense of inadequacy may find that technological innovation might lessen some of the challenges they face. Various types of impediments, such as physical deficiencies, hearing impairments, and apparent hindrances, are conveyed by the term "assistive advancement" (AT). They have benefited from the advancements in assistive technology (AT). In any event, the development of an AT is at the pinnacle, resulting in a high level of mobility. There are several ways to help those who appear to be stuck, as proven by Mazo and Rodriguez, and one of them is an outwardly weaker blow. To a large extent, the physically disabled population, as demonstrated by Herman, has lost their credibility. Furthermore, they have little faith in their own abilities. Bouvrie has shown this paper, which includes the results of an investigation dubbed Project Prakash. It was designed to see if the supposedly disabled could use their minds to discern various things. With the example of Chang and Song, the same can be applied to a wide range of situations. They will find it difficult to recall the areas of investigation or obstacles when they move around another circumstance in which they appear to be frustrated. These models depict the difficulties faced by people who appear to be in a medically induced coma. Using the Guide Cane, clients who appear to be impeded can quickly and safely navigate around obstacles and unique threats. The customer walks with the Guide Cane in front of them while using a Guide Stick, which is similar to the widely used white stick. Guide Canes have servo motors, making them heavier than the white sticks. Encoders are included in the wheels to allow the user to select the relative rate of development. As long as the verified PC is used to control the wheel servos, they can be coordinated right next to the stick. The Guide Cane is equipped with 10 ultrasonic sensors in order to detect obstacles. The customer can agree on a correct development orientation with the help of a smaller-than-average joystick mounted on the handle. The guide cane is much heavier and more difficult to manage than a standard white stick because it cannot be crumpled. Despite the fact that it began as the design of a conventional externally hindered stick, Splendid has since evolved into a sensor-equipped device. This development appears to pave the way for future developments that utilize the several ultrasonic sensors built into this device. With this advancement in servo motor structure and performance, it is now possible to assist those who are physically impaired in their research. Ultrasonic sensors must be able to detect and maintain a critical distance from any obstacles or items that may be in the way of the customer's view. It's at this point that the controller must decide on the rules that will be applied, such as turning right or left. As an analogy, this improvement has a control button on the handle that has four distinct arrows on it. The guide stick includes a few sluggish spots where it may be difficult to save space or place the adroit stick. Otherwise, the project's cost is a weakness because the individuals who would be affected by it receive little to no regular compensation. Undergraduates from Central Michigan University organized Splendid, which makes use of Radio Frequency Identification (RFID) (RFID). When RFID is used to identify customers, it identifies the REID name that has been pre-programmed in a few districts. The consumer wears a sack with this improvement, which is much the same as a regular stick. Sacks with speakers inside inspire the customer to take responsibility of their own development. Customers who are deaf or hard of hearing can benefit from special gloves that vibrate at each finger, each with a distinct level of intensity, for those who are unable to hear.. However, this enhancement has a few drawbacks and is best suited for small districts. Due to the fact that it only recognizes zones marked by an RFID tag, this innovation essentially functions as a regular outwardly disabled stick. Furthermore, this improvement necessitates a staggering price tag if employed outside due to the large area that needs to be marked and the staggering price. It is proposed that the standard work among the allegedly blocked individuals be supported by a mechatronic stupor stick. There are many similarities between its development and the magnificently weakened bamboo. As a result of which this invention employs sound vibration and ultrasonic sensors. In any event, there are a few flaws in this work as a whole. In order to save it, you'll need a lot of effort. Furthermore, this upgrade does not include sensors that can detect water bodies. Even infrared-based intelligent stupor sticks exist in reality. A massive amount of research and study is being done to create a fine instrument that provides the customer with an unparalleled foundation for their feet. Magnificent vision is just one of many. Hough development and precise edge pointing make this a suitable structure for finding way borders. It is possible for the board to detect obstructions that are both stationary and moving at the same time. The history is relived by a camera attached to the customer's host, and the latte is made by a maui-caleb lighted, and naturally and normally impelled, major core interests in the client. In addition to Fernandez and Costa and Filipe and Hadjileontiad and Barroso, there is more work being done. The board explains to the customer how to get around the obstruction. Identity cameras, such as Profundities, are capable of capturing images that can be used to identify and categorize objects based on their quality. In addition to the current white can, Brilliance is a board that is capable of recognizing low-hanging shelter, such as the trunks of trees. For ground blockage and low hanging obstruction, the ultrasonic range sensor in It 8 has an unusual mass vibrating motor. Ultrasonic sensors allow a watchful guide stick to discern apart deterrents, but it is unable to determine whether or not a block is under construction. With the help of ultrasonic sensors, a remote ultrasonic going structure is able to identify obstacles, while the PIC16F877 microcontroller is able to locate the tangle's detachment. The phone connected to the microcontroller understands the data and sends it to the Bluetooth earphone to alert the client to the situation at hand. An indoor impediment help for 6 Degree of Freedom boardpost estimation with a minimum amount of support is proposed by Amirhossein Tamjidi Cang Ye and Soonhac Hong. An indoor GPS system is used to track the location of people who appear to be disabled. Additionally, it aids in catching exposure and allows the ostensibly hindered to move about freely. A RANSAC-based plane discovery approach has been suggested by C.Ye and X.Qian, in which the complex geometry of 3D data ensures correctness. A mechanical navigational load-up aiding the purportedly tried would employ this strategy. Using haptic feedback, the Augmented White Cane with Multimodal Haptic Feedback developed by S. Gallo, D. Chapuis, L. Santos-Carreras, Y. Kim, P. Retornaz, and H. Bleuler and R. Gassert mimics the lead of a gradually drawn-out stick. The analysis is provided by a stagger, which can detect clear points of interest and will release the engine's essentiality from a spinning wheel in a regulated aggregate utilizing two fi k providing modules. Energized on the customer's hand, the spatiotemporal vibration arrangement creates the vibe of a distinct improvement in case there should be an incident of a moving check The work of Larisa Dunai and Guillermo Peris Fajarnes offers an alternative strategy. Continuous Assistance Prototype Another Navigation Aid for Outwardly Weakened People" features stereo-vision advancement fusing persistent static and moving barrier and freeway area. Through the transmission of auditory signals, the structure presents the customer with a three-dimensional experience. The image is captured using a protective top equipped with many stereo cameras. Workstation forms are shown on the screen, and the customer is terrified via headphones. Nature's knowledge, exchanged with the aid of mobility aids. There are a wide variety of products on the market, as well as a few that were developed later. Some of them are without a doubt farther developed than the task that is being provided. Regardless, many of the first ones are stunning, but require a lot of time and money to maintain. Due to this problem, they are no longer relevant to the filmmaking community, let alone the poor and other people who live in more remote parts of the common domain. Most elderly persons are unable to operate such complex machines. They require something that is simple to use, doesn't require any effort, and is organized in a nonsensical manner. We're all about meeting this demand.

2.2 Summary of the chapter

In this chapter, we described some related works on visually impaired people walking aids and helping sticks.

CHAPTER 3

DESCRIPTION OF COMPONENTS

3.1 Introduction

This section depicts the hypothetical data of this task associates with the explicit application and the air interface. Every practical segment of this undertaking are portrayed in incredible express. This archive can help us rapidly see all board interface particulars, electrical and mechanical subtleties. We utilized ESP-32, Ultrasonic sensor, Buzzer, DC to DC voltage converter, RF transmitter, RF receiver, GPS module and lithium-ion batteries to design the smart blind stick for blind people.

3.1.1 ESP-32 Boards

In addition to Wi-Fi and Bluetooth connectivity, the ESP32 microcontroller offers a wide range of features. The ESP32 is a powerful chip when it comes to the Internet of Things (IoT). Next up is ESP32, which is an upgrade to the ESP8266. Espress if Systems developed this low-cost, low-power system on a chip (SOC) series. For the first time in the history of programmable circuit boards, Esp-32 does not necessitate the use of an additional piece of hardware for programming. Because it employs a simpler form of C++, the IDE simplifies the programming process. For the first time, the ESP-32 microcontroller comes in a normal-sized packaging that makes it easier to access all of its components.

3.1.2 Purpose of ESP-32 Boards

These Boards have been used for making distinctive ventures. The item on this board is basic, to use for understudies, yet versatile palatable for innovative customers. It continues running on windows, Mac and Linux. Teachers and understudies in the schools use it to build, ease consistent mechanical assemblies to attest the gauges of material science and science. There are distinctive other microcontroller stages reachable for physical enlisting. ESP 32 board s, the Net media's BX-24, MIT's Handy board, Parallax Basic Brand, Phi get and diverse others present related convenience. Esp-32 moreover makes less troublesome the working methodology of microcontroller, anyway it gives about favored point of view on over various systems for students, teachers, and understudies.

3.1.3 ESP 32 Board's Features

Table 3.1 Features of ESP 32 Boards

ESP-32 Board's Model	**Processor**	**Memory**	**GPIO Pins**
ESP32 DEVKIT DOIT	Tensilica Xtensa Dual-Core 32-bit Microprocessor, Running at 160 or 240 MHz	520KB SRAM, 4 MB flash	30 and with 36 GPIOs.
ESP32-S3-DevKitC-1		8MB Flash + 2 MB PSRAM	45
ESP32-S3-BOX		16 MB Flash + 8 MB PSRAM	41
TTGO T-Call SIM800L		QSPI flash 4MB / PSRAM 8MB/ 520 KB SRAM	14

3.1.4 Different Types of ESP 32 Boards

There are many boards available in the market. The list of ESP-32 boards contains the following such as:

- DOIT Devkit V1
- WEMOS LOLIN 32
- Huzzah32
- ESP32-S3-Korvo-2

3.1.5 Esp-32 DOIT Devkit V1

The Esp-32 is the best ordinary board and the price is very low. It is impeccable with most available sensors and modules. Esp-32 is an open-source physical figuring stage subject to a fundamental I/O board and an improvement, circumstance that executes the Processing.

Esp-32 can be used to make stand-alone devices or can be controlled with programming.

Fig. 3.1 Esp-32 DOIT Devkit V1

The “Esp-32 DOIT Devkit V1” is a microcontroller board based on Tensilica Xtensa Dual-Core 32-bit Microprocessor. It has 30 digital input/output pins and 16 pins can be used as PWM outputs analog inputs, a USB connection, 1 boot and 1 reset switch. It has everything onboard needed to support the microcontroller; simply connect it to a computer with a USB cable. You can do experiments without any stress too ample about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

3.1.6 Technical Specifications of ESP 32

Table 3.2 ESP 32 Technical Specifications

Microcontroller	ATmega328P – 8bit AVR family microcontroller
Operating Voltage	3.3 V
Recommended Input Voltage	5-12V
Input Voltage Limits	5-20V
Analog Input Pins	30
Digital I/O Pins	30 (Out of which 18 provide PWM output)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
Flash Memory	4mb
SRAM	520 KB
EEPROM	512 bytes
Frequency (Clock Speed)	240 MHz

3.1.7 Pin diagram of ESP-32

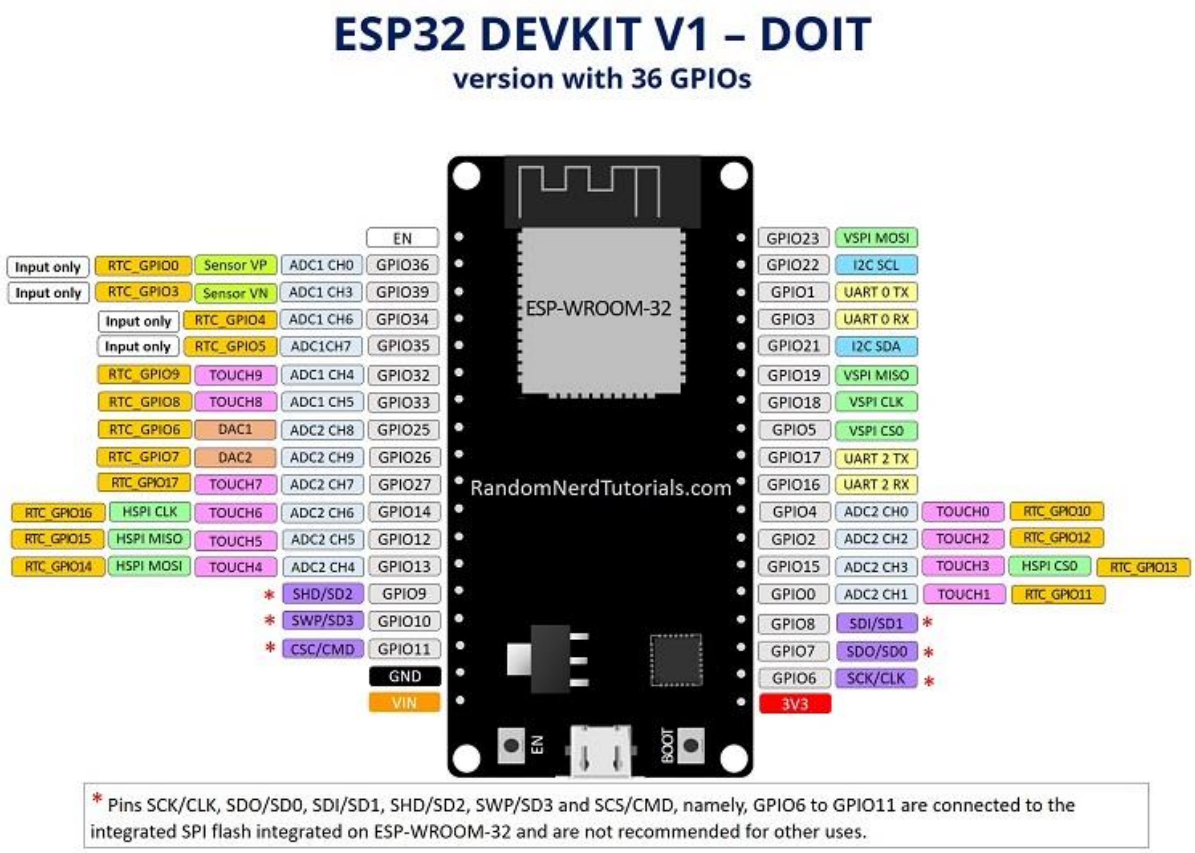

Fig: 3.2 Pin diagram of ESP-32

3.1.8 Short description of the pins:

Table: 3.3 Short description of the pins

Pin Category	Pin Name	Details
Power	Vin, 3.3V, GND	Vin: Input voltage to esp-32 when using an external power source. 3.3V: 3.3V supply generated by on-board voltage regulator. Maximum current draw is 40 mA. GND: ground pins.
Reset	Reset	Resets the microcontroller.
Analog Pins	All pins	Used to provide analog input in the range of 0-3.3V
Pins of Input /Output	Digital Pins	Can be used as output or input pins.
Serial	(Rx), (TX)	Used to receive and transmit TTL serial data.
External Interrupts	2, 3	To trigger an interrupt.
PWM	18 pins	Provides 2 * 8-bit PWM output.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication.
Inbuilt LED	2	To turn on the inbuilt LED.
TWI	21 (SDA), 22(SCL)	Used for TWI communication.

3.2 Ultrasonic sensor

An ultrasonic sensor is a device that uses ultrasonic sound waves to estimate the distance to a body. A transducer is used by an ultrasonic sensor to emit and receive ultrasonic heartbeats, which pass back data about the proximity of an item. High-recurrence sound waves reflect, from limitations to offer discrete, reverberating shapes.

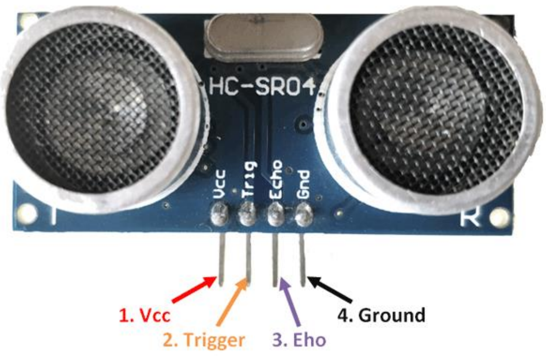

Fig: 3.3 Ultrasonic Sensor

3.2.1 Ultrasonic Sensor Pin Configuration

Table: 3.4 Ultrasonic sensor pin configuration

Pin Number	Pin Name	Description
1	Vcc	The Vcc pin powers the sensor, typically with +5V
2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be identical, to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

3.2.2 HC-SR04 Sensor Features

- Working voltage: + 5V
- Theoretical Measuring Distance: (2 – 450) cm
- Practical Measuring Distance: (2 – 80) cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15 mA
- Operating Frequency: 40 Hz

3.2.3 Working Principal of Ultrasonic Sensors

Ultrasonic sound vibrates at a constant frequency that exceeds the range of human hearing. The transducers are the speakers that are used to receive and transmit ultrasonic sound. Our ultrasonic sensors, like others, use a single transducer to send and receive a heartbeat. The sensor determines the detachment from a target by calculating the time interval between sending and receiving the ultrasonic pulse.

3.2.4 Use of ultrasonic sensor

Ultrasound is trustworthy in any lighting condition and can be used inside or outside. Ultrasonic sensors can manage crash avoiding for a robot, and being moved consistently, as long as it isn't likewise snappy. Ultrasonic are so commonly used, they can be constantly executed in grain repository distinguishing applications, water level recognizing, drift applications and identifying vehicles at your neighborhood drive restaurant or bank. Ultrasonic rangefinders are regularly used as contraptions to find an accident.

3.3 GPS Module

This is pretty simple GPS module which is very easy to use. It can spit nonstop data strings of NMEA type. The communication of the module uses simple serial connection of the RS232. NMEA is National Marine Electronics Association and it is a standard text protocol commonly used by many GPS modules.

Fig 3.3 U-blox NEO-6M GPS module

3.4 TP 4056 board

The TP4056 chip is a lithium Ion battery charger for a single cell battery. It protects the cell from over and under charging, so the battery lasts longer. It has two lights that show when it's charging and when it's done. It can also charge at a rate of up to 1A.

Fig 3.4 TP 4056

3.4.1 Examples

1. Used in various devices with different models.
2. Many devices with rechargeable battery uses this board for recharging and protection purpose.

3.5 Buzzer

A buzzer is an audio signaling instrument that can be mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic, or piezoelectric. A piezoelectric buzzer can be controlled by an oscillating electrical circuit or another source of audio signal. A click, beep, or ring can signal that the system has changed in some way.

Figure 3.5 Buzzer

3.5.1 Types of Buzzers

There are numerous types of buzzers. We carry a variety of the most common varieties at Future Electronics, sorted by type, sound level, frequency, rated voltage, dimension, and packaging type. The parametric filters on our website might assist you in refining your search results based on the specified criteria. The most comparable sound level sizes are 80 dB, 85 dB, 90 dB, and 95 dB; however, we also provide buzzers with a sound level of up to 105dB. Numerous varieties are available, including electro-acoustic, electromagnetic, electro mechanic, magnetic, and piezo.

3.5.2 Applications for Buzzers

Typical uses of buzzers include:

- Alarm devices
- Timers
- Confirmation of user input
- Electronic metronomes
- Annunciator panels
- Game shows
- Sporting events
- Household machinery

3.6 LED

An LED is a simple semiconductor that emits light when an electron flows across it. LED lights are extremely efficient, consume little energy, and have a much higher luminosity. A three-digit LED display indicates the output voltage of each channel. A light-emitting diode (LED) is a semiconductor device that emits light.

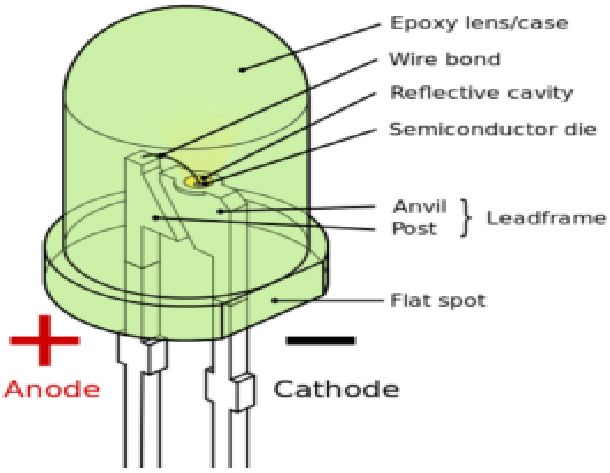

Figure 3.6 LED

3.6.1 Types of LED

- Through-hole LEDs
- SMD LEDs (Surface Mount Light Emitting Diodes)
- RGB LED (Red – Blue – Green Led)
- High – Power LEDs
- Bi-color LEDs

3.6.2 Working Principle of Led

LED is a two-lead semiconductor which works as a source of light. It contains a p–n junction diode inside that emits light when power passes through anode and cathode. Specific amount of voltage should be given to the leads, then electrons will be able to recombine with electron dumps within the device and release energy in the form of photons. This effect is so-called electroluminescence, and the color of the light is determined by the energy band gap of the semiconductor.

3.7 Switch

It is a frequently used physical circuitry component that regulates the flow of signals across a circuit's path. A switch enables the opening or closing of a connection in the circuit in which it is installed. When a switch is opened, it permits the flow of a signal or electricity through the connection. When a switch is closed, it interrupts the flow of signals or energy along that path and disconnects the circuit.

Figure 3.7 Switch

3.8 Jumper Wires

A jump wire is an electrical wire, or a group of them in a cable, with either a connector or a pin at each end used to connect breadboard or other prototype or test circuit components without soldering Each jump wire's "varnish connectors" are linked to the breadboard's header connection by inserting their heads into the breadboard's slots.

Figure 3.8 Jumper Wires

3.9 Summary of the chapter

In this section, we presented every equipment that we have utilized in the task. Additionally we examine the element, working principal, types and case of the equipment.

CHAPTER 4

ANALYSIS AND SIMULATION

4.1 Block diagram of the project

In this undertaking, the framework is planned in such a technique, to the point that it gathers information about nature by means of ultrasonic sensors and concentrates the visual data from that information. This visual data is then changed into a sound flag promptly and the visually impaired customary can perceive the ecological data through vibration engine and bell sound created by the framework. The entire activity of the task can be expressed by utilizing square chart. Figure 4.1 speaks to the essential square chart of the whole arrangement of undertaking.

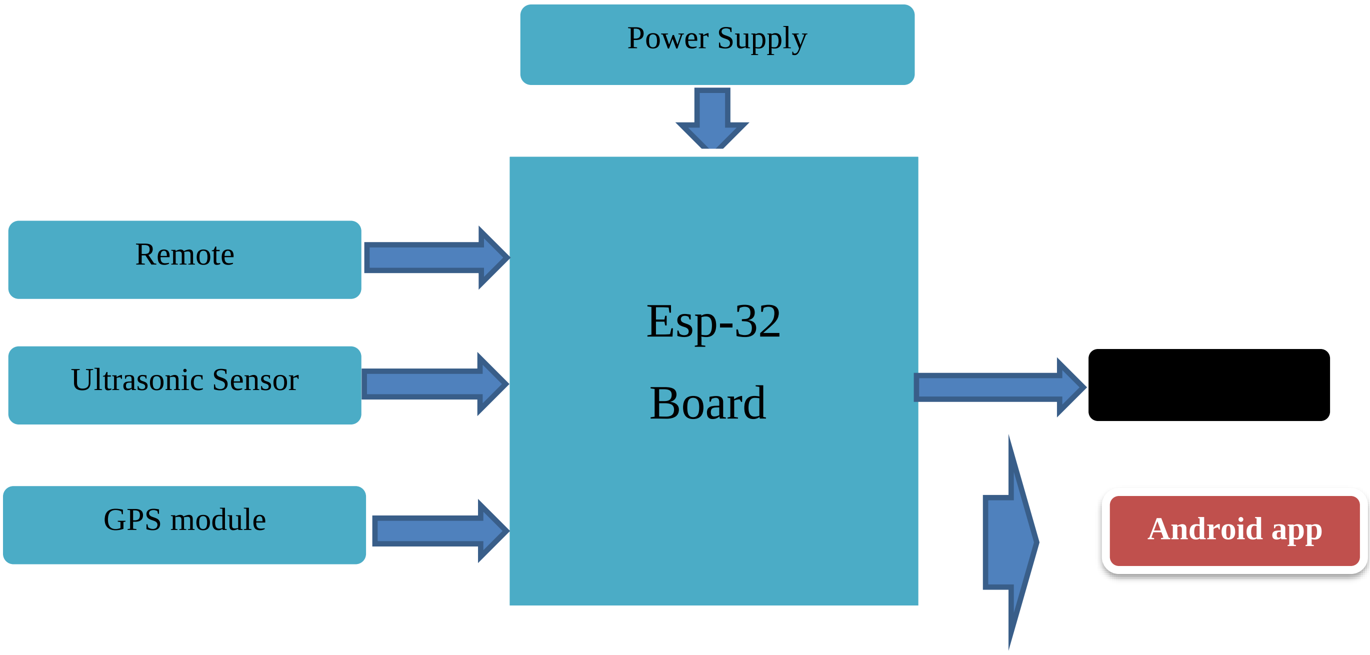

Fig 4.1: Block diagram of the IOT based Smart Blind stick

So as to portray the entire task of the project, it is required to clarify the square graphs of Figure 4.1. The ultrasonic sound sensor is situated in the stick so the bell must be activated when the structure identify any obstruction.

Our task first uses ultrasonic sensors to recognize hindrances. On detecting hindrances, the sensor passes this information to the Esp-32. The Esp-32 then systems this information and computes if the hindrance is close enough. The scope of the deterrent from the sensor is set to the framework. On the off chance that the obstruction is close the Esp-32 sends a notice through continuous buzzer sound. Also, if the impediment is far the Esp-32 sends a notice through signal bell sound. Be that as it may, if the structure distinguishes that there is no obstacle then there will be no sound in the buzzer.

So the outwardly hindered individual can undoubtedly comprehend the deterrent is close or not. So there will be no inconvenience for either crossing the street or strolling in the stairs for an outwardly disabled individual.

4.2 Flowchart

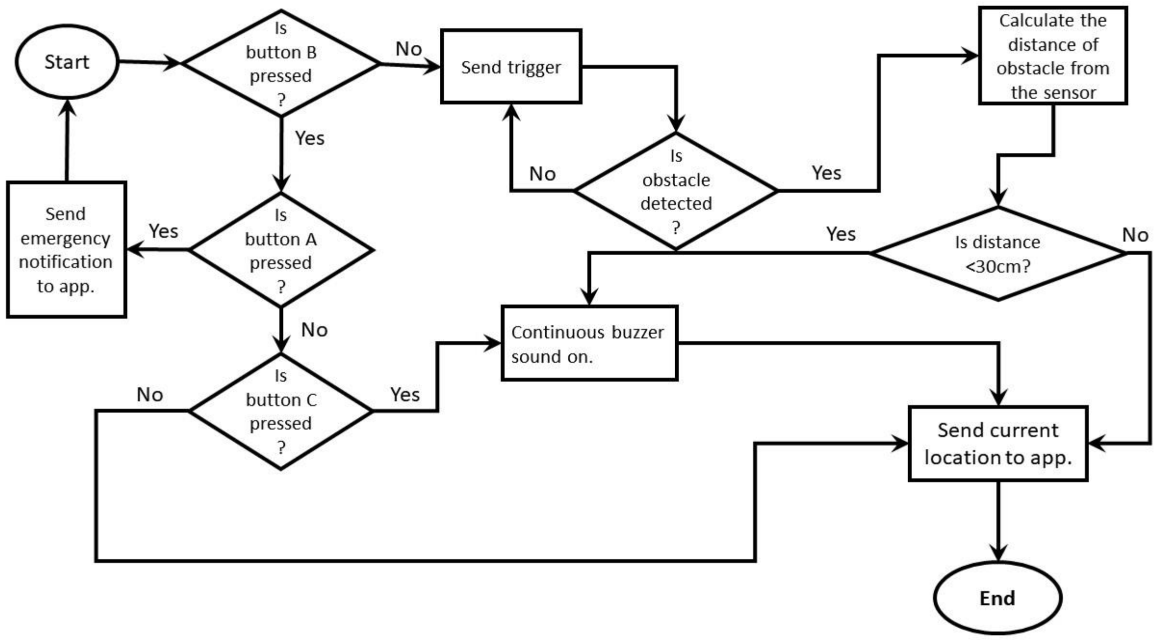

Fig 4.2 Flowchart of the smart blind stick

4.3 Circuit Design

Proteus v7.8 was used to create the circuit illustrated in Fig. 4.3 to simulate the project. Lab center Electronics created Proteus as a simulation and design tool for electrical and electronic circuit design.

About PROTEUS

It includes ISIS, which can be used for circuitry modelling and fabrication, as well as ARES, which is used for Circuit board.

- Wiring diagrams are drawn and devices are simulated using ISIS software. Human interaction is allowed while the scenario is running, allowing for authentic reproduction.
- The library of ISIS has a large variety of components. Measurement and analysis tools such as an oscilloscope are included in the package. Probes for real-time monitoring of circuit parameters, switches, displays, loads like engines and lamps, discrete components like resistors, capacitors, inductors, transformers, digital and analog Integrated circuits, semi-conductor switches, relays, microcontrollers, processors, sensors, and so on.
- ARES offers PCB designing up to 14 inner layers, with surface mount and through whole packages. It is embedded with the foot prints of various category of components like ICs, transistors, headers, connectors and other discrete components. It gives Auto routing and manual routing options to the PCB Designer. The schematic drawn in the ISIS can be frankly transferred ARES.

Proteus is an easy-to-use and vital piece of software for designing and simulating electronic circuits. After setting up the circuit, the relevant components can be emulated using the library's knowledge. The entire project must be run on the microcontroller, which must include the hex file. Complete microcontroller designs can be co-simulated with Proteus using circuit simulation.

We're using this software since it's easier to design and model circuits with than other tools. ESP 32, an ultrasonic sensor, a buzzer, a red LED, a blue LED, a green LED, a pot-hg, and a virtual terminal are all employed in the circuit design and implementation.

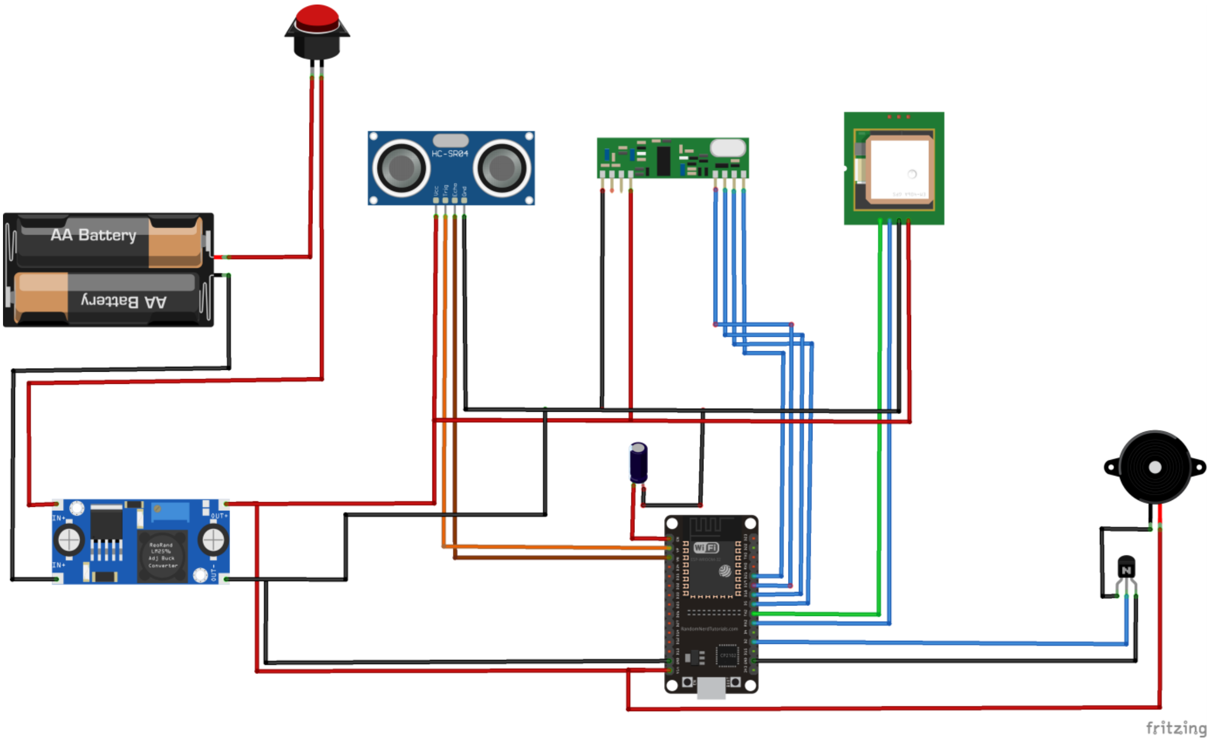

Fig 4.3: Schematic Diagram of the circuit

4.4 Device Design

The design prototype of the whole project was completed after the hardware implementation. Figure 4.4 shows the hardware implementation of the whole project.

Fig 4.4: Proposed Smart Blind Stick for Visually impaired people

Application Interface:

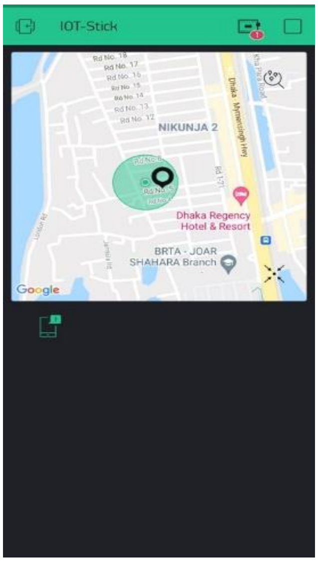

Fig 4.5: Proposed Smart Blind Stick for Visually impaired people

4.5 Summary of the chapter

In this section shows the savvy strolling stick for outwardly impeded individuals with square chart and flowchart. Additionally centered on programming structure and equipment plan of the task.

CHAPTER 5

RESULT AND DISCUSSION

5.1 Result

The system presented here is well-organized and well-suited for practical application. The architecture is capable of dealing with three different situations that blind people may find themselves in. The architecture responds towards each situation by coding and introducing a microcontroller-specific software.

- When impediment is recognized by the ultrasonic sensor in the close or a long way from the stick, at that point ESP-32 send the message to the visually impaired through signal and vibrator. Likewise red and blue drove will be on.
- But if no hindrance is recognized, ringer and vibrator are off and just green driven will be on.

A basic, shabby, configurable, simple to deal with electronic direction framework is recommended to give productive partner and support to dazzle and outwardly hindered people. Our proposed structure for outwardly debilitated individuals fundamentally rely upon ultrasonic sensor. We pick ultrasonic senor for working our task since it is in a perfect world suited to right, programmed remove estimation in common and troublesome situations and furthermore it is exceptionally exact, stable and can be utilized over expansive reaches. Our proposed plan "shrewd strolling stick for outwardly weakened individuals" is tried, by putting different deterrents at various separations from the sensor. The framework is effective in notice the client about the adjacent and far hindrances in their way. The separation determined dependent on the accepting heartbeat (resound) isn't hundred percent precise, however, we consider the most pessimistic scenario and hence furnish with the best outcomes to stay away from the hindrance. The test outcomes have been recorded in Table 5.1.

Table 5.1 Smart walking stick for visually impaired people test result

Serial Number	Obstacle Distance (cm)	Range of the obstacle	Output
1	12	Obstacle is near to the stick	Continuous buzzer sound
2	23	Obstacle is near to the stick	Continuous buzzer sound

3	31	No obstacle	Buzzer turned off
4	10	Obstacle is near to the stick	Continuous buzzer sound
5	20	Obstacle is near to the stick	Continuous buzzer sound
6	5	Obstacle is near to the stick	Continuous buzzer sound
7	18	Obstacle is near to the stick	Continuous buzzer sound
8	140	No obstacle	Buzzer turned off
9	201	No obstacle	Buzzer turned off
10	365	No obstacle	Buzzer turned off

5.2 Discussion of Result

The technology is conceived, built, tested, and validated. The program's real-time results are impressive, with an efficiency of 93 percent in identifying distance. The results show that the system is usable and unique in its capacity to specify the premise and proximity of things that may come into contact with the blind. It can estimate the distance between two points in front of a blind man. As a result, individuals who took part in the test preferred it. The ultrasonic sensor has been fully exploited in order to improve blind or visually impaired peoples choices movements in a comfortable and autonomous manner.

5.3 Cost Analysis

Table 5.2: Cost analysis of the smart blind stick for visually impaired people project

No	Equipment Name	Quantity	Price(Taka)
1	Esp-32	1	420
2	Ultrasonic Sensor	2	140
3	Buzzer	1	20

4	TP 4056	1	130
5	Adult Moving Stick	1	600
6	GPS	1	300
7	Receiver	1	30
8	Remote	1	150
12	DC to Dc voltage converter	1	60
Total			1850

5.4 Cost Comparison

Globally, there are an estimated 45 million blinded persons, with 87percent of total of those individuals live in poor nations. So the plan of the "smart blind stick for blind people" project aim is to provide the low cost smart helping stick to the blind. Before making the smart blind stick project, we justified the local market price of the project equipment. There are many types of ESP 32 in the market which price is very high but we choose the lowest one. Also, the ultrasonic sensor price is very high. But we found in the market which price is low. Basically, our design smart walking stick for visually impaired people is operated and total cost is 1850 Taka. Above table 5.2, the equipment cost per unit and total cost is shown. The other blind stick project cost is nearly 2500 taka in the market. So, we say that the cost to design the smart walking stick is cheaper than other blind stick project and also the equipment can be replacement which are available in the market.

5.5 Summary of the chapter

In this chapter firstly, we shown the result that was tested, by placing various obstacles at different distances from the sensor. Then we discuss about that result. Also we analysis the cost to complete this project. And after that we comparison the cost according to market.

CHAPTER 6

CONCLUSIONS

6.1 Conclusion

The innovations of smart blind stick are updating step by step. This paper has depicted the framework and research gadget which gives a tremendous help and support to dazzle people. The facts demonstrate that each organ of the body is real essential. Sadly, daze individual's life is truly shading less and is drained of numerous most joyful snapshots of life. The venture will help the visually impaired people to distinguish the hindrances. At last this examination based task will bring about helping the mankind which is without a doubt a biggest demonstration. With the arranged design, whenever built with most exactness, the visually impaired individuals can move starting with one then onto the next without other help and our model guarantees one thing that is making the assignment of moving of a visually impaired individual simple and agreeable. The stick is additionally light and helpful to convey. Furthermore, the segments or parts that we utilized in the stick are additionally effectively accessible and less in expense. And furthermore all that the assembling cost is likewise rather low, that makes the stick moderate for individuals of all class and age. In future, in the event that further enhancement and venture is completed with the stick, it will be a much increasingly powerful gadget for the future world. This could likewise be viewed as an essential method for liberal the visually impaired a feeling of vision.

Advantages:

1. The system can be used both indoor and outdoor navigation.
2. Blind person’s location can be tracked whenever needed which will ensure additional safety.
3. Detects obstacles and alerts the blind person through vibration alert and buzzer output.
4. It is very low cost
5. Very low power consumption
6. High performance
7. User of the stick can send emergency message in critical situation.
8. GPS module can send the live location when the alert button in the remote is pressed.

9. User can find the stick by pressing a button in the remote through the sound of the buzzer.

6.2 Limitation of the Study

Nowadays, measuring distance is considered as a problem in building field or indoor measuring activities because this task is made by measuring tape. The problem will happen when using measuring tape where we need at least 2 persons to measure between two distances. Different, it is not have a perfect accuracy due to parallax and obstacle in their way. Improvement had been done where some products have infrared light emitters and receivers to determine an objects distance. Other device has laser-based systems which have improved accuracy and precision.

6.3 Future Works

It will be real boon for the blind. The developed prototype gives good result in detecting obstacles paced at distance in front of the user. The solution developed is a modest budget navigation aid for the visually impaired. However, minimizing cost leads to compromises in performance. It is advised that the design be developed before commercial production. Some improvements that could be made are follows:

1. It can be future enhanced by using VLSI technology to design PCB unit.
2. GPS module can be used for helping to find the tick with the help of mobile phone
3. Increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching.
4. Synchronization with external memory to increase the number of routes stored
5. Provision for voice control using speech recognition
6. Response stick for various works can be tabulated
7. Charger module can be integrated with an USB system
8. Reduced size
9. Reduced weight
10. Improved weight balancing
11. Ergonomic grip

12. Improved angle adjustment mechanism

6.4 Summary of the chapter

In this chapter we discuss about the advantage of our project. Also we discuss the limitation of its. And then we discuss the future work of our project.

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IOT BASED SMART BLIND STICK TO HELP BLIND PEOPLE

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