ABRIDGEMENT:

The vision of this device is to design and construct the blind-friendly embedded device. The blind and visually handicapped have difficulty utilizing mobile phones because social media and online banking programmes on smartphones are difficult for them to utilize. For quick bank transactions, ATMs are used. If blind individuals use the ATM and it isn't designed with visually impaired persons in mind, there will be privacy concerns. Using mobile phones with the assistance of others may jeopardize their security and privacy. Touch screens were not designed with visually impaired persons in mind. They are uneasy using cell phones in public due to current technologies. When visually impaired persons walk, they use a stick, which can be replaced as well, By gaining access to all capabilities of smart phones, the developed system would assist visually impaired persons in making their lives much easier.

INTRODUCTION:

There are a total of 285 million people around the world who are visually defect as stated by the World Health Organization (W.H.O) . The number of visually faulty people on the planet is believed to be 39 million. Over 1.3 million persons in the United States are completely blind, and the number of people who are visually defect goes up to 8.7 million .As stated by the American Foundation for Blind and the National Federation for Blind 100,000 of them are students. As a result of the success of public health programmes, disease-related blindness has decreased in recent years. Over the age of 60 the number of visually faulty people ,on the other hand, is increasing at a rate of 2 million every decade All of these figures, however, are predicted to rise by 2020.

'Am The Eye' is a device that allows visually impaired people to use their cellphones without even touching them. In today's world, there are a plethora of smartphones to choose from, but none of them are totally accessible to visually impaired persons. 'Am the eye' is a hybrid system that combines hardware and software.

Smartphones are one of the most important technology of current generation. Almost all communication and transactions, such as current news, financial transactions, social/family updates, and so on, are done through mobile phones. The blind and visually handicapped have difficulty utilizing mobile phones because social media and online banking programmes on smartphones are difficult for them to utilize. They are unable to fully utilize smartphones. Using mobile phones with the assistance of others may compromise their security and privacy. For quick bank transactions, ATMs are used. If blind individuals use the ATM, there will be privacy concerns, and it is not properly designed for visually impaired persons. Touch screens were not designed with visually impaired persons in mind. They are uneasy using cell phones in public due to current technologies.

Am the Eye is a device that enables blind people to use their phones without having to hold them. The microcontroller-based system will be linked to the phone through Wi-Fi. then the user gets calls or texts, he will be notified and will have the option to return the call or text. Text from social media apps and text messages will be converted to Braille. Six LRA motors will be grouped in a braille dot pattern. It will vibrate to the beat of the music. It can express approximately five words in a single second. With this apparatus, he can walk

without requiring a cane. The system will include a sensor that will detect road impediments. With this method, he can walk without needing a cane. A sensor in the glove will detect ground obstacles. By pointing to his hand, he can walk. They can recognize and communicate with the people in front of them with the help of AI. The use of ATMs is straightforward. The device will read the display and offer the user with information. Through this method, he will be able to use social media and ATMs. They can use it to text someone at any time using gloves that are already in their hand. The alphabet and number system will be included in the gloves. There will be notification mode, call mode, text mode, walking mode, and other applications that use mode. Notification mode: In this mode, the user will only get notifications from the Instant Messages App. They are not able to respond to text messages. They can switch to this mode if they want to use their hands freely. None of the switches are functional in this situation. This mode can be used to make a phone call to another person. Text Mode: He can use WhatsApp, SMS, and other social media in this mode. He will be able to text and send data in this status. Walking Style (used when walking around).

The increase in the demand for orientation and navigation aids. The white cane and trained dogs are used as the most cost effective and basic navigational tool. Despite their widespread use, The technology available in todays world is not so beneficial to the blind as compared to the people with sight

This gadget helps by providing a comprehensive review of the literature on various navigation tactics used by (or suggested for) visually impaired persons. Unlike most other evaluations, this one includes navigation systems that may be used in a number of environments (such as outdoors, inside, and so on) and that use a variety of technologies (vision, non-vision, mobile-based, etc.).

UNKNOWN:

When technological advances were employed to create common items, people began to apply that advantage to assistive technology as well. These goods are intended to help people with impairments in their daily lives. Accessibility Aid were later coined to describe these types of assistive devices. Assistive technology, according to analysis, refers to technologies, equipment, devices, apparatus, services, systems, processes, and environmental changes that enable people with disabilities to overcome physical, social, infrastructure, and accessibility barriers to independence and live active, productive, and independent lives as equal members of society. According to research, assistive technology is becoming more crucial in the lives of people with disabilities, particularly for navigation. Examples include 'Wayfindr,' 'Envision,' and other similar services. As a result of technological breakthroughs in the mobile industry, mobile devices with suitable computing capacity and sensor capabilities are also presenting endless opportunities in the creation of G.P.S devices.

According to Csapó et al., the largest and most widely used mobile platforms are rapidly emerging as de-facto standards for the deployment of assistive technology.

A great deal of research has gone into assistive navigation aids for the blind or visually impaired. It could be because the scope of its application ranges from physiological factors

associated with vision loss to human factors influencing mobility, orientation, and information access, as well as technological aspects in the development of navigation, wayfinding, information access, interaction, and other tools and techniques. It is difficult, according to the authors, to characterize or convey the spirit of this field in a single photograph. Various navigation systems for blind and visually impaired people have been presented, but only a few of them can provide dynamic interactions and adaptability to changes, and none of them perform flawlessly both indoors and outdoors.

Numerous studies on various navigation gadgets and approaches used by vision impaired or blind people have been conducted. Tapu et al. conducted research on wearable devices that aid visually impaired people in navigating outside environments. A review of visual assisting approaches for indoor positioning and navigation was conducted by the authors of a review. The study examines a variety of electronic travel aids (ETAs), particularly those that use machine vision to help blind people navigate. Hojjat reviewed some of the most recent indoor navigation solutions for the blind and visually impaired. There are, however, fewer comprehensive reviews of navigation systems that operate both indoors and outdoors and are classified based on technological advancements.

This review paper makes a contribution by providing a systematic overview of the research on various navigation methods used by (or recommended for) visually impaired people. Unlike the majority of similar other evaluations, this one takes into account navigation systems that operate in a variety of contexts (such as outdoors, indoors, and so on) and employ a variety of underlying technologies (vision, non-vision, mobile-based, and so on). This paper would be better organized if the reviewed works were organized according to the underlying technology. Finally, the paper concludes with some recommendations based on the authors' extensive research. The authors believe that this paper can provide an overview of recent developments in the field and that the recommendations can be used to develop future navigation solutions for visually impaired people.

MOTIVATION:

Only a few inventors and innovators are working to empower the world's blind and visually impaired in overcoming their constraints. The percentage of inventors working on helpful solutions for persons with impairments, on the other hand, is steadily increasing. Furthermore, we currently live in an era when inventions and new solutions are created in quite different ways than in the past. Academic research institutes were responsible for the majority of inventions only a century ago. Today, anybody and everyone can create an innovation.

LITERATURE SURVEY:

The "AM THE EYE" system was designed by improving the specific purpose designed walking aid stick into much complex device which can act as an eye for the visually challenged. // [1][2][3] in this device the Three of the four sensors on the Glove are in charge of obstacle detection.

The other sensor, which is located beneath the smart stick, detects potholes.

They use a walking stick in these articles, whereas we use a glove and a wrist band, which is a lot more complicated and multitasking system.

Devices Designed for Detection, Navigation and To Alert Blind.

A system for detecting impediments, darkness, and tracking the visually impaired person was proposed. The user is tracked using a GPS gadget. When the Infrared Sensor senses an obstruction, the camera is utilized to capture photos that will allow the user to determine what the obstacle is. The Light Dependent Resistor is used to detect darkness. The blind will receive these alerts via headphones. This device is portable, and it can function even if it is not connected to the internet.

- This device is specifically developed to track those who are blind or visually challenged. It makes it easier to communicate panic alerts to the appropriate caregivers, as well as the current position. This allows the vision challenged person to walk through map directions unaided.
- • Both the impediment and the hole are detected by the ultrasonic sensor, allowing for obstacle detection. Moisture sensors are used to detect the presence of water. Radio frequency transmission is used to recover the stick if it is misplaced. Arduino is in charge of all of these modules. In urgent situations, it uses GPS for tracking and GSM for delivering alert messages.
- This method uses an ultrasonic sensor to detect impediments like pits and pebbles. A water sensor monitors the spread of water. When the detection is identified, the user receives an alert, and the buzzer begins to sound when impediments are detected. To locate the missing stick, radio frequency transmission is used. The blind individual is tracked by GPS, and the alert message is sent to the concerned users through GSM.
- Here, haptic feedback is used, and Bluetooth and USB communication are both supported. For USB and Bluetooth connectivity, two different controllers are used. To avoid message drops, the computer communication network transmission protocol is employed for acknowledgment. It makes use of a Kinect sensor to provide depth data, as well as an infrared projector that generates various patterns. Humans are detected by the Kinect sensor. For example, if a person weaves his hand, the user is alerted via headphones, and the blind learns that a human is present in front of him.
- This gadget utilizes a multi-sensor probe to identify humans while the user is going through a crowd. The PIR sensor detects movement by emitting infrared radiation. The sonar module provides the target distance and velocity, which assists in estimating the real distance.
- This gadget utilises a multi-sensor probe to identify humans while the user is going through a crowd. The PIR sensor detects movement by emitting infrared radiation. The sonar module provides the target distance and velocity, which assists in estimating the real distance.
- Color, light, object, and banknote detection is possible with this Android app. The inbuilt light sensor detects light and emits a beep sound based on the strength of the light. RGB values are used to detect color. Bank notes that are spotted are identified using a database that has been previously stored. Text to speech is used to inform these detections.

- Two ultrasonic sensors detect impediments, while a moisture sensor detects water spreading. The user is notified of the detection via voice output. Think talk is used to upload data to the cloud.
- With the use of an ultrasonic sensor, obstacles are detected from the front, upper, and side. When an obstruction is detected, the user receives a vibration alert. The GPS module keeps track of the user's location.
- The video is recorded using a robot technology with a video processing equipment. Images will be taken from the video, and face detection will be performed using the library's face detection feature. The depth map is detected using a laser sensor, and the obstacles are detected by a camera. With the detection output, the decision module directs the robot. A smart glass and a cane are used. The smart glass detects obstacles, and the walking stick alerts the blind to the danger. In the event of a collision, the caretakers will be notified via an online platform.
- The signal is received by one sensor array and transmitted by the other. The emitter's signal will be detected by receivers. This aids in determining the range of distance. The device determines how far away the target is. Expected and actual distances are measured and matched as a result of this.
- Using an ultrasonic sensor, obstacles are detected in three directions: right, left, and front. When an obstruction is spotted, a buzzer will sound to inform the blind.
- In order to identify impediments, The gadget makes use of RADAR technology. It is based on the transmitter and receiver elements of the RADAR. The device's miniaturization and portability are two advantages.
- The tutor teaches the blind students how to use the touchscreen keyboard to pass information to the microcontroller. The data will be displayed tactilely to the students on the receiving end. Multiple blind students can be trained using this technique with the support of a single tutor.
- Text-to-speech technology is used in this application. Users who want to help the blind should input a message that will then be converted to voice. A blind person will be provided with earphones in order to hear the voice message.
- The whereabouts of blind people will be tracked based on the building's construction by detecting the direction and distance of movement. Data is collected and processed at several stages, and a map is created to aid the blind in his navigation. It aids blind people's indoor navigation.
- It operates on the basis of echolation and picture processing. Images are captured using an image sensor. The collected images are used to identify both static and moving items. The obstruction is detected by an ultrasonic sensor, and the distance is calculated. The use of a GPS module aids blind people in their navigating.
- It is intended for use in the open air. It features buttons that can be used to conduct various tasks. Pressing the appropriate buttons initiates the SETUP procedure, navigation, help, emergency, and vision system. This prototype is currently in its early stages and could be improved.

- Blinds were asked to snap photographs in this experiment, and the findings were wildly wrong. According to the findings of the tests, blind people were able to shoot movies more easily than they were able to capture photos. It has the potential to work in the future, allowing blind people to register images on their own.
- They've experimented with both multi-story buildings and underground passageways. They calculated the difference between the estimated and actual locations. This prototype is useful for navigating large complexes of buildings.
- The device is a wheel chair with an ultrasonic obstacle detection sensor. It employs an infrared sensor to track the line, allowing the wheel chair to move in a precise path. The user must follow the path that has been set out for him. This device allows the blind to navigate independently.
- The obstruction is detected and the real distances are calculated in this prototype. The information will be retrieved by connecting the smartphone to a Bluetooth module.
- Convolutional Neural Network is used for detection. Different entities, such as a cup, a ball, and a human, are used in the testing. According to the results of the tests, it has an accuracy of 80%. It is more precise and effective.
- It assists the blind in locating a nearby pedestrian signal, which allows him to cross the street safely. The depth and color images are obtained using the Kinect sensor. The blind are guided to the exact position of the pedestrian crossing as soon as the image is recognized by GPS.
- This technique enables blind people to read text that is embedded in an image. A laptop, a camera, and a voice synthesizer are included. To catch the texts, the camera offers a zooming option. Texts are discovered using the FDR approach. It is still in its early stages and is not yet ready for use.
- The obstruction, as well as its size, velocity, and position, are detected by the RGB-D camera. It aids navigation in a dynamic interior environment by using fuzzy integral-based gaze control. A vibrotactile vest is used to alert the wearer to the presence of an impediment. This method aids the blind in shopping malls. The photos will be saved after the webcam captures the picture. When the user walks barefoot, the Gait detector uses a pressure sensor to evaluate his foot position and size. A laser range finder gadget is used to determine a person's height. A microphone will be used to aid the user.

METHODOLOGY:

Both hardware and software are equally important in our system. The requirements' minimal functionality, or required capability, is listed below. The ‘Am the Eye’ device must have an internet connection and a SIM card. A mobile phone is required of the user. It is designed specifically for visually challenged. It also comes with gloves and a wristband.

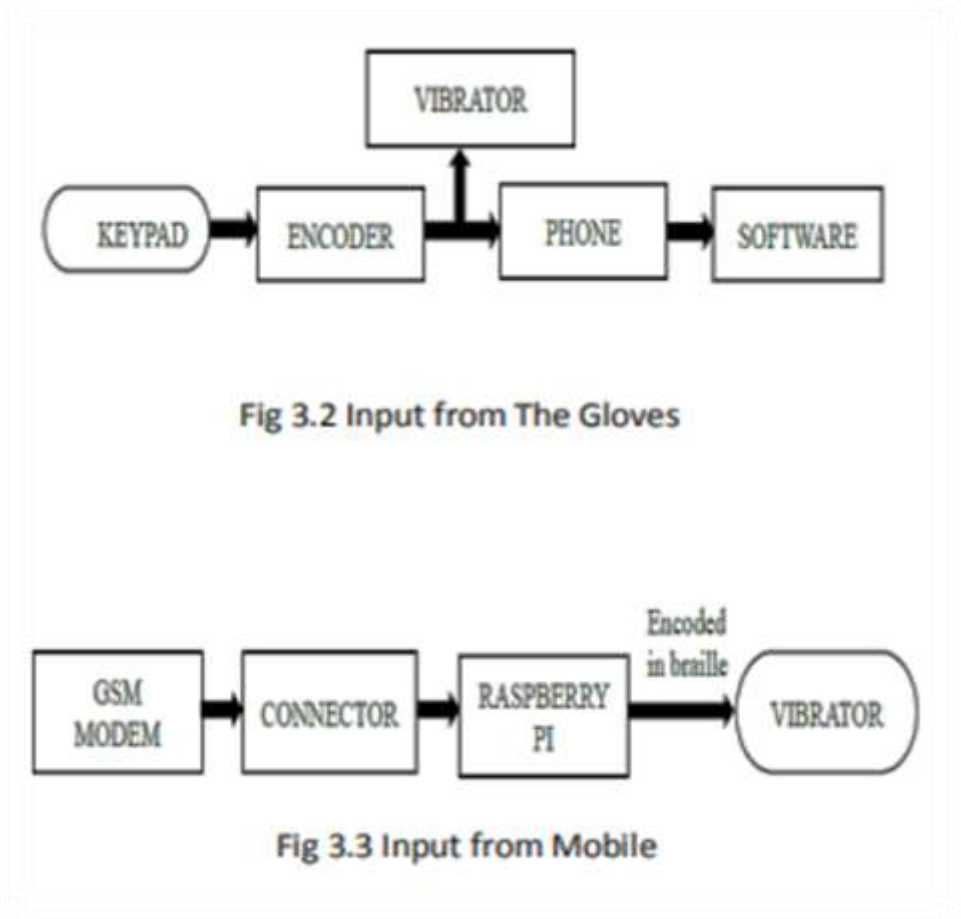
Vibrations will be used to address the communication interface of Texts or Notifications. Specifically, six LRA motors will be installed in the band, which will vibrate in accordance with the braille format. The Pi will be connected to the phone via Wifi.

A. Architectural Strategies

The system uses the following components Sensors-HCSR04 Ultrasonic Sensor, Network-WIFI., Edge/Fog/Mist –Nil, Storage-32gb SD Card, Data Abstraction- LBPH Frontal Face, Application Development-Nil, People and Business Process- Visually Impaired People, Security-Secured Networks.

B. Data Flow Diagram

The data flow in "AM THE EYE" is depicted in the diagram below. Because the device has numerous components, it depicts the path in which data flows inside the circuit. This diagram depicts how the program's components or steps are carried out.



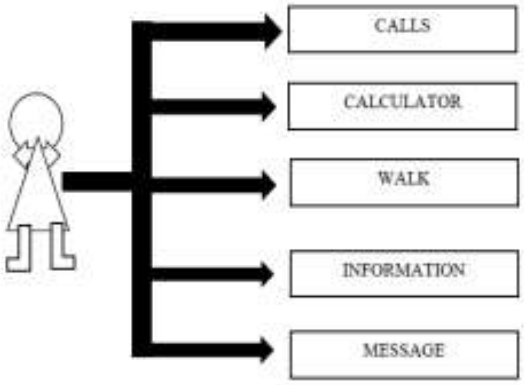
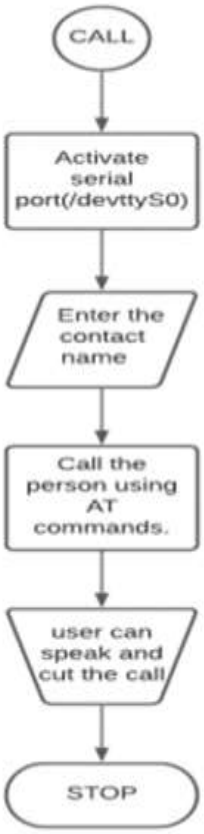


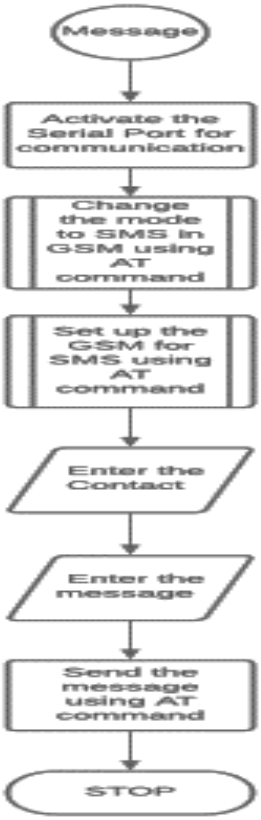
Fig3.4 Use Case Scenarios

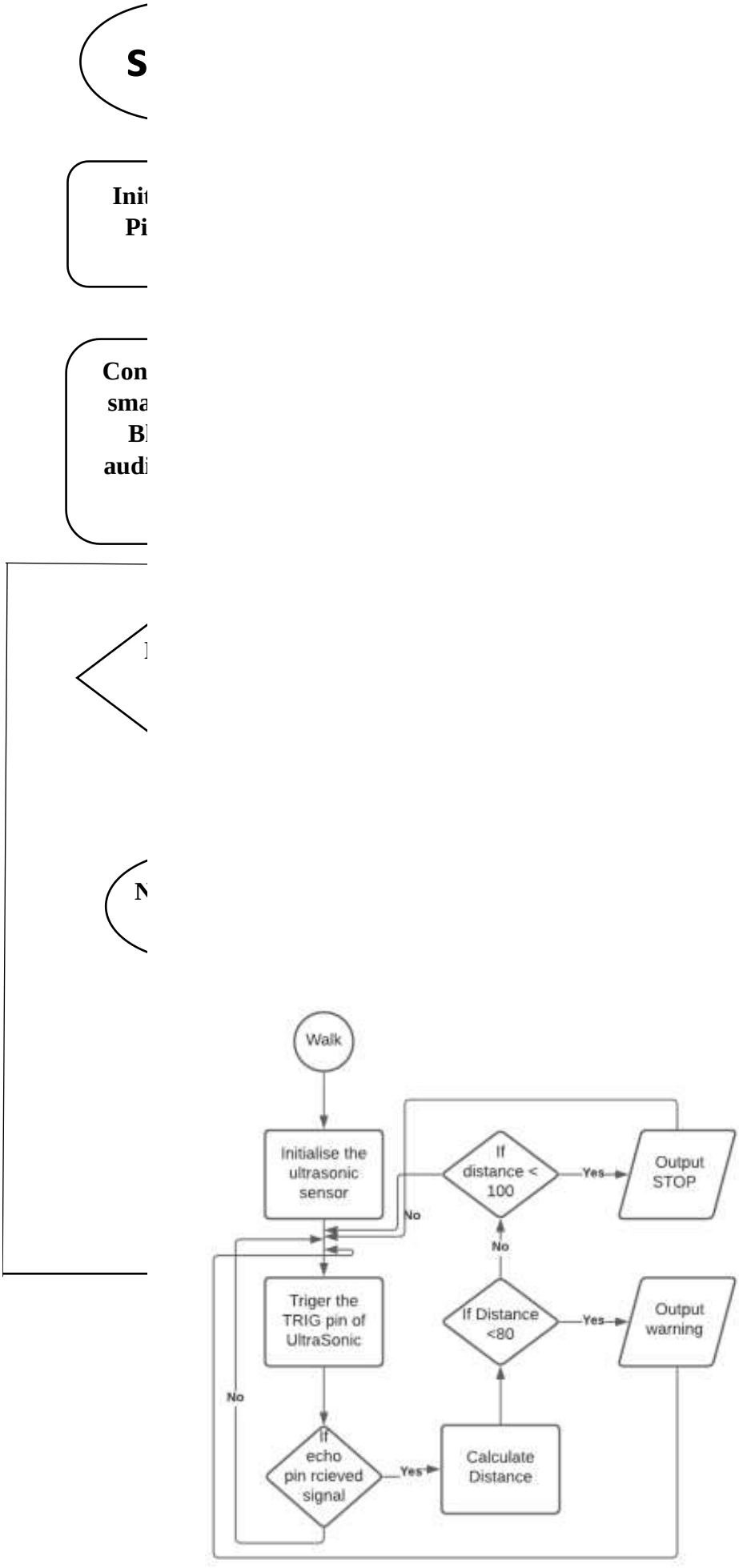
The applications of "AM THE EYE" are depicted in this diagram. It illustrates the capabilities of the device. The graphics above demonstrate a system's high-level capabilities and breadth. These diagrams also depict the system's and its actors' interactions. As shown in, use cases and actors explain what the system does and how the actors interact with it, but they do not explain how the system works within. Through fig. 3.4.

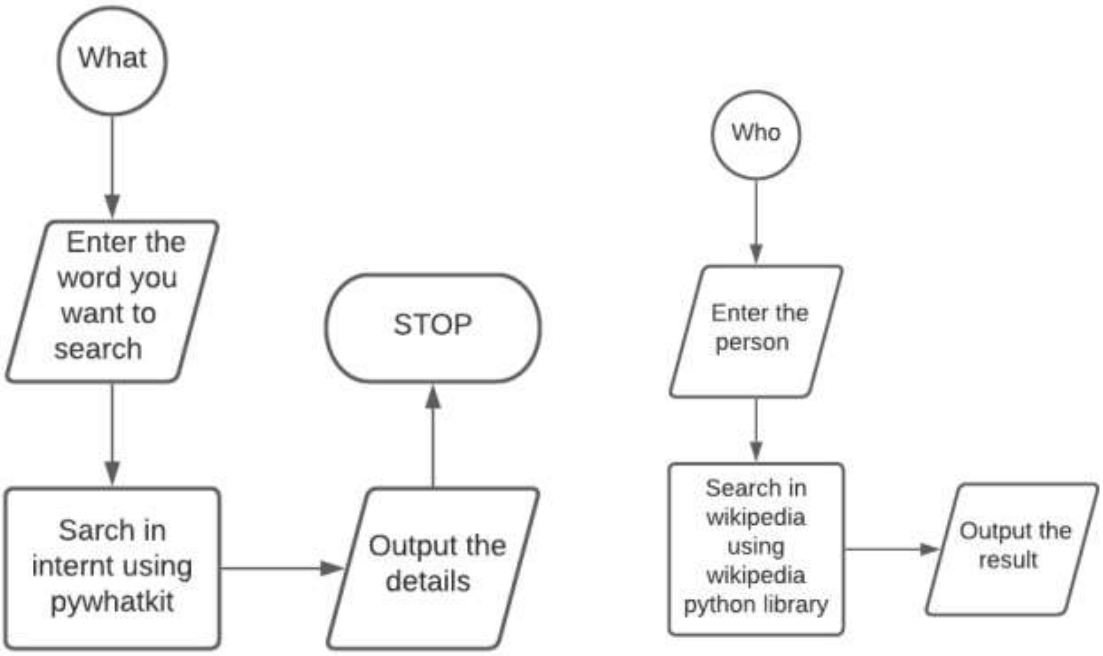
C. Schematic

A schematic displays a process's component elements in logical sequence. The process begins with the Raspberry-GPIO PI's pins being initialized. It is then connected to the smartphone's Bluetooth and Wi-Fi, and when a button is touched, it either listens for or executes a command; there are numerous commands in it, for example, a command to send a message, a command to walk, a command to read, and so on.




Message
Activate the Serial Port for communication
Change the mode to SMS In GSM using AT command
Set up the GSM for SMS using AT command
Enter the Contact
Enter the message
Send the message using AT command
STOP


Walk
Initialise the ultrasonic sensor
If distance < 100
Yes
Output STOP
No
Triger the TRIG pin of UltraSonic
If Distance <80
Yes
Output warning
No
If echo pin rcieved signal
Yes
Calculate Distance
No



D. Hardware Implementation

The microcontroller will be connected to the mobile phone through WIFI. The user will be notified whenever he receives calls or messages, and he can return the call or text.

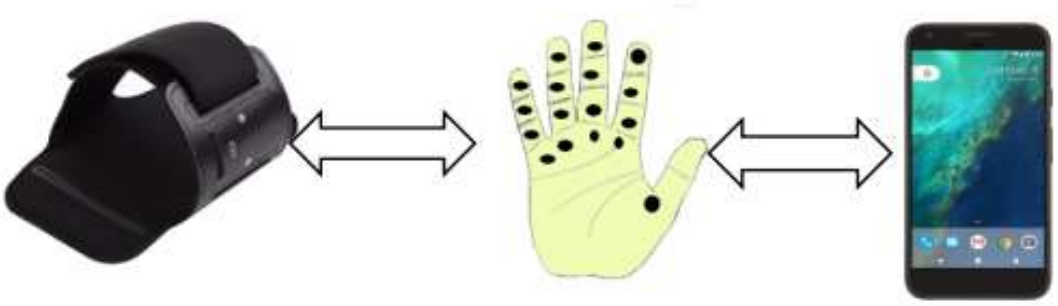


FIG 30 LOW VIEW

Raspberry Pi (The Raspberry Pi) (System on Chip) The SoC from Broadcom Technologies is based on the ARM architecture. The ARM CPU operates at frequencies ranging from 700 MHz to 1 GHz. The SoC also has a video core 4 GPU, a fast 3D core, OpenGL, and Blue ray and H.264 video playback. Because smartphones and tablets are essentially miniature computers, they require many of the same components found in desktops and laptops to provide us with all of the fantastic things they can do (apps, music and video playback, 3D gaming, enhanced wireless capabilities, and so on).

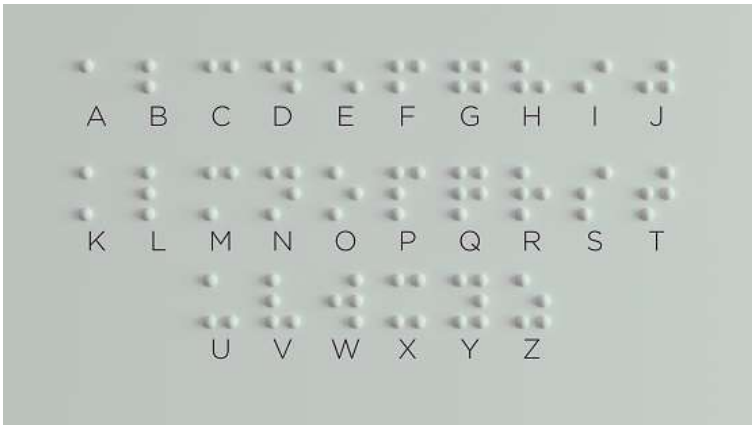
Linear Resonant Actuators (LRA motors) When compared to ERMs, it has a quicker response time and a longer utilization life. As a result, linear vibration motors (LRA) are increasingly being employed in phones, wearable vibration, and mobile phone vibration.

The vibrations produced by an LRA, like those produced by Eccentric Rotating Mass vibration motors (ERMs), are based on the movement of a mass, which creates recurrent displacement.

To begin, readers should be recalled that the ERM has an off-center load, which causes the motor to revolve. To generate spinning, a current is given to the armature windings attached to the motor shaft. When they are inside a magnetic field generated by permanent magnets on the interior of the motor's body, a force is created, forcing the shaft to revolve. To guarantee that the rotation continues in the same direction, the current in the windings is reversed. To do this, static metal brushes at the motor terminals connect to a commutator, which spins with the shaft and windings. During rotation, the commutator's different segments connect to the brushes, and the current is reversed, holding the brushes in place.

LRAs produce a force in the same manner as magnetic fields and electrical currents do. The voice coil (the armature windings' counterpart) remains fixed as the magnetic mass moves. The mass is also equipped with a spring, which facilitates in its return to the centre. Moving the magnetic mass up and down causes the LRA to move and therefore the vibration force. The LRA generates music in the same way as a speaker does. A loudspeaker's speaker cone is used to generate audio waves by displacement. A loudspeaker, on the other hand, is built to operate across a wide frequency range, but an LRA, as we'll see later, is limited to its resonance frequency.

Braille Louis Braille invented Braille in 1821 as a linguistic system for blind people to read and write. It's made up of raised dots that are placed in "cells." A cell is made up of six raised dots that are grouped in a 3*2 matrix under the fingertips.



WORKING OF 4*4 KEYPAD:

First, check to see whether any keys are pushed. Connect the electricity to the rows so that they are at maximum capacity. Then, set Rows R1-R4 to Low and verify the column status. Any key pushed in a Low column shows that one of the column's four keys is being pressed. If all columns are set to High, no key has been pressed. Find the key next. Because the column in which the pressed key is placed has been discovered, knowing the line would complete the testing. As a consequence, turn the rows Low one at a time until one is exposed – the remaining rows will stay High. The row can now be identified. Determine the status of each column in turn..

The GSM Module or the mobile phone is used to make and receive phone calls. On Wikipedia, you may compute the mathematical computation and look up information on a specific subject. It will convert the text from the SMS into Braille format. There will be 6 LRA motors which are placed in the format of braille dots. It will vibrate in accordance with the text

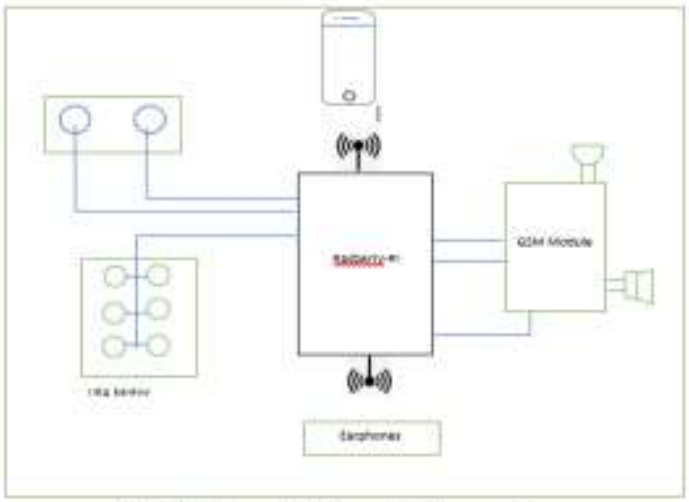


Fig 3.6 Overall Circuit Connection

EXPERIMENTAL VERIFICATION/ANALYSIS:

A. Checking Messages and Texts Through GSM Modem

For communication through a mobile sim card, the module features GPRS/GSM technology. It uses the 900 and 1800 MHz frequency bands to make and receive phone calls as well as SMS messaging.

The AT command can be used to alter the baud rate from 9600 to 115200. The GSM/GPRS Modem's built-in TCP/IP stack allows you to connect to the internet through GPRS. It is suitable for SMS, Voice, and DATA transfer applications in the M2M interface.

Using GSM SIM900A behind the usage of texts and calls is fully working in our system. The GSM/GPRS module's input voltage supply ranges from 3.2 to 4.5 V, with an average power supply current of 400 mA to ~1 A.

B. Text to Speech (TTS) And Speech to Text Recognition (STT)

TTS and STT are both used in our system. It works, and individual testing was completed successfully, producing the desired results. TTS is a type of speech synthesis that translates written text into spoken voice output. The first text-to-speech system was created to help the visually handicapped by providing them with a computer-generated spoken voice that "reads" text to them. Moreover, required texts will be turned into the appropriate speech, and the speech will be converted back into the required texts. There were no issues discovered when the python package easy-pyttsx3 was evaluated for known vulnerabilities and missing licenses. As a result, the package was judged safe for usage.

C. Working of Keypad

The 4*4 Keypad, which is connected to the Raspberry Pi, is part of our system. The 16 built-in pushbutton contacts on this 4x4 matrix keypad are linked to row and column lines.

Processing Elements can scan these lines for a button-pressed condition. In the keypad library, the Propeller sets all column lines to input and all row lines to input. Then it selects a row and raises it.

There are 16 keys on our keypad, each of which is assigned to a specific value. For example, the keys 0-9 are assigned for dialing numbers and sending SMS, while the keys A, B, C, D, *, # are assigned for specific modes such as calling mode, SMS mode, walking mode, face detection mode, notification mode, and so on.

We had considered including bespoke gloves, but due to a lack of time and quantity constraint, we were unable to do so.

D. Obstacle Detection Using Ultrasonic Sensor.

The distance between two objects can be determined using an ultrasonic sensor. In the distance measurement technique, the time between the emission of the wave and the receipt of the echo is measured. In the air, the ultrasonic wave travels at the speed of sound (340 m/sec).

ACTUAL RESULTS: 0 – 5V output (Output high when obstacle detected in range). The maximum angle of the beam is 15 degrees. 2 centimeters – 400 centimeters 0.3cm accuracy.

We can identify potential stumbling blocks and determine which paths should be avoided. The ultrasound sensors, on the other hand, are simply employed to determine whether there are any impediments in front of the users.

APPLICATIONS:

- This technology will enable blind people to use mobile phones and other applications without the assistance of a third party.
- If a visually impaired person wishes to use a smartphone, they must seek assistance from others, which may endanger their privacy, credentials, and other personal information. As a result, they can be self-sufficient by using Am the Eye.
- Blind people's smartphones can be safer since they can have a lock-screen that they can operate independently using this device.
- They will be able to access social media and Instant Messaging with this gadget. They can text a person at any time by using a glove that is mounted on the user's hand. There will be every letter of the alphabet as well as all of the numerals.
- Notification mode, call mode, text mode, walking mode, and other programme using modes are among the options.
- Notification mode: The user will only receive notifications from the Instant Messages App in this mode. They can activate this mode whenever they want to be able to freely use their hands. In this state, none of the switches work.
- Call Mode: This mode can be used to make a phone call to someone.
- Walking mode: The visually impaired can walk without using a stick by pointing the glove on their palm in the direction they want to go.

CONCLUSIONS:

Smartphones are one of the most important technology of current generation. Almost all communication and transactions, such as current news, financial transactions, social/family updates, and so on, are done through mobile phones. The blind and visually handicapped have difficulty utilizing mobile phones because social media and online banking programmed on smartphones are difficult for them to utilize. For quick bank transactions, ATMs are used. If blind individuals use the ATM, there will be privacy concerns, and it was not designed with visually impaired persons in mind. Using mobile phones with the assistance of others may compromise their security and privacy. Touch screens were not designed with visually impaired persons in mind. They are uneasy using cell phones in public due to current technologies. When visually impaired persons labor, they utilize a stick, which needs to be replaced as well. This gadget will make life easier for visually challenged persons by giving them access to all of the functions of smartphones. It would aid a visually challenged person in traversing public spaces autonomously. The suggested system aims to correct the flaws of the existing one. It makes an effort to address the issues that blind people experience on a daily basis. Furthermore, the system takes precautions to protect their safety. The Smart Stick for Blind design, which combines ultrasonic sensors, GPS, and voice output, is very beneficial for independent mobility. The system's advantage is that it might be a very low-cost solution for millions of blind people throughout the world. The recommended combination of Ultrasonic Sensor and GPS offers a real-time system that monitors and delivers feedback on the user's position, making navigation safer and more secure. A few tests were carried out in order to assess the accuracy and performance of the supplied system. The outcomes of this study demonstrate the rewards of our efforts to develop a low-cost, high-accuracy travelling assistance that assists the visually impaired in managing their everyday lives.. The embedded sensors, as previously indicated, detect information about the environment. When it comes into touch with an object, the design is such that it detects it and alters course with a high degree of accuracy. As a safety measure, a GPS module is also incorporated. Our overall purpose is to provide visually impaired people with an easy and joyful way of life at a reasonable cost.

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