SMART SHOE FOR BLIND

A PROJECT REPORT

Submitted to

Visvesvaraya Technological University

Belagavi-590018

by

P J Prajanya Jain	**4SU20IS028**
Pooja	**4SU20IS029**
Prathvin P Shetty	**4SU20IS031**
Praveen M R	**4SU20IS032**

Under the guidance of

Mrs. Shobha

Assistant Professor

in partial fulfillment of the requirements for the award of the degree of

Bachelor of Engineering

Department of Information Science and Engineering

SDM INSTITUTE OF TECHNOLOGY

UJIRE -574240

2023-2024

SDM INSTITUTE OF TECHNOLOGY

(Affiliated to Visvesvaraya Technological University, Belagavi)

UJIRE – 574 240

Department of Information Science and Engineering

CERTIFICATE

Certified that the Project Work titled **'Smart Shoe for Blind'** is carried out by **Ms. P J Prajanya Jain,** USN**: 4SU20IS028, Ms. Pooja,** USN**: 4SU20IS029, Mr. Prathvin P Shetty,** USN**: 4SU20IS031 and Mr. Praveen M R,** USN**: 4SU20IS032,** are bonafied students of SDM Institute of Technology, Ujire, in partial fulfillment for the award of the degree of **Bachelorof Engineering** in Information Science and Engineering of Visvesvaraya Technological University, Belagavi during the year 2023-2024. It is certified that all the corrections suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The report has been approved as it satisfies the academic requirements in respect of project work prescribed for the said degree.

Mrs. Shobha	**Dr. G P Hegde**	**Dr. Ashok Kumar T**
Asst. Professor and Guide	Professor and Head	Principal

Signature with date and seal:

External Viva

Name of the Examiners: **Signature with Date**

1.

2.

Acknowlegdement

It is our pleasure to express our heartfelt thanks to **Mrs. Shobha,** Assistant Professor Information Science and Engineering, for her supervision and guidance which enabled us to understand and develop this project.

We are indebted to **Dr. G. P. Hegde**, Professor and Head of the Department, and **Dr. Ashok Kumar T**, Principal, for their advice and suggestions at various stages of the work.

We also extend our heartfelt gratitude to Management of SDM Institute of Technology, Ujire, for providing us with a good learning environment, library and laboratory facilities. We appreciate the help and the support rendered by the teaching and non- teaching staff ofInformation Science and Engineering.

Lastly, we take this opportunity to offer our regards to all of those who have supported us directly or indirectly in the successful completion of this project work.

P J Prajanya Jain

Pooja

Prathvin P Shetty

Praveen M R

Abstract

IoT-based smart shoes for blind people are made using ultrasonic sensors connected to an Arduino Nano board. IoT communicates with objects or people through physical objects. There are 20 million. Visually impaired people in India, including 1.6million children. It is extremely difficult for a blind person to move independently. They should always be dependent on others in many areas of their lives. One of the biggest problems is that they must walk on the streets. They can't figure out every obstacle in the way with an ordinary stick. So, these smart shoes offer them a long-term solution. Plus, it will help them to reach their destination stress-free and independently. Built with IoT technology, the shoes have sensors, microcontrollers and buzzers embedded in it. If there is an obstacle in front of the user, the shoe will sound warning through a buzzer.

Table of Contents

List of Figures

List of Tables

Chapter 1

1. Introduction

1.1 Project Introduction

Blindness is the most prevalent disabilities globally, and presents profound challenges for those affected. Individuals grappling with vision impairment encounter substantial hurdles in navigating their surroundings and maintaining independence. The inability to travel freely diminishes their access to education, employment opportunities, social interaction, and essential services. Recognizing these obstacles, innovative solutions are imperative to empower visually impaired individuals and enhance their quality of life. Those living with blindness encounter difficulties in traveling or relocating, which are not experienced by sighted individuals.

An estimated about 253 million people world wide are living with moderate to severe vision impairment or blindness. Amon them, approximately 36 million people are blind, with blindness being defined as having a visual acuity of 20/400 or less in the better eye with the best possible correction or a visual field of less than 10 degrees. The vision impairment and blindness represent significant public health consequences.

For the blind many global efforts are done in order to help them where various organizations and advocacy groups work to promote the rights and inclusion of blind individuals, advocating for accessible environments, equal opportunities, and greater awareness of the needs and challenges faced by the community and also the WHO has launched initiatives like the “VISION 2020: The Right to Sight” program, which aims to eliminate avoidable blindness and ensure universal access to eye care services in the upcoming years. Despite progress, challenges remain in achieving this goal and still blind individuals are facing certain problems.

Blindness affects the mobility and independence. Traditional mobility aids such as canes offer limited assistance and do not provide real-time navigation guidance. Consequently, visually impaired individuals often rely on memorization of routes or assistance from sighted companions, constraining their autonomy and spontaneity. Moreover, the fear of getting lost looms, exacerbating feelings of anxiety and isolation. The lack of reliable means to track their movements heightens vulnerability, making them susceptible to disorientation or potential harm.

In this project we have installed an ultrasonic sensor which detects the obstacles which come in their way from which the blind is aware of the obstacles and can pass through those objects without causing accidents or any falls. The sensors will detect obstacles in the user's path and provide timely alerts to prevent collisions. To alert them about the obstacles a buzzer is added when the obstacle is detected the buzzer makes an alert sound so that the blind will be aware of the obstacle and if the person is blind and also deaf a vibrating motor is attached so when the object is detected along with the buzzer sound a vibration occurs which helps to sense the blind about the obstacle. All the sensors and the vibrating motor is mounted to the microcontroller chip called Arduino Nano.

In this we have used Arduino Nano because it will be implemented for the shoe so Arduino Nano uses less space and is of lightweight. Complimentary to this an GPS tracking system is mounted where suppose an accident occurs or the blind person trips or falls which causes serious injuries during that time to reach out anybody for help is difficult. At that time These GPS tracking system sends the location of the blind person where the person who takes care of them or the guardians receive their location link so that they can reach the blind person for help easily and keep track of them.

This Innovation holds the key to unlock the new possibilities for individuals with visual impairments, empowering them to navigate the world with confidence and independence. By developing a smart navigation system that addresses the specific challenges faced by the blind community. This project aspires to create a more inclusive society where everyone, regardless of ability, can participates fully and realize their potential. Through collaboration, technological advancement, and a commitment to accessibility, we can bridge the gap between aspiration and reality, ensuring that no one is left behind in the pursuit of progress.

The system will feature a user-friendly interface accessible through a wearable device, such as smart shoes equipped with haptic feedback or audio cues. And the system will enable users to navigate complex indoor environments such as malls, airports, and office buildings, as well as outdoor spaces like streets and parks. By integrating indoor mapping data with GPS technology, it will offer precise location information at the time of emergency. The caregivers or caretakers will have the ability to remotely monitor the user's location and receive alerts in case of emergencies or deviations from the intended route or if any accidents occur in the path. Sensors play a major role in this system because they are the major tools for the user guidance, due this feature it is the best equipment for the visually impaired persons.

From the development of this project, it aims to address the limitations faced by blind individuals and also the blind individuals will have access to the tool that empowers them to explore the world with greater freedom and confidence. In addition to assisting blind individuals in their movements, the device will also offer peace of mind to their care takers or guardians by allowing them to monitor the blind easily. By this we can create a more equitable society where all individuals have the opportunity to thrive, regardless of their abilities.

1.2 Problem Description

Visual impairment leads to significant obstacles to daily life for millions of people worldwide. Despite advancements in assistive technology and awareness campaigns, individuals with visual impairments continue to encounter numerous challenges that impact their mobility and, independence, and overall quality of life and many other problems are faced by the visually impaired community.

One of the primary challenges faced by the individuals with visual impairments is limited mobility. Naviagting unfamiliar environments, crossing streets, and accessing public transportation can be a daunting task without adequate support or assistance. Visual impairment can lead to social isolation and feeling of loneliness due to barriers to communication and participation in social events. Limited access to transportation and inaccessible workplace environments.

Safety is significant concern for individuals with visual impairments, and also trouble is caused in navigating busy streets, crowded areas, or unfamiliar environments. Accidents falls and injuries are common risks faced by visually impaired individuals due to some of obstacles and hazards in their surroundings.

Addressing these challenges requires a multifaceted approach that involves improving accessibility, raising awareness, and developing innovative solutions tailored to the needs of individuals with visual impairments and also promotes the independence of the blind individual so that they can travel from one place to other and helps the visually impaired community and this project we aim to enhance the mobility so that they can travel from one place to another independently and also promotes the safety where an tracking system is been installed to overcome the emergency situations easily and also it is an user friendly device

This helps to address these issues, one that includes increasing accessibility, spreading awareness, and creating creative solutions that are specific to the requirements of people who are visually impaired. The objective of this initiative is to improve visually impaired people's mobility so they can move around independently. We enable blind people to move about their environment more confidently by encouraging their independence. To further ensure user safety in emergency scenarios, our solution also features a tracking system. Because of its user-friendly design, the gadget is a useful tool for improving the quality of life for those who are visually impaired.

Chapter 2

Literature Review

2.1 General Introduction

A literature review discusses published information in a particular subject area, and sometimes information in a particular subject area within a certain time period. A literature review can be just a simple summary of the sources, but it usually has an organizational pattern and combines both summary and synthesis. A summary is a recap of the important information of the source, but a synthesis is a re-organization, or a reshuffling, of that information. It gives a new interpretation of old material or combines new with old interpretations or traces the intellectual progression of the field, including major debates. Depending on the situation, the literature review may evaluate the sources and advise the reader on the most pertinent or relevant.

2.2 Literature Survey

The literature surveys contribute to Knowledge construction by synthesizing existing research findings and identifying research gaps, literature surveys contribute to the construction in the field. They lay groundwork for advancing understanding and generating new insights through the empirical research.

In 2021**, Teja Chava, A. Tarak Srinivas et al**. [1] proposed complete research on smart shoes which helps to detect the obstacles. Blind people face great difficulty to travel independently. They have to depend on others in many aspects of their life. The Major problem is when they walk on the road. With a stick in hand, they cannot detect every obstacle that comes in their way. The Smart shoe design provides a long term solution for the blind to walk independently. It is built using IoT Technology in which the shoe will be embedded with sensors and buzzers.

In 2018, **Sohan. N et al**. [2] have stated that their projects consist of assistive system which helps the blind to find obstacle free path based on the voice commands. The main aim of this research work is to provide a better solution regarding navigation system for blind people with all the mentioned functions. This approach aims to improve the mobility and independence of visually impaired people by providing them with a reliable means of navigation and this proposed method significantly increases improves the mobility and independence of blind individuals by providing them real time navigation assistance.

In 2022, **Pratik Bhongade et al**. [3] have proposed the design, implementation, and potential benefits of IoT-enabled shoes for blind people and the Smart shoe which they have developed consists or is equipped with various kinds of sensors and the entire system is powered by the two sources, two batteries as a primary source and piezoelectric plates as an alternate source that generates power when blind person walks where this feature allows the shoes to generate power during use, potentially extending battery life or providing supplemental power and the shoes may feature a user interface through which the blind can interact with the system with voice commands.

In 2020, **Manali Tayade et al**. [4] have proposed a system that includes sensors to detect obstacles such as sidewalks, staircases, etc. Entire data received from the wearable sensors is displayed on the android device which is connected to the shoe where the information about detected obstacles in a user-friendly format possibly through text or graphical representations. The data collected by the sensors embedded in the shoes is transmitted to the android device through Wi-fi or Bluetooth connection and the end user or the person who take care of the blind can view and access the data.

In 2018, **Valentina Balas et al**. [5] proposed a system which is inserted to the shoe which provides the information about the location for the visually-impaired persons about the closest locations such as marketplaces, supermarkets, hospitals, institutions etc., through voice commands. This feature discussed in the paper is the integration of a location system which utilizes the technologies such as GPS determine the wearer's location and provide information about the nearby points of interest and the method proposed in the paper emphasis on assisting visually impaired individuals in navigating their surroundings and accessing essential services and amenities.

In 2020, **Jeffrey Chehade, Ali Hayek et al**. [6] presented the design, implementation, and Validation of smart shoes to enhance the security of movement for blind and visually impaired individuals. The system detects obstacles, wet floors, and incidents like patient's falls, notifying users through voice alarms and sharing their location with caregivers via companion mobile application. Incorporating safety measures such as electrical safety. This system demonstrated low faulty errors and achieved an accuracy rate of approximately 96% in testing with five subjects.

In 2021, **Pradeep Kumar M, Inchara K M et al**. [7] proposed a wearable technology aid visually impaired individuals by providing eyes free-navigation, detecting obstacles, and guiding them into their destination. The light weight controller device and sensors detect obstacles ahead, while the phone module utilizes GPS and smartphone app for navigation.

The system ensures dynamic adaptability and cost-efficiency, with reliable and stable software enhancing usability and effectiveness. This solution eliminates the need for additional support instruments, providing a seamless and independent navigation experience for visually impaired individuals.

In 2019, **I. Suneetha, Angeri Sandhya et al**. [8] proposed an IoT based Smart Shoe system for the blind integrates ultrasonic sensors with Arduino UNO board to aid independent travel for visually impaired individuals, addressing the challenges faced by nearly 40 million blind people in India, including 16 million children. Traditional methods like using cane often fail to detect all obstacles, posing a risk on roads. This innovation solution embeds sensors, microcontrollers, and buzzers into the shoe, providing real-time warnings to users when obstacles are detected, enhancing their safety and autonomy during the navigation.

In 2016, **Qianli Xu, Tian Gan et al**. [9] designed a wearable system utilizing haptic feedback through vibrating shoes to assist visually impaired individuals in navigation. A mobile phone serves as the control unit, generating directional instructions transmitted to the shoes, which produce unique vibration patterns synchronized with the user’s movement. The Research contributes empirical evidence on the effectiveness of vibration patterns for direction sensing, offering guidelines for design improvements. The system shows the potential to provide smart and sensible navigation guidance for visually impaired individuals.

In 2023, **Shelena Soosay Nathan, Lim Xin Weoi et** al. [10] proposed a system consists of multi-sensor technology to enhance independent navigation and it also integrates various components such as moisture sensors, ultrasonic sensors, buttons, a DF player, and a speaker. The agile development method is used which involves brainstorming, design, development, quality assurance, and deployment. The preliminary test is been conducted which demonstrates the effectiveness of the smart walking shoes as a navigation aid for visually impaired individuals.

In 2022, **Azadeh Kian et al**. [11] review the development of shoe-mounted sensor systems for pedestrian safety, focusing on gait assistance and hazard detection. By integrating motion sensors with machine learning algorithms, these wearable technologies can identify tripping risks in real-time and provide corrective feedback to the users. The research represents a crucial step towards practical, low-cost devices that enhance walking safety, aiming to reduce the financial and human toll of fall injuries, and the advancements is been addressed where the upgradation of the smart wearables signify a critical research front in developing practical and cost-effective solutions to mitigate the growing societal burden of fall accidents.

In 2022, **Tshering Tenji Sherpa et al**. [12] proposed a design of completely portable aid kit for visually impaired persons. It focuses on detecting the pedestrian traffic lights and obstacles in the way of visually impaired person who crosses a pedestrian crossing. The proposed system recognizes the pedestrian traffic lights in real–time with deep learning and provides signals to the visually impaired person to cross the pedestrian crossing in the form of audio output and system works in both day and night time and have good reliability. For the good reliability of the system, different sorts of images and video data have been collected, edited, and stored in a large amount of training data to get a good model.

In 2020, **A. Rohith Kumar, K. Sanjay et al**. [13] proposed a system the AIoT Blind Stick is ground breaking assistive device designed to empower visually impaired individuals with enhanced mobility and independence. This solution integrates a Raspberry Pi Zero, high resolution camera, MPU sensor, ultrasonic sensor, Buzzer and speaker to create a comprehensive system that addresses the visually impaired community's unique challenges. The AIoT Blind Stick represents a significant advancement in assistive technology, potentially greatly improving the quality of life for visually impaired individuals worldwide.

In 2020, **T. S. Aravinth et al**. [14] proposed the technology makes strolling stick smarter which has many applications together with on foot stick indicator in case if they miss the stick through sound beeping, they might walk using utilizing the way themselves. If they face any obstacle, they can sense it by vibration sensor, and also, they can hear the guide directions in the headset. The camera is used to detect the obstacle through an ultrasonic sensor placed on the stick. The captured image is sent to the microcontroller to identify the type of the object and then it is intimated as voice command through the speaker or via earphones connected with Raspberry pi and also GPS is used to identify the exact location.

In 2021, **Sarath Sasikumar et al**. [15] designed an intelligent shoe for blind individuals so that they can walk independently it is equipped with ultrasonic sensors, voice alert systems, GPS navigation, and smartphone connectivity, the shoe detects obstacles and provides real-time feedback to enhance the safety and social inclusion and this approach promotes the autonomy but also greater inclusion and participation in daily activities for the people with blindness and this paper proposes a system where blind can lead an independent life.

2.3 Comparative Analysis of Related Work

A comparative analysis of various obstacle detection systems reveals a spectrum of functionalities and technologies employed, ranging from basic Arduino Uno implementations to advanced setups incorporating Raspberry Pi Zero with high-resolution cameras and GPS tracking. These systems not only detect obstacles but also integrate features such as voice commands, multiple energy sources, Bluetooth and Wi-Fi connectivity for data collection, moisture sensing, pedestrian traffic light detection, and machine learning algorithms for enhanced navigation assistance. Additionally, some systems offer unique functionalities like wet floor detection, patient movement monitoring, and nearby location suggestions, showcasing the diverse capabilities available for addressing specific needs and preferences in obstacle detection and navigation assistance.

The table 2.1 shows the comparative analysis of the current systems in light of the suggested proposal

Table 2.1 Comparative Analysis

Sl. No	Authors(s)	Techniques	Performance Measures
1.	Teja Chava et al.	Obstacle detection along with buzzer	Accuracy
2.	N. Sohan, H. S. Sai et al.	Obstacle detection along with the voice commands	Accuracy
3.	Pratik Bhongade et al.	Obstacle detection along with use of two types of sources of energy	Efficiency
4.	Manali Tayde et al.	Obstacle detection and Data of person's movement is collected with Bluetooth and Wi-fi connection	Data Collection

5.	Valentina Balas, Muhammad Arif et al.	Obstacle detection along with near by location suggestions with voice commands	Accuracy
6.	Jeffrey Chehade, Ali Hayek et al.	Obstacle detection and wet floor detection with patient movement detection.	Accuracy
7.	Pradeep Kumar M et al.	Navigation and Software Application to support Navigation	Accessibility, real-time updates, security and privacy
8.	I. Suneetha, Angeri Sandhya et al.	Obstacle detection using Arduino Uno	Reliability and Real-Time Monitoring
9.	Qianli Xu, Tian Gan et al.	Different Vibration Patterns	Navigation Assistance
10.	Azadeh Kian et al.	Implemented Machine Learning Algorithms	Real Time Assistance
11.	Shelena Soosay Nathan et al.	Moisture Sensing	Accuracy
12.	Tshering Tenji Sherpa et al.	Obstacle detection with pedestrian traffic lights detection	Reliability
13.	A. Rohith Kumar, K. Sanjay et al.	Usage of Raspberry Pi Zero and High Resolution Camera	High Quality Assistance and Enhance in mobility
14.	T. S. Aravinth	Obstacle detection using Raspberry Pi and GPS tracking system	Accuracy
15.	Sarath Sasikumar et al.	Obstacle Detection along with Voice Command assistance and Phone connection	Accessibility, Efficiency

2.4 Summary

The studies state that there are some other means like stick or obstacle detection gloves for blind. But it is not so reliable to use them and cannot detect the obstacle which is present in their path accurately. So here we have used the best possible way to detect the obstacle in their path by installing obstacle detection sensor in the shoes. The sensors improve the user's safety and spatial awareness by giving them immediate feedback in the form of vibrations or audio alarms. In addition to increasing dependability, this approach provides a covert and useful means of detecting obstacles, enabling visually impaired people to move around with more assurance and autonomy.

Chapter 3

3. Problem Formulation

Blind and visually impaired people face several challenges in their daily lives, including navigating their surroundings safely and independently. Smart shoes have the potential to address these challenges by providing blind and visually impaired people with real-time information about their surroundings and helping them to avoid obstacles and reach their desired destination without falls, accidents, or injuries.

These smart shoes have sensors that can identify obstacles and changes in the ground. They can provide instant feedback in the form of vibrations. This creative technique increases the user's confidence in navigating both familiar and unfamiliar areas while also improving spatial awareness. Incorporating GPS technology also helps customers plan their routes and find their way around, which makes for more effective travel. Smart shoes dramatically enhance the quality of life for those who are blind or visually impaired by encouraging safety and autonomy, which increases independence and decreases need on help and allows them to move independently from one place to their required destination easily without any injuries.

3.1 Motivation

The obstacle detection method is the key factor for recognizing the obstacles and avoiding them which may act as a block in the path for the blind person. Obstacle detection is implemented in all other kinds of kits like gloves, and walking sticks for the blind but it is not so efficient to use. So, considering this factor we are motivated and have implemented the methodology to the shoes so that the blind can easily wear and walk on the path to reach their destination, to alert them about the obstacle we have added a buzzer that gives an alert sound when the obstacle is detected and for the people who are blind and also deaf we have added a vibrating motor to sense the obstacle where it vibrates when the obstacle is detected. The Tracking system is been implemented in all the fields by keeping the idea of a tracking system we have implemented the GPS tracking system for the shoe because if the person gets lost or has undergone some injuries, he or she can press the button to alert the caretaker or guardian and send the live location of them to their guardian’s phone.

3.2 Objectives of the Present Study

The objectives of the proposed project are as follows:

1. To help blind people to find obstacle-free paths.
2. To help the blind to reach their destination independently.
3. To increase the independence and mobility of the blind people.
4. To reduce the accidents and injuries of the blind people.

Chapter 4

Requirements and Methodology

4.1 Hardware Requirements

The hardware requirements for the proposed project are depicted in the table 4.1 below:

Table 4.1: Hardware Requirements

Sl. No	Hardware/Equipment	Specification
1.	Arduino Nano	ATmega328
2.	Ultrasonic Sensor	HC SR04
3.	Battery	9V
4.	Buzzer	5V
5.	Vibrating Motor	9000 RPM
6.	GPS Tracker	A9G
7.	Antenna	1575.42 MHz

Arduino Nano:

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x).It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. A development board that is both small and powerful, the Arduino Nano is built around the Atmega328 microprocessor. The Nano has several features, including PWM outputs, I2C, SPI, UART, and analog and digital ports, all despite its small size. Its USB interface makes serial computer communication and programming simple. Because of its adaptability, the Arduino Nano is a great choice for makers of all skill levels, from novices dabbling with blinking LEDs to expert makers creating intricate IoT projects. Additionally, its open-source nature and price make it usable by both experts and enthusiasts, fostering innovation and creativity in the electronics industry.

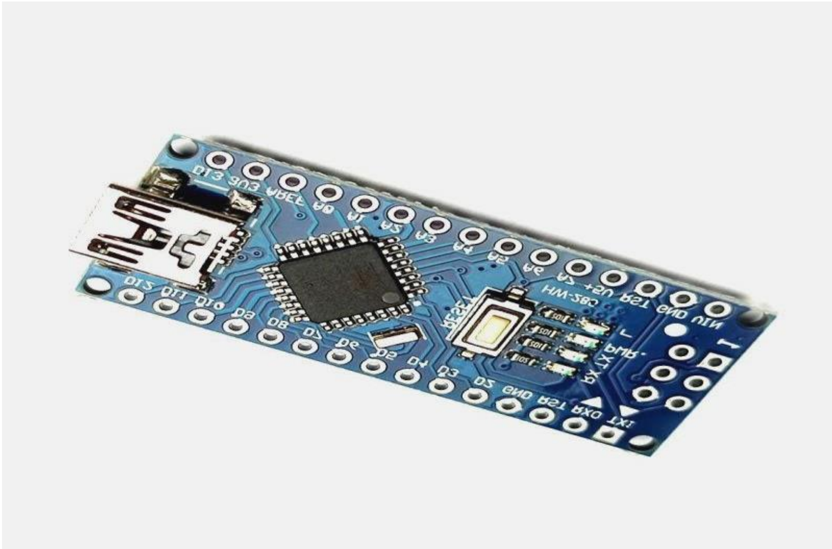


Figure 4.1: Arduino Nano

Ultrasonic Sensor:

An Ultrasonic Sensor is an electronic device that measure the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic Sensor has two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). Ultrasonic sensors find widespread usage in several fields, including industrial automation, robotics, car parking assistance systems, medical imaging, and object recognition and proximity sensing. Even in difficult conditions, their non-contact nature, accuracy, and dependability make them preferred options for applications requiring precise distance measurement.

Figure 4.2: Ultrasonic Sensor

Buzzer:

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell and siren. Buzzers allow timely reactions in emergency situations by providing instant audio alarms, such as fires or medical crises. Additionally, they provide insightful user feedback by validating activities or adjustments made to smart device settings, which improves user interaction.

Figure 4.3: Buzzer

Vibrating Motor:

Vibrating Motor is a compact size coreless DC motor used to informs the receiving the signal by vibrating, no sound. Vibrating motors are widely used in a variety of applications including cell phones, handsets, pagers, and so on. Users can experience haptic input using vibrating motors, simulating interactions with real-world objects through tactile sensations. Subtle vibrations are produced by vibrating motors in Internet of Things (IoT) devices that have buttons or touchscreens, including wearables, smart home controls, or smartphones, to verify user inputs or gestures. In Internet of Things devices where audio signals might not be appropriate or desired, vibrating motors are frequently utilized to convey notifications and alerts.

Figure 4.4: Vibrating Motor

GPS Tracker:

Using the Global Positioning System (GPS, all process used to establish all position at any point on the globe) the following two values can be determined anywhere on Earth. GPS receivers are used for positioning, locating, navigating, surveying and determining the time and are employed both by private individuals and companies. GPS trackers are also utilized for private tracking purposes, like monitoring the whereabouts of kids, the elderly, or pets. These trackers, which are frequently incorporated into wearable technology or smartphone apps, give caretakers piece of mind and enable them to find their loved ones fast in an emergency.

Figure 4.5: GPS Tracker

Battery:

A 9V battery is a type of rechargeable or single-use battery that provides 9 volts of power. It is commonly used in small electronic devices such as watches, calculators, and remote controls and it is also used in Used in devices that require 9V power, like smoke detectors, multimeters and toys. Additionally, 9V batteries are relatively inexpensive and easy to find, making them a convenient choice for many applications. The 9V battery is widely used to power portable electronics, Arduino projects, and small robotics. In order to reach the 9V output, the battery usually consists of six separate 1.5V batteries stacked in series. Nine-volt batteries come in a variety of forms, with capacities and performance traits that range.

Figure 4.6: Battery

Antenna:

The antenna provides real-time location data to outdoor enthusiasts, senior citizens, and children's personal tracking gadgets, improving safety and security. The GPS antenna makes precise position tracking possible in Internet of Things applications like asset tracking and smart wearables, opening up new functionality. These antennas are essential for accurate position tracking by emergency response systems, which can speed up response times and even save lives. They are also utilized in high-precision data collecting for professional mapping and surveying, as well as in telematics systems that send position data over cellular networks for uses like remote diagnostics and car tracking. The GPS antenna helps with precise field mapping and provides guidance for autonomous machinery in precision agriculture.

Figure 4.7: Antenna

4.2 Software Requirements

The software requirements for the proposed project are depicted in the table 4.2 below:

Table 4.2: Software Requirements

Sl. No	Software	Specification
1.	Embedded C	Programming Language
2.	Arduino IDE	Version 2.2.1

Embedded C:

Embedded C programming plays a crucial role to make the microcontroller run and perform the fancied actions. At present, we usually utilize several electronic devices like mobile phones, writing machines, security systems, refrigerators, digital cameras, etc. The managing of these embedded devices can be done with the help of an embedded C program. Embedded C programming strengthens with functions where every function is a set of statements utilized to complete specific tasks. The embedded C and C languages are equivalent and implemented through significant components like a variable, character set, keywords, data types, declaration of variables, expressions, statements. All features play a significant role while writing an embedded C program.

Arduino IDE:

The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor for writing code, a messages area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. Users can develop and edit code in languages like C and C++ using the flexible code editor provided by the IDE. Features like syntax highlighting and error checking are built into this editor to assist users in writing clear, error-free code. The library management system, which enables users to quickly search for, install, and manage libraries containing pre-written code for various components and functions, is one of the main features of the Arduino IDE.

4.3 Methodology Used

The proposed smart shoe system is implemented using the following steps:

STEP 1: The shoe consists of Arduino Nano to which the ultrasonic sensors, buzzer, battery and vibrating motor, buzzer and GPS system is mounted to it.

STEP 2: The blind person wears this shoe and move towards his desired destination.

STEP 3: If the obstacles occur the ultrasonic sensors detects the obstacles and it detects obstacle from certain distance makes a buzzer sound to alert the blind person.

STEP 4: Suppose the blind person is also deaf he could not hear the buzzer sound about obstacle order to overcome that a vibrating motor is installed to the smart shoe so that along with sound, vibration occurs so that they can sense the obstacle.

STEP 5: If the person feels he/she is lost by pressing a button the current location of the blind person is sent to the guardian’s phone or parent’s phone this is achieved as we will be installing GPS-GSM tracking system to the shoe.

Chapter 5

System Design

5.1 Architecture of the Proposed System

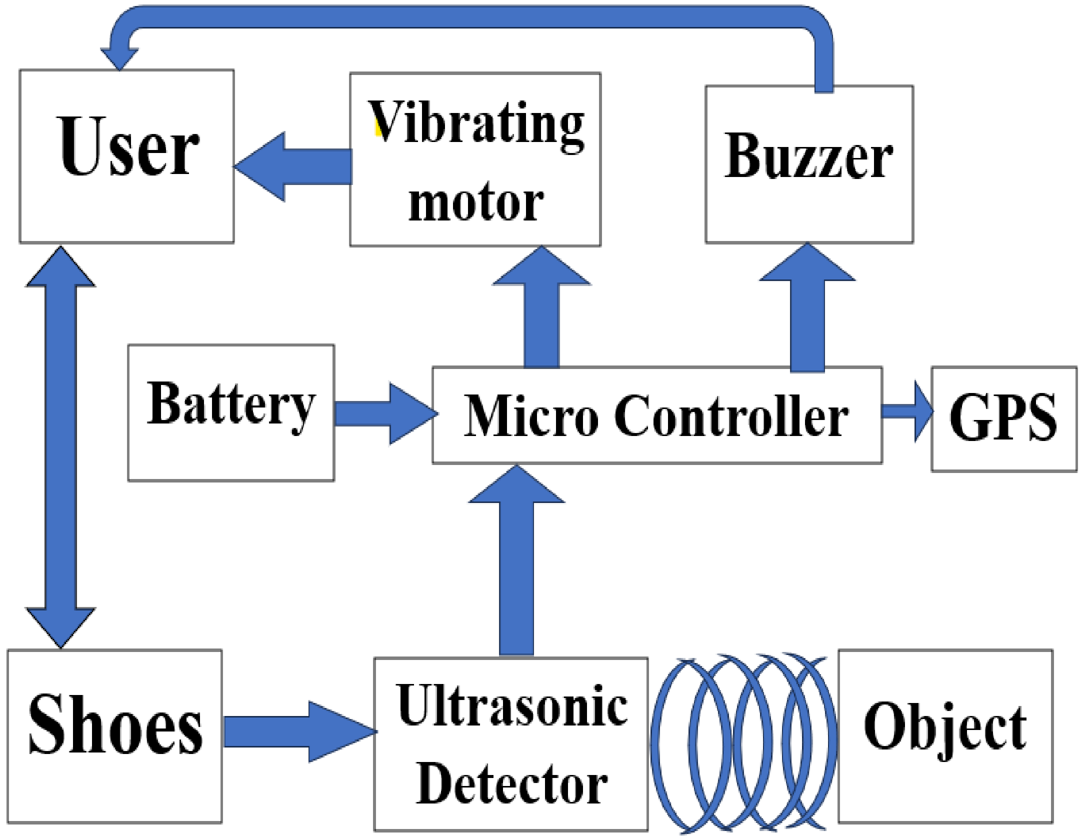


Figure 5.1: Architecture of the proposed system

Smart shoe for blind people system mainly consists of Microcontroller, sensor, battery, motor, buzzer etc. Interfacing microcontroller with ultrasonic sensor to detect the obstacles using ultrasonic waves. The buzzer (sounds) alerts visually impaired people over objects which are coming between their ways and could help them in walking with less accident. It keep’s track of the user’s location through the GPS module and keep the guardian notified of the user’s location. As an alert message is sent to the guardian’s phone and the live location of the person is sent via message in offline mode.

5.2 System Flowchart

Figure 5.2 shows the flowchart of the smart shoe system. First step is to activate the ultrasonic sensor using some power button. As soon as the blind persons encounters any obstacle it is detected using the sensor and it alerts the user using buzzer, along with the GPS. If no then person steps forward. If the person falls or any accident occurs, it will alert the guardian and sends the live location.

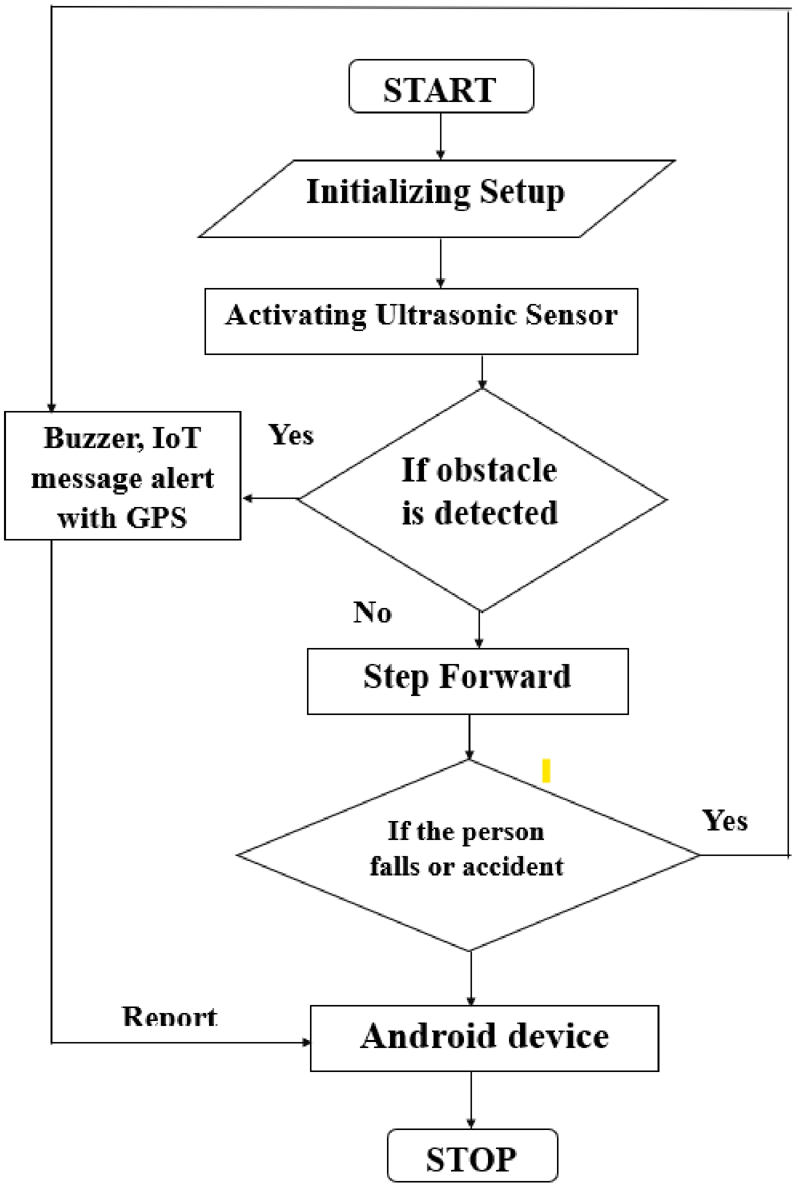


Figure 5.2: System Flowchart

5.3 Implementation Code

5.3.1 Code for Ultrasonic Sensor, Vibrating Motor and Buzzer:

```
#define trigPin 9
#define echoPin 10
#define buzzerPin 8 // Change
this to your actual buzzer pin
#define motorPin 11
long duration;
int distance;
void setup()
{
pinMode(motorPin,OUTPUT);
  pinMode(buzzerPin,
OUTPUT);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  Serial.begin(9600);
}
void loop()
{
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = duration * 0.034 / 2; // Speed of sound in cm/us
  Serial.print("Distance: ");
  Serial.print(distance);
  Serial.println(" cm");
```

```
 if (distance < 20)
 {
// Close proximity, loud tone
   digitalWrite(buzzerPin, HIGH);
   digitalWrite(motorPin, HIGH);
   delay(2000);
   digitalWrite(buzzerPin, LOW);
   digitalWrite(motorPin, LOW);
 }
 else
 {
// Far distance, short beep
   digitalWrite(buzzerPin, LOW);
   digitalWrite(motorPin, LOW);
 }
// delay(200);
}
```

5.3.2 Code for GPS Tracking

System:

```
#include <SoftwareSerial.h>
#include <MicroNMEA.h>

SoftwareSerial GPSData(10, 11);

char buffer[85];
const unsigned long eventInterval = 20000;
unsigned long previousTime = 0;
MicroNMEA nmea(buffer, sizeof(buffer));

unsigned long lastLog = 0;
float latitude_mdeg ;
```

```
float longitude_mdeg ;
String d = "";
#include<EEPROM.h>
// cell number1
int cn1_starting_address = 10;
int cn1_ending_address = 27;
int eeprom_Memory_address = 0;
int read_eepromDATA = 0;
char serialDATA_to_write;
int write_memoryLED = 13;
int end_memoryLED = 12;
int eeprom_size = 1024;
String number1 = "+919108072557"; // Replace this with your mobile number
char data;
const int sosPin = 2;     // the number of the pushbutton pin
int sosState = 0;
void setup()
{
  pinMode(sosPin, INPUT_PULLUP);
  Serial.begin(19200); // baudrate for GSM shield
  GPSData.begin(9600);
  //================================================
  pinMode(write_memoryLED, OUTPUT);
  pinMode(end_memoryLED, OUTPUT);
  number1 = "";
  previous_numbers_saved();
  //================================================
  // *********************************************************//
  Serial.println("\r");
  Serial.print("AT+CPMS=");
  Serial.print(char(34));
  Serial.print("SM");
  Serial.print(char(34));
  Serial.print(",");
  Serial.print(char(34));
```

```
Serial.print("SM");
Serial.print(char(34));
Serial.print(",");
Serial.print(char(34));
Serial.print("SM");
Serial.println(char(34));
delay(1000);
Serial.println("AT+CMGD=1,4\r");
delay(10);
Serial.println("AT+CMGD=1\r");
delay(10);
Serial.println("AT+CMGD=2\r");
delay(10);
Serial.println("AT+CMGD=3\r");
delay(10);
Serial.println("AT+CMGD=4\r");
delay(10);
//================
Serial.println("AT+GPS=1\r");
delay(100);
Serial.println("\r");
Serial.println("AT+GPS=1\r");
delay(1000);
Serial.println("AT+GPSMD=0\r");
Serial.println("AT+GPSRD=10\r");
delay(100);
Serial.println("AT+CMGF=1\r");
delay(1000);
Serial.println("AT+LOCATION=1\r");
Serial.println("AT+CNMI=2,2,0,0,0\r");
delay(1000);
Serial.print("AT+CMGS=\"");
delay(100);
Serial.print("+919108072557");  // Replace this with your mobile number
delay(100);
```

```
 Serial.print("\"\r");
 delay(1000);
 Serial.print("Tracker active...");
 Serial.write(0x1A);
 delay(1000);
}
void loop()
{
 unsigned long currentTime = millis();
 while (GPSData.available() > 0)
 {
  char inByte = GPSData.read();
  nmea.process(inByte);
 }
 latitude_mdeg = nmea.getLatitude();
 longitude_mdeg = nmea.getLongitude();
 latitude_mdeg = latitude_mdeg / 1000000.;
 longitude_mdeg = longitude_mdeg / 1000000.;

 if (Serial.available() > 0)
 {
  char a = Serial.read();
  boolean b = Serial.find("@");
  if (b)
  {
   String c = Serial.readStringUntil('@');
   delay(100);
   Serial.println(c);
   delay(100);

   if (c == "F")
   {
sendsms:
    Serial.println("AT+GPSRD=0\r");
    delay(1000);
```

```
  number1 = "";
  previous_numbers_saved();
  delay(1000);
  Serial.println("AT+CMGF=1\r");
  delay(1000);
  Serial.print("AT+CMGS=\"");
  delay(100);
  Serial.print("+919108072557");  // Replace this with your mobile number
  delay(100);
  Serial.print("\"\r");
  delay(1000);
  Serial.print("www.google.com/maps/?q=");
  Serial.print(latitude_mdeg, 6);
  Serial.print(",");
  Serial.print(longitude_mdeg, 6);
  delay(1000);
  Serial.write(0x1A);
  delay(2000);
  Serial.println("AT+GPSRD=10\r");
  delay(1000);
  Serial.println("AT+CMGD=1,4\r");
  delay(10);
  Serial.println("AT+CMGD=1\r");
  delay(10);
  Serial.println("AT+CMGD=2\r");
  delay(10);
  Serial.println("AT+CMGD=3\r");
  delay(10);
  Serial.println("AT+CMGD=4\r");
  delay(10);
 }
 if (c == "N")
 {
  Serial.println("AT+GPSRD=0\r");
  delay(2000);
```

```
        for ( eeprom_Memory_address = cn1_starting_address; eeprom_Memory_address <
cn1_ending_address;)
        {
          serialDATA_to_write = Serial.read();
          if (serialDATA_to_write == '@')
          {
            goto label1;
          }
          //  Serial.print(serialDATA_to_write);
          EEPROM.write(eeprom_Memory_address, serialDATA_to_write);
          eeprom_Memory_address++;
          number1 = number1 + serialDATA_to_write;
        }
label1:
        delay(1000);
        Serial.println("AT+GPSRD=10\r");
        delay(1000);
        number1 = "";
        previous_numbers_saved();
        Serial.println("AT+CMGD=1,4\r");
        delay(10);
        Serial.println("AT+CMGD=1\r");
        delay(10);
        Serial.println("AT+CMGD=2\r");
        delay(10);
        Serial.println("AT+CMGD=3\r");
        delay(10);
        Serial.println("AT+CMGD=4\r");
        delay(10);
      }
    }
  }
  sosState = digitalRead(sosPin);
  if (sosState == LOW)
  {
```

```
    goto sendsms;
  }
}
void erase_number1()
{
  for (eeprom_Memory_address = cn1_starting_address; eeprom_Memory_address <=
cn1_ending_address; eeprom_Memory_address ++)
  {
    EEPROM.write(eeprom_Memory_address, " ");
  }
  Serial.println(" ");
}

void previous_numbers_saved()
{
  for (eeprom_Memory_address = cn1_starting_address; eeprom_Memory_address <
cn1_ending_address; eeprom_Memory_address ++)
  {
    read_eepromDATA = EEPROM.read(eeprom_Memory_address);
    if (char(read_eepromDATA) == '#')
    {
      goto skip1;
    }
    number1 = number1 + char(read_eepromDATA);
    delay(1);
  }
skip1:
  Serial.print("Master Number:");
  Serial.println(number1);
}

void erase_memory()
{
  for (eeprom_Memory_address = 0; eeprom_Memory_address < eeprom_size;
eeprom_Memory_address ++)
  {
```

```
    EEPROM.write(eeprom_Memory_address, " ");
  }
  Serial.println("Memory Erased!!!");
}
```

Chapter 6

Results and Discussion

6.1 Results

The Smart Shoes are developed to detect the obstacles which occur in the path of the blind and also vibrating motor is been implemented where the blind can sense the obstacle if he/she is deaf. GPS Tracking System is implemented where suppose the person is lost, or any accidents or injuries has occurred, if the person press the button an live location is sent to the caretaker or guardian's phone.

Figure 6.1 shows the distance of the obstacle detected by the Ultra Sonic Sensor and output is shown in the serial monitor of Arduino IDE.

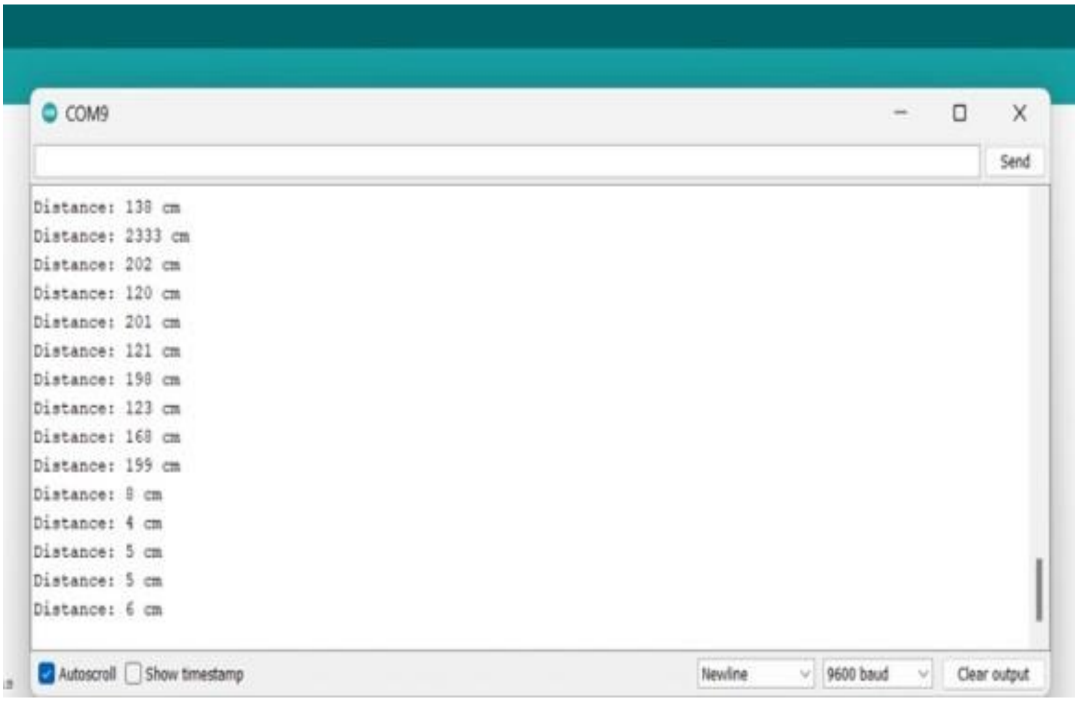


Figure 6.1: Obstacle Detected Represented in the Serial Monitor

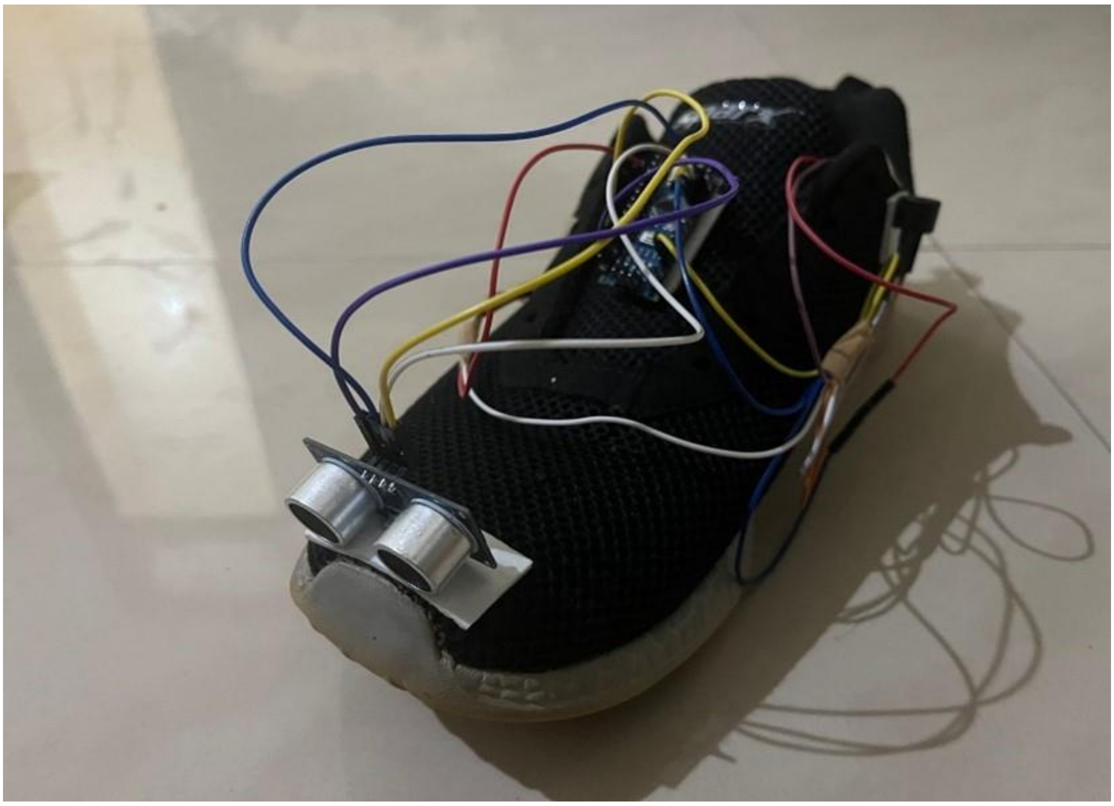


Figure 6.2: Obstacle Detection Setup

Figure 6.2 shows the Obstacle Detection Setup on the Shoe where the Sensor detects the obstacle and alerts the person with the buzzer sound and also alerts through haptic feedback.

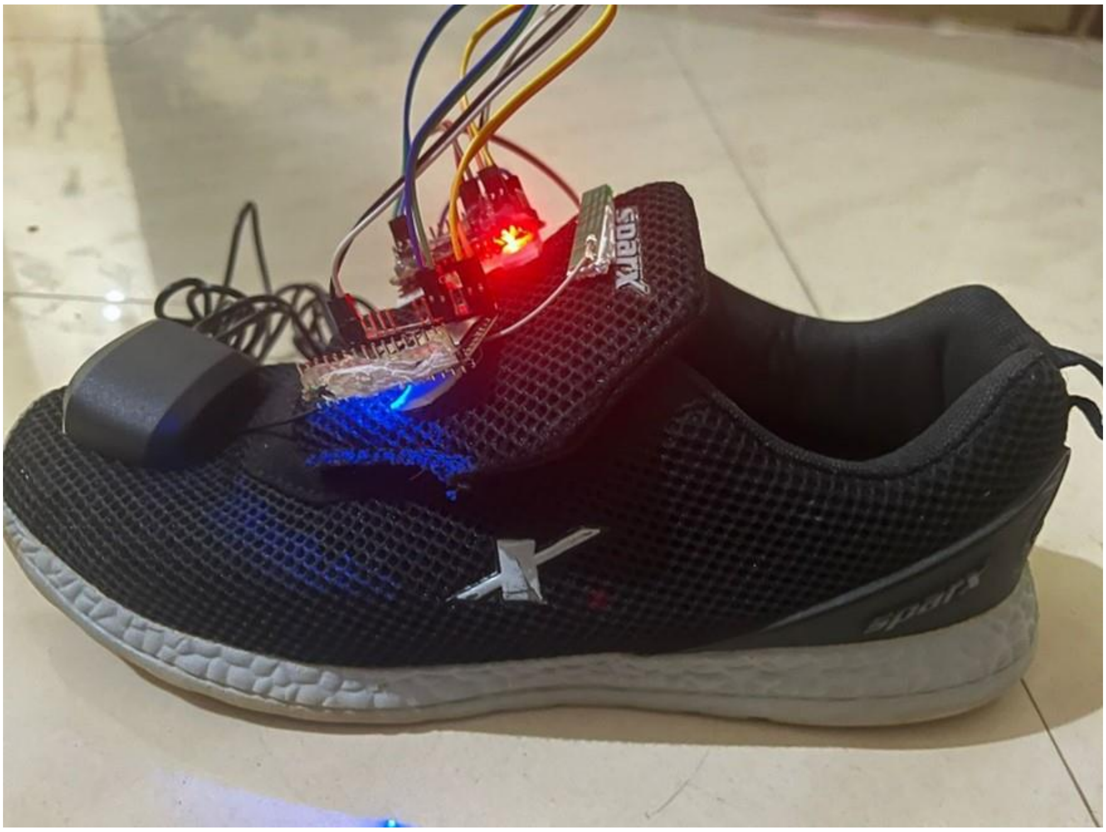


Figure 6.3: GPS Tracking System Setup

Figure 6.3 shows the GPS Tracking System Setup where if the person has undergone some accident or injuries or he/she is lost for help purpose a button is clicked so that live location of the blind is sent to guardian's or caretaker's phone.

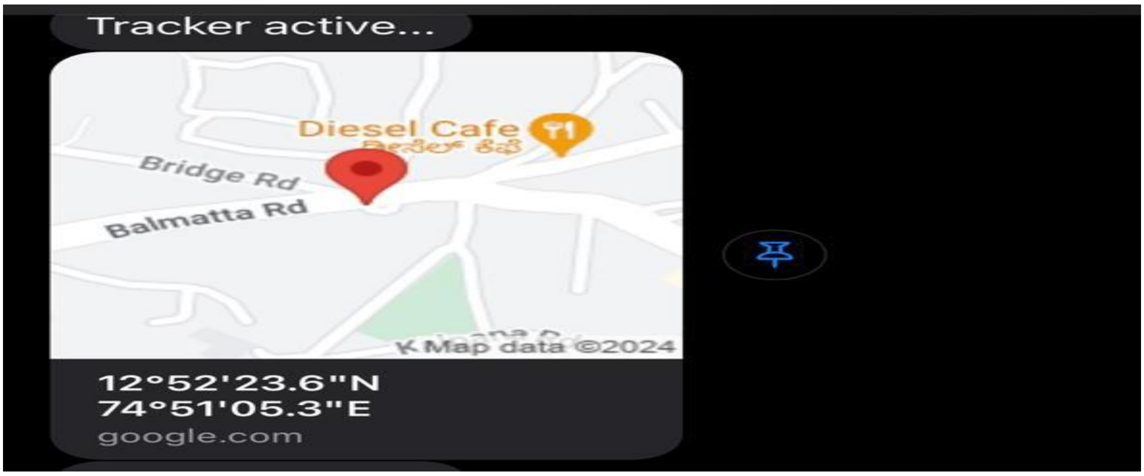


Figure 6.4: Live Location Sent via SMS

Figure 6.4 shows the Live location sent to the guardian's or caretaker's phone tracked using GPS Tracking System.

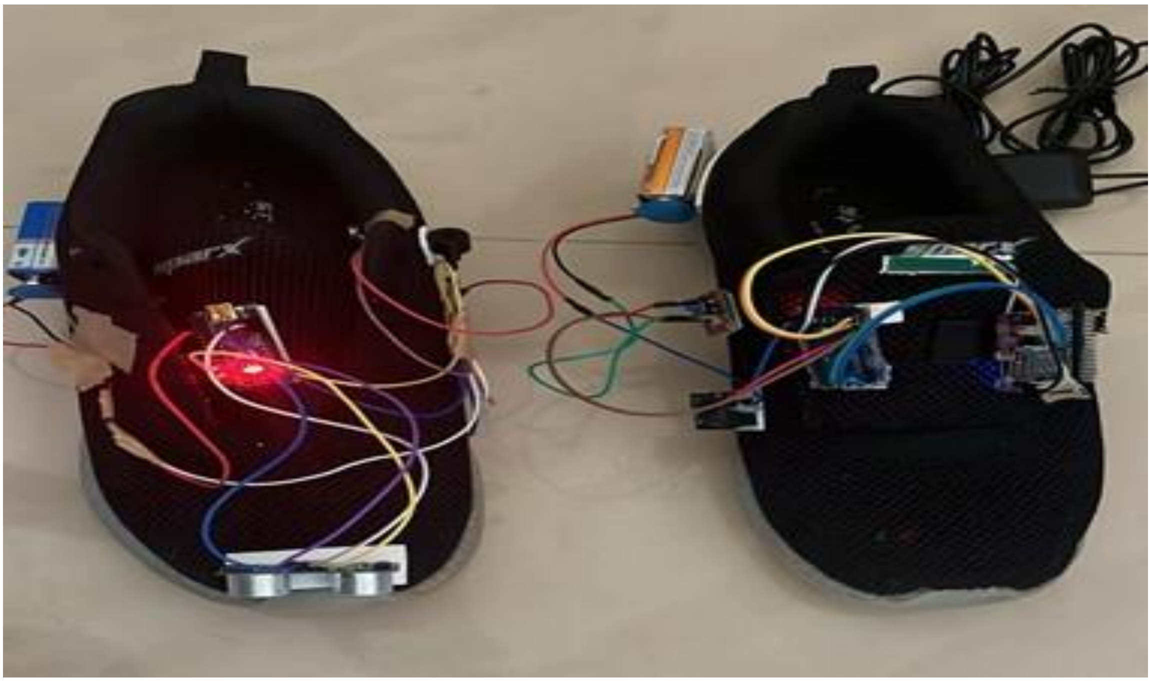


Figure 6.5: Full Setup

Figure 6.5 shows the overall Setup of Obstacle detection and GPS Tracking System implemented on the Shoes.

6.2 Discussion

This project smart shoe developed for blind people, developed on the Arduino Nano processor board. Its main aim is to reduce the dependency on other people while moving from one place to other. This system detects the obstacle present infront of the blind, alerts the blind using buzzer along with the vibration of the motor. Additional feature of our project is GPS Tracking System which sends the live location of the blind persons to their guardians or caretaker with the help of GSM module.

Chapter 7

Conclusion and Scope for Future Work

7.1 Conclusion

The smart shoe project has the potential to make a significant Impact on the lives of blind people. Most promising outcome of the project is the potential to improve the mobility and independence of people. These shoes may help blind people to participate more fully in all aspects of life. It also offers lots of advantages over blind stick. By leveraging cutting-edge technology, including sensors, GPS and other connecting features, this project aims to enhance mobility, safety of the blind.   This project not only highlights the possibilities of integrating technology to address accessibility challenges but also underscores the importance of user centered design in creating impactful solutions. Integration of GPS technology allowed for seamlessly enhancing user’s spatial awareness.

7.2 Scope for Future Work

The future scope of the smart shoe project includes improving battery life and connectivity options. Integration of machine learning and AI can enhance navigation capabilities, while adding safety features like fall detection and emergency alerts. Collaboration for global availability and affordability is crucial for widespread impact and inclusivity. Continuous user feedback will drive ongoing improvements for a practical and beneficial solution for visually impaired individuals.

References

[1] Teja Chava, A. Tarak Srinivas, A. Lohith Sai, VenuBabu Rachapudi, K.L University, “IOT based smart shoe for blind”, International Conference on Inventive Computation Technologies(2021).

[2] N. Sohan, et al. "Smart Assistive Shoes for Blind”, International Conference on Computational Vision and Bio Inspired Computing (ICCVBIC 2018).

[3] Pratik Bhongade,Sanyukta Girhay,Abdul Moeid Sheikh,Rahul Ghata,Sakshi Ambadkar,Chitra Dusane,\"Internet of Things - Enabled Smart Shoes for Blind People\",2022 IEEE Delhi Section Conference (DELCON).

[4] H. K. K., A. K. Palakurthi, V. Putnala and A. Kumar K., "Smart College Chatbot using ML and Python," 2020 International Conference on System, Computation, Automation and Networking (ICSCAN), Pondicherry, India, 2020, pp. 1-5, doi: 10.1109/ICSCAN49426.2020.9262426.

[5] “Smart Footwear for the Visually-Impaired People Based on Arduino Platform and Ultrasonic Sensors”and the authors are Iuliana Chiuchisan, Oana Geman, Valentina Balas, Guojun Wang, Muhammad Arif, Haroon Elahi & Peng Tao of Springer publication.

[6] Jeffrey chehade, Georgio abou haydar, Ali hayek, Josef boercsoek, Jose Javier Serrano olmedo, "Design and Implementation of Smart Shoes for Blind and Visually Impaired People for More Secure Movements", 2020 32nd International Conference on Microelectronics (ICM).

[7] Pradeep Kumar M, Inchara K M, Lekhashree S, Likhith C N, Pavan U, "Real Time Assistive Shoe for Visually Impaired People", 2021 6th International Conference for Convergence in Technology (I2CT).

[8] I. Suneetha, Angeri Sandhya, L. Rama Krishna reddy, H. Reddy Jyothika, C. Tharun, “Smart Shoe for the Visually Impaired Using IOT”, International Journal of Advances in Engineering and Management (IJAEM),Volume 5.

[9] Qianli Xu, Tian Gan, Shue Ching Chia, Liyuan Li, Joo-Hwee Lim, Phyoe Kyaw Kyaw, "Design and Evaluation of Vibrating Footwear for Navigation Assistance to Visually Impaired People\",2016 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData).

[10] Shelena Soosay Nathan, Kuan Jung Ying1, Lim Hui Wen, Lim Xin Weoi , “Design of Smart Walking Shoe for Visually Impaired People”, Journal of Advanced Research in Applied Mechanics 101, Issue 1 (2023) 53-61.

[11] Azadeh Kian et al. "Application of Wearable Sensors in Actuation and Control of Powdered Ankle Exoskeletons". (2022).

[12] Shering Tenji Sherpa, Akinori Kimura "Pedestrian Crossing Lights and Obstacles Detections for Visually Impaired Person", (2022) Nicograph International (NicoInt).

[13] A. Rohith Kumar, K. Sanjay et al. "IoT based Blind Stick", International Research Journal of Engineering and Technology (2020).

[14] T. S. Aravinth (2020), "WiFi and bluetooth based smart stick for guiding blind people", Proc. 3rd Int. Conf. Intell. Sustain. Syst. ICISS 2020 pp 317–320.

[15] Vijayaraja Loganathan, Dhanasekar Ravikumar ORCID, Gokul Raj Kusala Kumar, Sarath Sasikumar, Theerthavasan Maruthappan and Rupa Kesavan. "Multipurpose Smart Shoe for Various Communities".

Plagiarism Profile

DrillBit

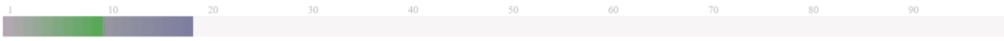
The Report is Generated by DrillBit Plagiarism Detection Software

Submission Information

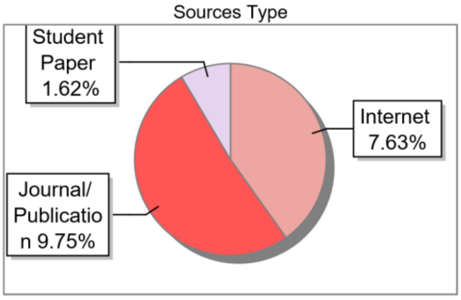
Author Name	Praveen
Title	Smart Shoe for Blind
Paper/Submission ID	1818936
Submitted by	ise@sdmit.in
Submission Date	2024-05-17 11:36:07
Total Pages, Total Words	38, 6896
Document type	Project Work

Result Information

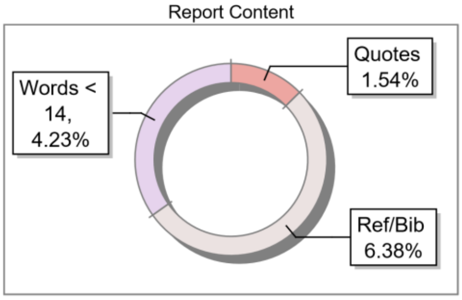
Similarity **19 %**



Sources Type



Report Content



Exclude Information

Quotes	Not Excluded
References/Bibliography	Not Excluded
Source: Excluded < 14 Words	Not Excluded
Excluded Source	**0 %**
Excluded Phrases	Not Excluded

Database Selection

Language	English
Student Papers	Yes
Journals & publishers	Yes
Internet or Web	Yes
Institution Repository	Yes

A Unique QR Code use to View/Download/Share Pdf File

Personal Profile

Mrs. Shobha

Asst. Professor and Project Guide

Mrs. Shobha received B.E. degree in Computer Science from NMAMIT Nitte in the year 1994, and MTech. in Information Technology in the year 2006.

Her subjects of interest include C, C++, Java, Data Mining and Data Warehousing, Software Testing, Automata Theory and Computability, Compiler Design.

Name: P J Prajanya Jain

USN: 4SU20IS028

Address: Thrijaya Jain Compound Laila,
Belthangady Taluk

E-Mail ID: 20b27@sdmit.in

Contact Phone No: +91 872554324

Name: Pooja

USN: 4SU20IS029

Address: Kanchinja House, Melanthabettu village,
Guruvanyakere, Belthangady Taluk.

E-Mail ID: 20b28@sdmit.in

Contact Phone No: +91 9380825663

Name: Prathvin P Shetty

USN: 4SU20IS031

Address: Sudha House,SarvaPrakash Nagar, Ankadakatte,
Koteshwara, Kundapura, Taluk.

E-mail ID: 20b30@sdmit.in

Contact Phone No: +919108072557

Name: Praveen M R

USN: 4SU20IS032

Address: #52, Kondadahalli, Kondadhahalli Post,
Channagiri Taluk, Davangere District.

E-Mail ID: 20b31@sdmit.in

Contact Phone No: +91 7676626605