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Department of MCA

IOT LAB WITH MINI PROJECT

(20MCA37)

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CERTIFICATE

This is to certify that Subham Kumar (1CR21MC102) has successfully completed the lab work of IoT Lab with Mini Project (20MCA37) in partial fulfillment of the III semester, Master of Computer Applications (MCA) course, under Visvesvaraya Technological University (VTU), Belgaum for the year 2023.

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Date:

External Examiner:

(1)____________________

(2)____________________

ACKNOWLEDGMENT

I would like to express my sincere appreciation to the team behind the IoT smart shoes project for blind people. This innovative project has the potential to significantly improve the lives of visually impaired individuals by providing them with a tool that can assist them in navigating their surroundings.

We are thankful to our beloved Head of Department, Mrs. Gomathi Ramkumar, who encourages us to come up with new and innovative ideas and for providing the environment with all the facilities for completing the project.

We are also grateful to our project guide, Ms. Dhivya Rajanbabu, Assistant Professor in the Department of Master of Computer Application, for their valuable guidance and constant support during our project development.

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SR NO.

Chapter 1: Introduction

1.1 INTRODUCTION

The IoT smart shoes project for blind people is an innovative initiative that aims to provide a solution to the mobility challenges faced by visually impaired individuals. The project involves the development of a pair of shoes that are equipped with sensors and connected to an IoT (Internet of Things) platform, allowing them to provide real-time feedback to the user.

The smart shoes use a combination of sensors, such as ultrasonic sensors and gyroscopes, to detect obstacles in the user's path and provide haptic feedback through vibrations on the sole of the shoe. This feedback allows the user to navigate their surroundings more confidently and safely.

The development of the IoT smart shoes project for blind people has the potential to significantly improve the quality of life for visually impaired individuals, allowing them to navigate their environment more independently and with greater confidence. The project has received positive feedback from blind individuals who have participated in testing and development, and it is hoped that it will be made widely available to the blind community in the near future.

1.2 OBJECTIVE

The IoT smart shoes project for blind people is an innovative initiative that aims to provide a solution to the mobility challenges faced by visually impaired individuals. The project involves the development of a pair of shoes that are equipped with sensors and connected to an IoT (Internet of Things) platform, allowing them to provide real-time feedback to the user's path and provide haptic feed through vibrations on the sole of the shoe. This feedback allows the user to navigate their surroundings more confidently and safely.

Chapter 2: Requirement Analysis

2.1 PROBLEM STATEMENT

Visually impaired individuals face many challenges when navigating their environment, including the risk of colliding with obstacles or getting lost. Traditional assistive tools, such as canes or guide dogs, have limitations and may not provide sufficient assistance in certain situations.

The IoT smart shoes project for blind people addresses this problem by providing a new tool that can assist visually impaired individuals in navigating their environment more safely and independently. The project aims to provide a solution to the following problems:

Lack of Real-Time Feedback: Traditional assistive tools, such as canes, provide feedback only when the user comes into contact with an obstacle. This can be dangerous, as it does not provide real-time feedback to the user, leaving them vulnerable to colliding with obstacles.

Inaccuracy of Traditional Navigation Tools: Traditional navigation tools, such as GPS devices or maps, may not provide accurate or up-to-date information, making it difficult for visually impaired individuals to navigate to specific locations.

Dependence on Others: Visually impaired individuals may need to rely on others for assistance in navigating their environment, which can be limiting and reduce their independence.

Safety Concerns: Visually impaired individuals may be at higher risk of falls or accidents due to their limited ability to navigate their environment safely.

The IoT smart shoes project for blind people addresses these problems by providing a new tool that can assist visually impaired individuals in navigating their environment more safely and independently. The smart shoes provide real-time feedback, accurate navigation assistance, and can detect falls or other safety concerns, allowing visually impaired individuals to navigate their environment with greater confidence and independence.

2.2 PROBLEM SOLUTION

The IoT smart shoes project for blind people provides a solution to the challenges faced by visually impaired individuals in navigating their environment safely and independently. The project achieves this solution through the following features: Real-Time Feedback: The smart shoes are equipped with sensors that can detect obstacles in the user's path and provide haptic feedback through vibrations on the sole of the shoe. This provides real-time feedback to the user, allowing them to avoid obstacles and navigate their environment more safely.

Accurate Navigation Assistance: The shoes are connected to a mobile app that provides GPS navigation, allowing the user to navigate to specific locations with accurate and up-to-date information. The haptic feedback also provides directional guidance to the user.

Independence: The smart shoes allow visually impaired individuals to navigate their environment more independently, reducing their dependence on others for assistance and increasing their confidence and self-reliance.

Safety: The shoes can detect falls or sudden changes in motion and send alerts to a caregiver or emergency services, providing an added level of safety for visually impaired individuals.

Overall, the IoT smart shoes project for blind people provides a comprehensive solution to the challenges faced by visually impaired individuals in navigating their environment safely and independently. The project's features, including real-time feedback, accurate navigation assistance, independence, and safety, make it a promising tool for improving the quality of life for visually impaired individuals.

2.3 METHODOLOGY

The methodology for developing an IoT smart shoes project for blind people typically involves several key steps:

Requirement analysis: This step involves identifying the requirements of the project, including the user's needs and the technical requirements for the sensors and feedback mechanisms.

Design: In this step, the shoe design is created, including the placement of the sensors and feedback mechanisms, as well as the selection of the microcontroller and power source.

Implementation: This step involves building the shoe prototype, including assembling the sensors, microcontroller, and feedback mechanisms into the shoe design.

Testing: Once the prototype is built, it is tested in a controlled environment to ensure that the sensors and feedback mechanisms are working correctly and providing accurate feedback to the user.

User feedback: After testing, the shoe prototype is typically evaluated by blind users to gather feedback on its effectiveness and usability. Based on this feedback, the design may be revised to better meet the needs of the users.

Refinement: The final step involves refining the shoe design based on the user feedback and testing to create a final prototype that meets the requirements of the project.

Overall, the methodology for developing an IoT smart shoes project for blind people involves a user-centered design approach that emphasizes the needs and preferences of the blind user. It is an iterative process that involves testing and refinement to create a final product that is effective, reliable, and user-friendly.

Chapter 3: Software Requirement Specification

3.1 FUNCTIONAL REQUIREMENT

Functional requirements describe the specific features and capabilities that a system or project should provide. In the case of the IoT smart shoes project for blind people, some functional requirements could include:

Obstacle Detection: The shoes should be equipped with sensors that can detect obstacles in the user's path and provide real-time feedback through haptic vibrations on the sole of the shoe.

3.2 NON-FUNCTIONAL REQUIREMENT

Non-functional requirements are the characteristics that a system or project should possess, aside from its primary functionality. In the case of the IoT smart shoes project for blind people,some non-functional requirements could include.

Usability: The shoes should be designed with the user in mind, ensuring that they are Comfortable, easy to wear, and intuitive to use. The mobile app should also be user-friendly with clear instructions and customization options.

Reliability: The shoes should be reliable and accurate in detecting obstacles and providing feedback, ensuring that the user can navigate their environment safely and with confidence.

3.3HARDWARE REQUIREMENTS:

Arduino UNO
Jumper Wires

9-volt Battery

9-volt Cap

Ultrasonic Sensor
Buzzer
Led
Plastics Box

Shoes

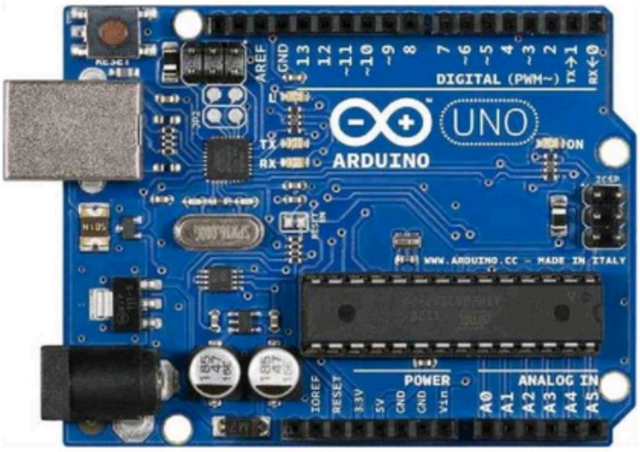
3.4 SOFTWARE REQUIREMENTS:

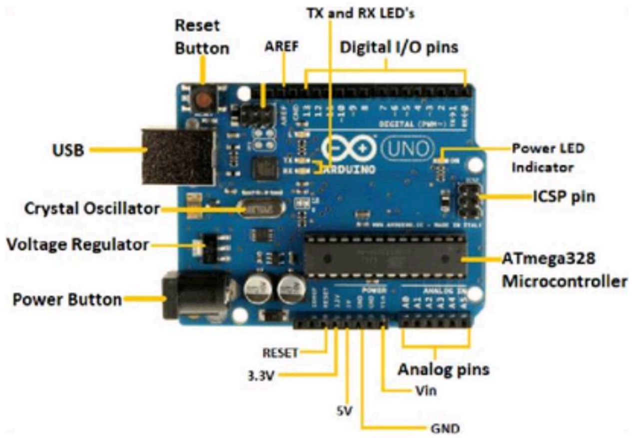
Operating System	: Android
Languages	: Arduino C
IDE	: Arduino IDE

Chapter 4: System Analysis and Design

4.1 TOOLS USED

4.1.1. Arduino Uno





The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board.

Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.

The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

4.1.2 Jumper Wires

jump wire (also known as **jumper**, **jumper wire**, **DuPont wire**) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without sol- dering. Individual jump wires are fitted by inserting their "end connectors" into the slots pro- vided in a breadboard, the header connector of a circuit board, or piece of test euipment.

4.1.3 Ultrasonic sensors

Ultrasonic sensors are commonly used in the IoT smart shoes project for blind people to detect obstacles and provide feedback to the user. These sensors emit high-frequency sound waves that bounce off objects in the user's environment and then return to the sensor. By measuring the time it takes for the sound waves to return, the sensor can calculate the distance to the object and determine whether it poses a potential obstacle for the user.

In the IoT smart shoes project for blind people, ultrasonic sensors are typically mounted on the front or sides of the shoe, facing outward to detect obstacles in the user's path. When an obstacle is detected, the sensor sends a signal to a microcontroller, which then triggers a vibration motor to provide haptic feedback to the user. The intensity of the vibration can be adjusted to indicate the proximity of the obstacle, with stronger vibrations indicating a closer object.

Ultrasonic sensors are advantageous for use in the IoT smart shoes project for blind people because they are relatively low-cost, have high accuracy, and are able to detect a wide range of objects, including walls, furniture, and people. However, they do have some limitations, such as difficulty detecting objects that are very small or flat, or objects that absorb sound waves, such as soft materials or fabrics. Additionally, ultrasonic sensors may not perform well in outdoor environments with strong wind or rain, which can interfere with the sound waves.

4.1.4 9-volt Battery

A 9-volt battery can be used to power the IoT smart shoes project for blind people. The battery is typically connected to a microcontroller, which controls the sensors and feedback mechanisms in the shoe.

One advantage of using a 9-volt battery is that it provides a relatively high voltage and a long-lasting power source for the shoe, making it ideal for use in the field. Additionally, 9-volt batteries are widely available and can be easily replaced when they run out of power.

4.1.5 Buzzer

A buzzer can be used as a feedback mechanism in the IoT smart shoes project for blind people. When an obstacle is detected by the sensors, the buzzer can be triggered to emit an audible sound to alert the user of the obstacle.

The buzzer is typically connected to a microcontroller, which receives signals from the sensors and triggers the buzzer to emit the appropriate sound. The sound can be adjusted in terms of pitch and volume to provide different levels of feedback to the user.

One advantage of using a buzzer as a feedback mechanism is its simplicity and low cost. Buzzer components are readily available and can be easily integrated into the shoe design. Additionally, a buzzer can provide a loud and clear signal to the user, even in noisy environments.

However, one disadvantage of using a buzzer is that it may not be as discreet or subtle as other feedback mechanisms, such as haptic vibrations. Some users may prefer a more discreet feedback mechanism that does not draw attention to their impairment.

Overall, a buzzer can be an effective feedback mechanism in the IoT smart shoes project for blind people, but designers should consider the user's preferences and the environment in which the shoes will be used when selecting feedback mechanisms.

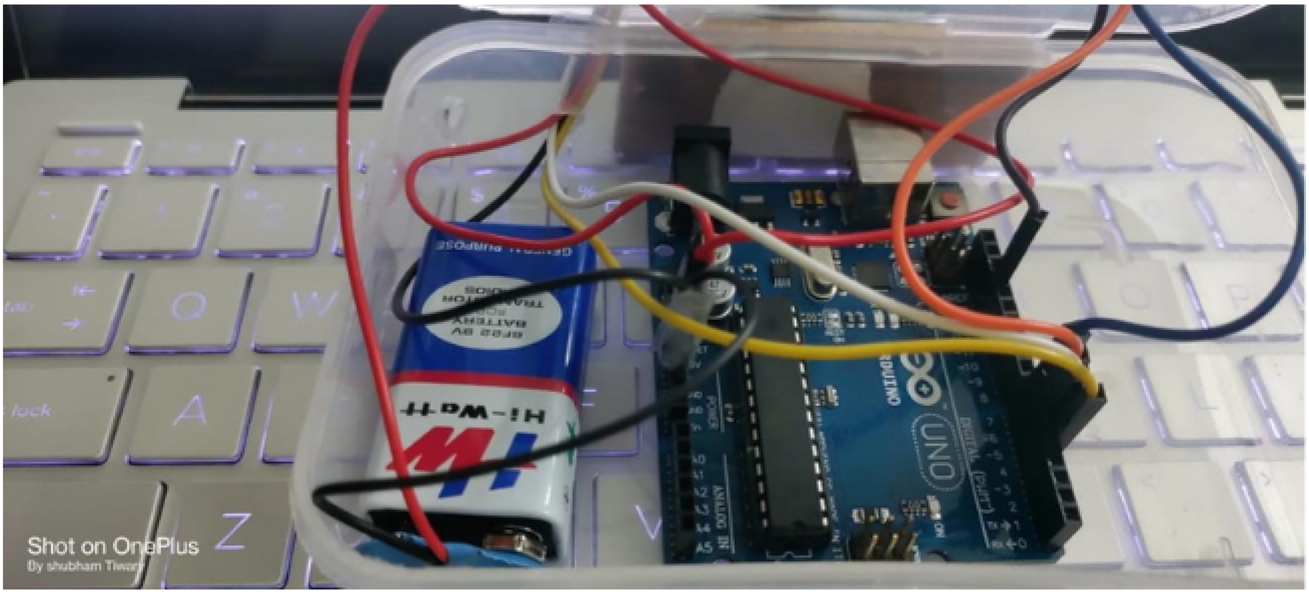
Chapter 5: Implementation and Testing

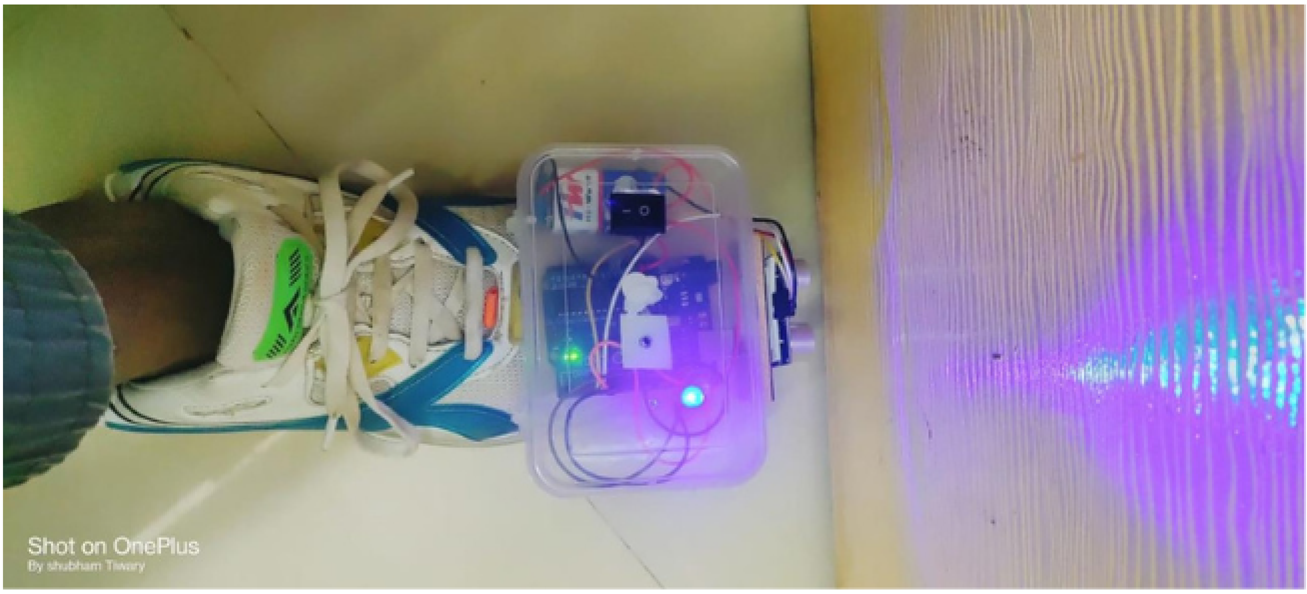
5.1 Source Code

```
// defines pins numbers
const int trigPin = 4;
const int echoPin = 5;
const int Relay = 6;
const int ledPin = 7;

// defines variables
long duration;
int distance;
int safetyDistance;


void setup() {
pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
pinMode(echoPin, INPUT); // Sets the echoPin as an Input
pinMode(Relay, OUTPUT);
pinMode(ledPin, OUTPUT);
Serial.begin(9600); // Starts the serial communication
}


void loop() {
// Clears the trigPin
digitalWrite(trigPin, LOW);
delayMicroseconds(2);

// Sets the trigPin on HIGH state for 10 micro seconds
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);

// Reads the echoPin, returns the sound wave travel time in microseconds
```

```
duration = pulseIn(echoPin, HIGH);

// Calculating the distance
distance= duration*0.034/2;

safetyDistance = distance;
if (safetyDistance <=25){
digitalWrite(Relay, HIGH);
digitalWrite(ledPin, HIGH);
}
else{
digitalWrite(Relay, LOW);
digitalWrite(ledPin, LOW);
}

// Prints the distance on the Serial Monitor
Serial.print("Distance: ");
Serial.println(distance);
}
```

5.2 Snapshot


Shot on OnePlus
By shubham Tiwary


Shot on OnePlus
By shubham Tiwary

Chapter 6: Conclusion and Future Enhancements

In conclusion, the IoT smart shoes project for blind people is a promising technology that can greatly benefit the visually impaired by providing them with an enhanced sense of awareness and mobility. By using sensors and feedback mechanisms, the shoes can detect obstacles and provide real-time feedback to the user, allowing them to navigate their environment with greater confidence and independence.

However, there is still room for improvement in the design and implementation of the technology. Some potential future enhancements include:
Integration with GPS technology: By incorporating GPS tracking, the shoes could provide additional information to the user, such as their location and directions to a desired destination.
Haptic feedback mechanisms: In addition to audible feedback, haptic feedback mechanisms, such as virating motors, could be used to provide tactile feedback to the user. Machine learning algorithms: By using machine learning algorithms, the shoes could learn from the user's movements and behavior, providing more personalized feedback and enhancing their mobility. Integration with smart home devices: The shoes could be integrated with smart home devices, such as voice assistants or home automation systems, to provide the user with additional support and Overall onvenience.Ol the IoT smart shoes project for blind people has the potential to greatly improve the lives of the visually impaired. With continued innovation and refinement, the technology could become e an essential tool for enhancing mobility and independence.

Chapter 7: Bibliography

https://drive.google.com/file/d/1ET4JUACivXec2NGLbbp_UGxI6X1kxK3m/view?usp=drivesdk

https://youtu.be/WTflEIW-qCY