SMART SHOE USING ARDUINO

A project report submitted in partial fulfilment of the Requirements for the award of credits of Programming with Microcontroller a skill-oriented course of

Bachelor of Technology

In

CSE (IoT, CYBERSECURITY INCLUDING BLOCKCHAIN TECHNOLOGY)

By

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CERTIFICATE

This is to certify that the project titled **"SMART SHOE USING ARDUINO"** is a Bonafide record of work done by **Ms BEJJAM CHARITHA** under the guidance of **Mr. K. Ravi Kumar, Associate professor** in partial fulfilment of the requirement for the award of credits of **Programming with Microcontroller** a skill-oriented course of Bachelor of Technology in Computer Science and IOT, cyber security including block chain technology JNTUK during the academic year 2023-2024.

Signature of Project Instructor
Mr. K. Ravi Kumar

Signature of HOD
Dr.M.R.N.Tagore

DECLARATION

I, BEJJAM CHARITHA (22BQ1A4710) hereby declare that the project report entitled **"SMART SHOE using ARDUINO"** done by me under the guidance of Mr,K.RAVI KUMAR, Associate professor, Department of CSE (IOT, Cyber security including Block chain Technology) is submitted for the partial fulfilment of requirements for the award of Degree of Bachelor of Technology in COMPUTER SCIENCE AND IOT, INCLUDING BLOCKCHAIN TECHNOLOGY.

Date: **Signature of the candidate:**

Place: VVIT, Nambur.

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TABLE OF CONTENTS

ABSTRACT

The major goal of this initiative is to help the blind walk normally by providing them with acoustic support and addressing their mobility issues. As a result, the initiative attempts to create a tool that could act as a navigational aid for them. The study focuses on creating a tool that will enable visually impaired (or blind) people to travel more easily and independently. One of the largest challenges that people with visual impairments encounter is travelling because, unlike sighted people, they are less aware of their location and direction in relation to traffic and other impediments as they walk both indoors and outdoors. The technique suggested in the research provides a remedy for those who are blind. The idea consists of smart shoes that warn visually impaired persons of impediments in their path and may enable them to walk without colliding as much. This abstract presents a solution for blind people in detecting obstacle in front of them and thus prevents them from hitting it. This is an extremely useful Arduino project. The obstacle detection is done by using HC-SR04 ultrasonic sensor. When the blind person reaches any obstacle, the ultrasonic sensor detects it and the buzzer goes on. The buzzer sounds the alarm as long as the shoe is near the obstacle. Smart Shoe can also help the person to reach their destination independently. In conclusion we say that smart shoe can help in their daily routine and act as a comfortable and safe companion without any obstacles.

CHAPTER-1

INTRODUCTION TO SMART SHOE USING ARDUINO

Persons with such problems are significantly impacted by blindness, low vision, visual impairment, and vision loss. They have effects on a person's physical, psychological, social, and economic well-being, which lowers their quality of life and prevents them from performing several Activities of Daily Living (ADL), the most important of which are mobility and navigation. Blindness is a qualitative phrase used to describe the clinical condition in which people lose their ability to perceive light completely. Blindness also describes those whose vision is so poor that they must mostly rely on their other senses to function. On the other hand, the phrase "visual impairments" is used to describe conditions where vision loss is accompanied by a loss of organ-level visual functions, such as the loss of visual acuity or the loss of visual field. The long Hoover Cane used by them is not advantages while walking and travelling. Using smart shoes for visually impaired people need not to be depending on others for mobility. The systems we have designed consist of sensors and vibrator for sensing the surrounding environment and giving feedback to the blind person. It is used as a safety device as well as navigation device. The electronic hardware will be fixed in shoes for users. User will wear the shoe and travel anywhere, and attached sensor will be sense obstacles near to the shoes alerts with the help of visually impaired people. India contributes about 21% of the blind people over total population. In a million populations, there are around 53 persons that are visually impaired; 46 thousand are having low vision and around 7000 have completely lost the vision.

DEFINING ARDUINO:

An Arduino is a microcontroller-based kit which can be either used directly by purchasing from the vendor or can be made at home using the components,

owing to its open source hardware feature. It is used in communications and in controlling or operating many devices.

- Digital pins: 14 (These pins have only 2 states i.e., high, or low or in simple words either 5 V or 0 V no in between values.)
- Analogy pins: 6 (A0 to A5 and they produce a resolution of 10 bits and they provide flexibility of connecting any external device via these pins.)

DESIGNING OF ARDUINO BOARD USING MICROCONTOLLERS AND MICROPROCESSORS

- Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analogy input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (For prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers can be programmed using C and C++ programming languages. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

- The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and effortless way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors. The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

DIFFERENT TYPES OF ARDUINO BOARDS

- Arduino Uno
- Arduino Due
- Arduino Mega(R3)
- Arduino Leonarde

CHAPTER-2

PRINCIPLE

Before, blind people use the hoover cane like smart stick as a tool for directing them when they move or walk. But presently develop the shoes which can be more efficient and user friendly, smart blind guidance system. Moving is particularly challenging for blind people in public places because of the obstacles. It can be difficult to travel or even merely to stroll down a busy street. Blindness frequently makes it difficult for a person to perform a number of job duties, significantly decreasing their employment prospects. Modern technology is advancing quickly, and both the hardware and software fronts have the ability to offer capabilities for intelligent navigation. To assist blind persons in navigating securely and freely, many Electronic Travel Aids (ETA) have been developed recently. Moreover, cutting-edge technical options have lately been made available to assist blind people in independent navigation. With this initiative, an effort has been made to raise the system's quality so that blind people can benefit from it more. In this project, the system was created as a component of the shoe for a blind person.

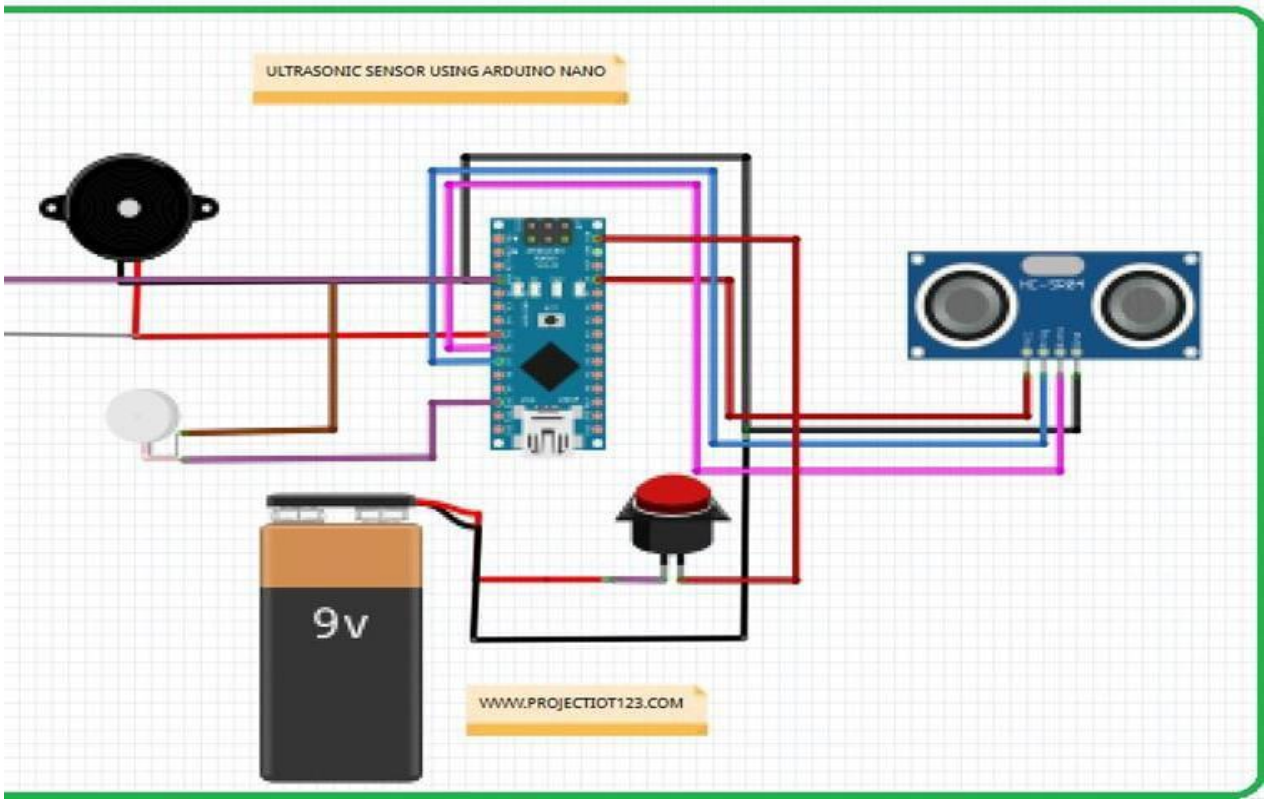
FEATURES OF SMART SHOE

- Obstacle detection for blind
- Auto detection
- Having features to give indicate right path
- Less accident will be from the blind people
- Automatic rerouting and alerts

CHAPTER-3

ARCHITECTURE

The following image shows the circuit diagram of the Arduino based on to remove the Obstacle using HC-SR04 Sensor. For the circuit design follow the following procedure.



A smart shoe IoT project for the visually impaired integrates various components to aid in navigation and obstacle detection. The shoe features a microcontroller that processes data from multiple sensors, including ultrasonic and proximity sensors to detect obstacles, and an accelerometer and gyroscope to monitor movement. A GPS module provides location data, while haptic feedback actuators and buzzers offer tactile and auditory alerts to the user about nearby obstacles and directional cues. Connectivity is facilitated through Bluetooth or Wi-Fi modules, allowing real-time data transmission to a smartphone app for enhanced user interface and additional functionalities like

emergency notifications. This integration ensures a comprehensive and user-friendly navigation aid for the visually impair.

CHAPTER-4

COMPONENTS

- Arduino UNO Board
- HC-SR04 Ultrasonic Sensor
- 9V Battery
- Connector for 9V Battery
- Jumper wires
- Rocker Switch
- Buzzer

1. Arduino Uno

Arduino UNO is a microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogy inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

2. HC-SR04 Ultrasonic Sensor

The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar. It's ideal for any robotics projects you have which require you to avoid objects, by detecting how close they are you can steer away from them. The HC-SR04 uses non-contact ultrasound sonar to measure the distance to an object, and consists of two ultrasonic transmitters (basically speakers), a receiver, and a control circuit. The transmitters emit a high frequency ultrasonic sound, which bounce off any nearby solid objects, and the receiver listens for any return echo. That echo is then processed by the control circuit to calculate the time difference between the signal being transmitted and received. This time can subsequently be used, along with some clever math, to calculate the distance between the sensor and the reflecting object.

3. 9V Battery

The **nine-volt battery**, or **9-volt battery**, is an electric battery that supplies a nominal voltage of 9 volts. Actual voltage measures 7.2 to 9.6 volts, depending on battery chemistry. Batteries of various sizes and capacities are manufactured; a very common size is known as **PP3**, introduced for early transistor radios. The PP3 has a rectangular prism shape with rounded edges and two polarized snap connectors on the top. This type is commonly used for many applications including household uses such as smoke and gas detectors, clocks, and toys.

4. Connector for 9V Battery

A connector is a component that forms an electronic/electrical circuit through electrical connections. The word "connector" means "something to connect", and it is used for various things today. Connectors that connect water pipes and air cylinders, connectors that connect web data, and recently

jobs and titles that connect people and jobs are also called connectors. IRISO, we manufacture and sell electrical connectors, which are the most popular types of connectors. We will introduce how the connector, which connects electricity between "something" and "something", has changed and evolved since its origin, and IRISO’s efforts.

5. Jumper wires

Generally, jumpers are tiny metal connectors used to close or open a circuit part. They have two or more connection points, which regulate an electrical circuit board. Their function is to configure the settings for computer peripherals, like the motherboard. Suppose your motherboard supported intrusion detection. A jumper can be set to enable or disable it. Jumper wires are electrical wires with connector pins at each end. They are used to connect two points in a circuit without soldering. You can use jumper wires to modify a circuit or diagnose problems in a circuit. Further, they are best used to bypass a part of the circuit that does not contain a resistor and is suspected to be bad. This includes a stretch of wire or a switch. Suppose all the fuses are good and the component is not receiving power; find the circuit switch. Then, bypass the switch with the jumper wire.

6. Rocker Switch

Rocker switches are switches commonly used to operate a device on and off. A rocker switch has a see-saw motion, which will indicate if the device or operation is on or off. Rocker switches are most used to operate power switch found on power sockets, to operate light switches and a range of industrial and domestic appliances such as: TVS, screens, hair styling devices. Rocker switches are panel mount switches which are used to switch an electrical device on and off. Rocker switches use a see-saw method, to operate switching between on and off and can be commonly located on power sockets, domestic and commercial appliances such as TVs, hair styling tools and other household appliances.

7. Buzzer

Buzzers are electric sounding devices that generate sounds. Typically powered by DC voltage, they can be categorised as Piezo buzzer and magnetic buzzer. They come in different designs and uses as well, and based on that, they can produce different sounds. An electromagnetic buzzer consists of an oscillator, solenoid coil, magnet, vibration diaphragm, housing etc. Pretty much works the same as a magnetic buzzer, where they produce sound through magnetism, with a frequency of 2 kHz.

CHAPTER-5

WORKING

A smart shoe IoT project for a blind man functions by integrating several advanced components to enhance mobility and safety. The shoe is equipped with ultrasonic and proximity sensors that continuously scan the surroundings for obstacles. Data from these sensors are processed by a microcontroller, such as an Arduino or ESP32, which then triggers haptic feedback actuators to provide vibrations or a buzzer to emit sound alerts, indicating the proximity and direction of obstacles. An accelerometer and gyroscope track the user's movements, ensuring stability and orientation.

A smart shoe for the visually impaired integrates Internet of Things (IoT) technology to enhance mobility and safety. Equipped with various sensors such as ultrasonic, infrared, and proximity sensors, the shoe detects obstacles

in the user's path. These sensors send data to a microcontroller, which processes the information and triggers feedback mechanisms. The shoe provides real-time alerts through vibrations, audio signals, or a connected smartphone app to inform the user of potential hazards.

CHAPTER-6

CODE

```
// constants won't change
const int TRIG_PIN   = 6; // Arduino pin connected to Ultrasonic Sensor's TRIG pin
const int ECHO_PIN   = 7; // Arduino pin connected to Ultrasonic Sensor's ECHO pin
const int BUZZER_PIN = 3; // Arduino pin connected to Piezo Buzzer's pin
const int DISTANCE_THRESHOLD = 50; // centimeters

// variables will change:
float duration_us, distance_cm;
```

```
void setup() {
  Serial.begin (9600);        // initialize serial port
  pinMode(TRIG_PIN, OUTPUT);   // set arduino pin to output mode
  pinMode(ECHO_PIN, INPUT);    // set arduino pin to input mode
  pinMode(BUZZER_PIN, OUTPUT); // set arduino pin to output mode
}

void loop() {
  // generate 10-microsecond pulse to TRIG pin
  digitalWrite(TRIG_PIN, HIGH);
  delayMicroseconds(10);
  digitalWrite(TRIG_PIN, LOW);

  // measure duration of pulse from ECHO pin
  duration_us = pulseIn(ECHO_PIN, HIGH);
  // calculate the distance
  distance_cm = 0.017 * duration_us;

  if(distance_cm < DISTANCE_THRESHOLD)
    digitalWrite(BUZZER_PIN, HIGH); // turn on Piezo Buzzer
  else
    digitalWrite(BUZZER_PIN, LOW);  // turn off Piezo Buzzer

  // print the value to Serial Monitor
  Serial.print("distance: ");
  Serial.print(distance_cm);
  Serial.println(" cm");
```

```
  delay(500);
}
```

CHAPTER-7

ADVANTAGES

- Auto Detection.
- Having feature to give the indicate right path.
- Simple to use.
- Less accident will be accrued form the blind people.
- This system is applicable for both the indoor and outdoor environment.
- Automatic rerouting and alerts.
- User friendly system.

- Auto-detection.
- The ability to show the proper path, easy to use, and auto-detection.
- Fewer accidents involving blind persons will occur.
- This system can be used in both indoor and outdoor setting.
- An intuitive system.
- Help in navigation when moving.

CHAPTER-8

CONCLUSION

The main focus of this paper is the various smart shoes for blind technologies and their techniques. In future work will be focused on the enhancing the better performance of the system and reducing the load on the users. The suggested work is an IoT-based solution that combines hardware and software to offer technical support. This technology is used by blind persons with vision impairments to detect obstacles. It also detects a person's fall and notifies the person who should be notified. Ultimately, it was possible to develop inexpensive, independent, and electrically safe smart shoes for the blind and visually impaired those provides assistance in the case of falls and avoid unintentional collisions. Smart shoes for the blind have the potential to be a useful aid for mobility and navigation. By using sensors and haptic feedback,

the shoes can detect and alert the wearer to obstacles in their path, providing a safer and more independent experience.

CHAPTER-9

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