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Ultrasonic Vibrator Gloves

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Abstract—***Third eye for the blind is an innovation with the help of the multidiscipline subjects like computer science, electronics engineering and health science which helps the blind people to navigate with speed and confidence by detecting the nearby obstacles using the help of ultrasonic waves and notify them with a buzzer sound or vibration. According to WHO 39 million people are estimated as blinds worldwide. One of the main peculiarities of this device is that it will be affordable. This will be equipped with ultrasonic sensors, consisting of module. Using the sensor, visually impaired can detect the objects around them and can travel easily. When the sensor detects any object, it will notify the user by beep or vibration. Thus, this device will be of a great use for the blinds and help them travel different places.***

Keywords— Arduino Nano, Ultrasonic Sensor, Buzzer, Vibration Motor, Rechargeable Battery, 3.7V Lithium Battery Charger Board Charging, Resistor, Capacitor, Diode, Push Button,3-pin mode Switch

I. INTRODUCTION

[1] With the improvement of the living standards of the people, we have become so materialistic that we have forgotten how the physically disabled people live a tough life. They undergo rigorous, apathetic, and indifferent behaviour towards them for being physically disabled. They become dependent on other people in a way for their daily routine chores. Blind and impaired persons always depend on other people for their locomotion. Eyes are prime sense of organ in perceiving the outside environment; dysfunction of such prime sense organ severely effects the knowledge perceiving capability of the outside environment. Therefore, going around to places in such environment is a very big challenge because the blind people cannot depend on their own eyes and thus face many difficulties. The objective of this project The Third Eye for the Blind is to design a product to help those people who are visually impaired and those who often must rely on others. Third eye for Blind project is an innovation which helps the visually impaired people to move around and go from one place to another with speed and confidence by knowing the nearby obstacles using the help of the wearable band which produces the ultrasonic waves which notify them with buzz sound or vibrations. It allows them to walk freely by detecting the obstacles.

II. LITERATURE SURVEY

A literature survey on "Ultrasonic Vibrator gloves" for blind individuals reveals the growing intersection of wearable technology and assistive devices aimed at enhancing mobility and independence for the visually impaired. The concept of " Ultrasonic Vibrator gloves " typically involves integrating sensors such as ultrasonic or infrared proximity sensors, microcontrollers, and vibration motors into a glove, allowing the user to detect obstacles in their path. Various studies have explored the feasibility and effectiveness of such devices, highlighting their potential to act as a supplementary tool to traditional mobility aids like white canes. Research

indicates that these gloves can provide real-time haptic feedback, enabling users to identify the distance and direction of obstacles without relying on sight. Overall, Third Eye Gloves represent a promising innovation in assistive technology, aiming to empower the blind community by improving spatial awareness and enhancing their confidence in navigating daily environments.

Several systems are connected to the development of projects for the blind and are intended to improve the effectiveness of the system. Thanks to this literature research, we have successfully addressed numerous design and software improvements. explains a better method for blind folks to navigate. Blindness can significantly impact a person's ability to navigate and interact with the world around them. However, recent technological advancements have made it possible to develop devices that can help people with visual impairments to regain some degree of independence [1]. One such device is a third eye for the blind, which uses ultrasonic vibrations to provide sensory information about the surrounding environment. The third eye for the blind consists of a glove with ultrasonic vibrators attached to the fingertips. The vibrators are controlled by a microcontroller, which receives input from an ultrasonic sensor mounted on the back of the glove. The sensor emits ultrasonic waves that bounce off objects in the surrounding environment and are detected by the sensor. The microcontroller then converts this information into vibrations that are transmitted to the fingertips of the glove. When a blind person wears the glove, the ultrasonic sensor sends out a signal that bounces off objects in the environment and returns to the sensor. The sensor then sends this information to the microcontroller, which converts it into vibrations. These vibrations are transmitted to the fingertips of the glove, providing the wearer with a sense of the objects in their surroundings. For example, if there is a wall nearby, the wearer will feel a strong vibration in their fingertips, indicating the presence of the wall. In order to help visually challenged people. A study that helps those people to walk more confidently is proposed. The study hypothesizes smart walking gloves that alert visually impaired people over obstacles, pits thus this device could help them in walking with less accident. It outlines a better navigational tool for the visually impaired. It consists of a simple walking equipped with sensors to give information about the environment [3].

The target of this task Ultrasonic Vibrator gloves for the Blind is to plan an item which is particularly helpful to those individuals who are outwardly debilitated and the individuals who frequently need to depend on others. Third eye for Blind task is a development which helps the outwardly debilitated individuals to move around and move between Different places with speed and certainty by knowing the adjacent hindrances utilizing the assistance of the wearable band which delivers the ultrasonic waves which inform them with the inbuilt voice assistant [4].

III. SYSTEM ARCHITECTURE

Hardware Components

- **Arduino Nano:** The Arduino Pro Mini 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 analog inputs, an on-board resonator, a reset button, and holes for mounting pin headers.

- **2N2222 Transistor:** Acts as an amplifier and switch for the fan.

- **Buzzer:** The buzzer is a sounding device that can convert audio signals into sound signals. It is usually powered by DC voltage.

- **1N4007 Diode:** The main purpose of this motor is to alert the user from receiving the call by without sound/vibrating.

- **3.7v Rechargeable Battery:** A rechargeable battery is a battery that can be recharged and used many times over.
- **Power Supply:** Provides necessary voltage levels for components.

Software Design

There are two main software used in developing this project which are Arduino software and Fritzing software. Arduino software used to write the program using C language and Arduino language. It is used to compile and install the program into the microcontroller. It also has the function to monitor the distance between obstacle and ultrasonic sensor. It will display the value of distance and make the project easier to be tested [3].

Fritzing software is used to design the circuit connection of all the hardware. Since all the hardware will have their own library. Fritzing software is a suitable software to be used in this project as it will help in showing the circuit connection and the schematic of the system. Besides that, SolidWorks also used to design structure of frame which is used to hold the position of ultrasonic sensors.

The Arduino program (sketch) follows these steps:

- Detect Obstacles within 10m by the ultrasonic sensor.
- Convert the analog data to digital in Boolean value.
- Determining the Obstacles, it sends signals to the Buzzer.
- The Buzzer Produce an Output and meanwhile send signal to the Vibrating motor for Haptic Feedback.
- Produce the Boolean value as true till no obstacles found nearby the ultrasonic sensor.

Working Implementation

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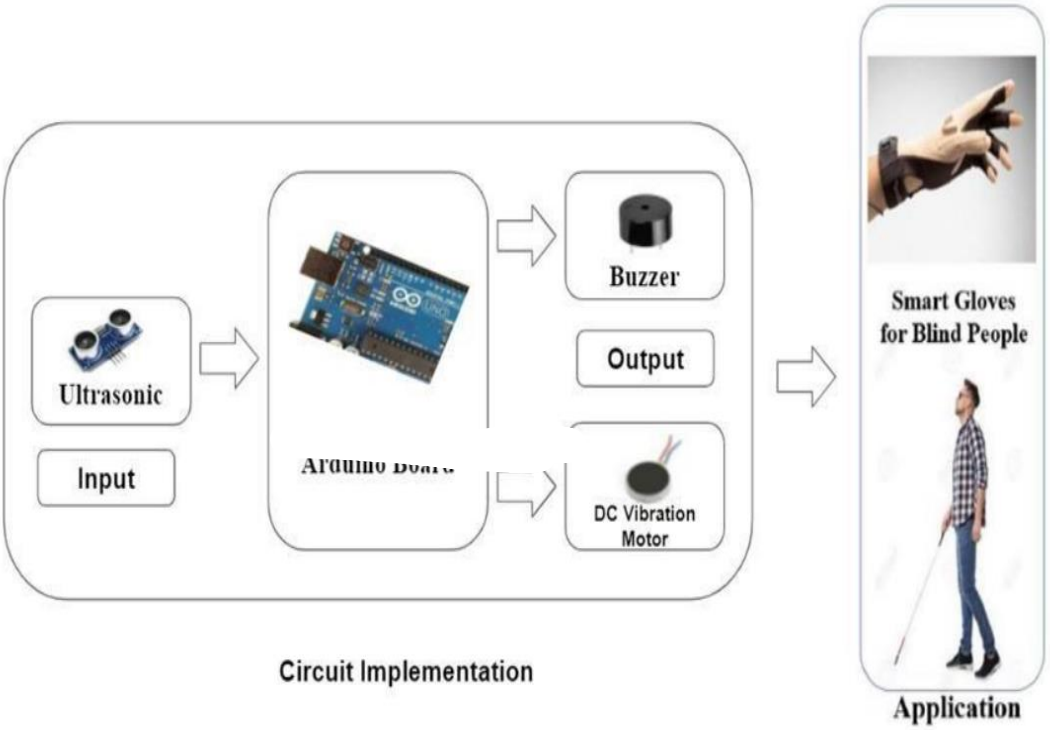

Fig.1 Block Diagram

IV. METHODOLOGY

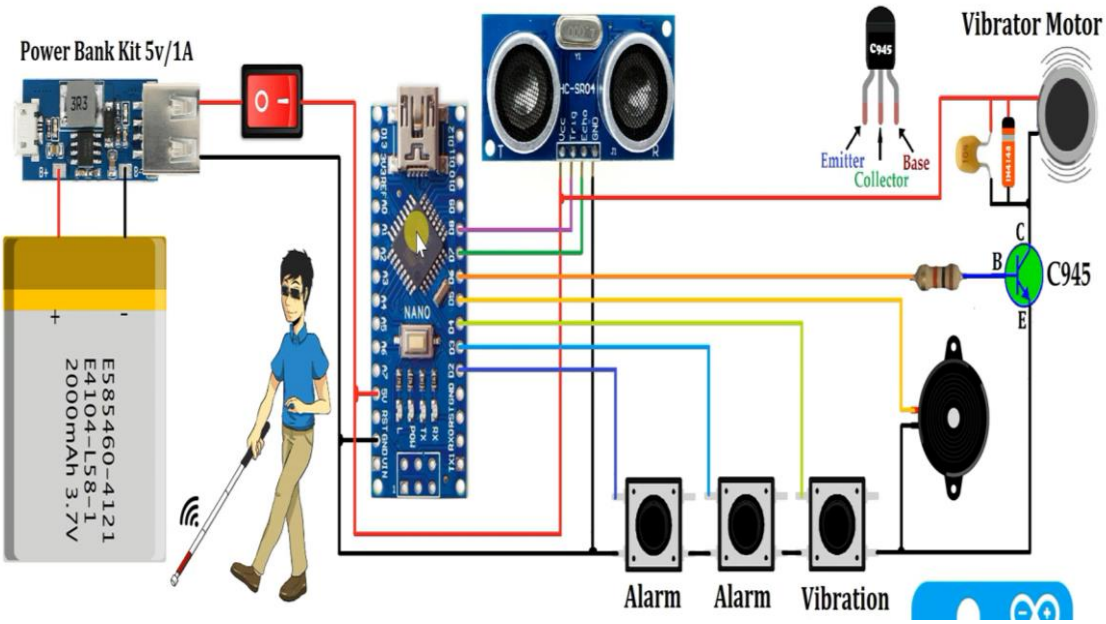

Fig. 2 Circuit Diagram

- The Ultrasonic Vibrator gloves for blind people is an innovation that helps them move around and from one place to another with confidence by knowing the nearby obstacles using the help of the wearable, which produces ultrasonic waves that notify them with buzz and vibrations. We use an ultrasonic sensor, Buzzer, vibration motor, and an Arduino UNO board to make this product, as shown in Fig.2.
- Whenever the ultrasonic sensor detects an object or obstacles, it will alert the blind person by continuously giving vibration and a buzzer sound until the path changes. Many accidents occur even while using the stick. Our project helps blind people to recognize the objects in front of them and makes them safe. If any person goes without others, help avoid accidents for that person.
- Our product is helpful to them. When the ultrasonic sensor detects the object, the device will notify the user through vibrations and sound beeps. The vibration intensity and beeping rate increase with a decrease in distance.

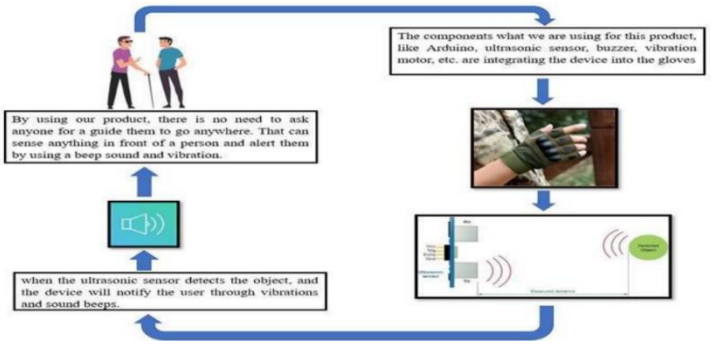

Fig. 3 Methodology Proposed System

Components Description

1. **Arduino Nano**
   - Specifications: Dual-core CPU, up to 240 MHz, with Bluetooth capabilities.
   - Purpose: Acts as the central processing unit managing inputs and outputs, wireless communications for GPS data and possibly connecting to a mobile app for additional functionalities
2. **Ultrasonic Sensors - Model: HC-SR04 or similar.**
   - Specifications: Range of 2cm to 400cm, with an accuracy of approximately 3mm.
   - Purpose: Detects obstacles within a certain range by sending and receiving ultrasonic waves, which help in calculating the distance to obstacles.
3. **Audio Output Module**
   - Specifications: Integrated with the MCU or standalone modules like the Player Mini.
   - Purpose: To provide audio feedback and instructions to the user, including navigation directions and obstacle warnings.
4. **Vibration Motors**
   - Specifications: Small DC motors or coin vibration motors.

- Purpose: To provide tactile feedback for obstacle detection, enhancing the user's awareness of immediate environmental changes.

5. **Power Supply**
   - Specifications: Rechargeable battery pack, typically Lithium-Polymer or Lithium-Ion, around 1000 Mah or higher.
   - Purpose: Powers the device ensuring mobility and portability without frequent recharges.
6. **Connectivity and Control Interfaces**
   - Specifications: Buttons or tactile switches for user interaction.
   - Purpose: Allow users to start navigation, toggle between modes, and replay audio instructions.
7. **Housing and Mounting**
   - Specifications: Lightweight, ergonomic design possibly using materials like ABS plastic gloves.
   - Purpose: To encase all electronic components in a wearable format, such as a glove, belt, or harness, making it easy and comfortable for the user to wear.

V. RESULTS AND DISCUSSION

Fig. 4 Proposed System

The proposed Ultrasonic Vibrator gloves were designed using components like Arduino UNO, ultrasonic sensor, Buzzer, DC Vibration Motor, 9v battery, transistor, resistor, and jumper wires.

The working principle behind this project is when an ultrasonic sensor detects an obstacle. The emitted waves sent from the ultrasonic sensor get reflected by the sensor, and by this, the waves get sensed; the distance can be measured based on the range then the reflected waves get captured by the Buzzer. The trigger pin present in the Ultrasonic sensor triggers the sound pulses or signals up to a certain distance. When these signals are reflected by touching an object, if these signals are weak, BJT takes place, and weak passwords are converted into strengthening or amplified. The signals are received by Arduino UNO, which acts as a mediator. Arduino is a microcontroller used to control all functions. It is used to read the inputs.

Now the working of the Buzzer takes place, and the audio signals were converted to sound signals; then, the vibrator working takes place in process by using centrifugal force the vibrator gets vibrate. Then both the buzzer and DC vibration motor alerts the person with a buzz and the vibrations. Platform easy to use in software and

hardware. ECHO pin present in the Ultrasonic produces a pulse after signs get received. Vibration motor takes place which consists of a commutation circuit. It alternates the direction of the field through the coils and interacts with the North and South poles, producing a magnetic field; the vibrator gets vibrated by this. The complete process is done in a fraction of seconds. All components are assembled in a board, and it is shown in Fig. The complete design was fixed in a glove. As a prototype, we directly selected the circuit in a single glove. In the future, we plan to assemble in a PCB board that can be used officially by all blind person.

VI. CONCLUSION

[1] Thus, this project proposed the design and architecture of a new concept of Arduino based Virtual Eye for the blind people. A simple, cheap, efficient, easy to carry, configurable, easy to handle electronic guidance system with many more amazing properties and advantages is proposed to provide constructive assistant and support for the blind and visually impaired persons. [2] To sum up, our research study has demonstrated a cutting-edge Internet of Things (IoT) smart glove system intended to provide blind people more autonomy and improved safety when navigating. To do this, the system makes use of a few interconnected technologies. As the user's eyes, ultrasonic sensors efficiently identify impediments and gauge their distance from them. Vibration motors positioned strategically provide the user real-time awareness of their surroundings by relaying this crucial information. With its all-encompassing approach to obstacle identification, safety protocols, and information dissemination, the suggested smart glove system is an invaluable assistive technology that encourages independent life among the visually impaired. Throughout the project, we achieved several key milestones: We successfully integrated a suite of sensors, including ultrasonic sensors for obstacle detection. This involved careful selection, calibration, and testing of the sensors to ensure they functioned reliably and delivered accurate data.

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