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DivyaDrishti Hi-Tech Glove for Specially Abled

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Abstract: In today's changing world, the Internet of Things is one of the fields which will impact human life to a great extent. Applying the concepts of IOT and using Arduino Microcontroller, the project aims to contribute towards a social cause, by solving the problem of visually impaired and mute people. The device would assist visually impaired users to sense objects without actually coming in contact with them by using sensors. The device also consists of a communication system which uses Morse code, for the people who are unable to communicate so that they can express themselves and convey messages to others. Users with the help of our project would be able to walk on roads or public places without any help of another human being, by making them independent.
Keywords: Social Cause, Visually Impaired, Mute People, Arduino Microcontroller, Morse code, Internet of Things.

I. INTRODUCTION

Worldwide people are living with various disabilities and facing many issues. Globally the number of people with visually impaired ability is estimated to be 285 million, of whom 39 million are blind. Along with visually impaired, the count of people having multiple disability such as combination of dumb and visually impaired is around to be 1 million. Being able to see the world is the most important sense and the visually impaired people are observed with pity by others and also they are discriminated against by normal people. Visually impaired people are part of this world, so technology must leave a significant impact on their lives to make what was impossible for them.

The previous solutions available for visually impaired people were devices such as OCR Products, identifying color, barcode readers; these devices were expensive and had limited capabilities due to rapid change in hardware. In this paper, we are presenting a device named 'DivyaDrishti: Hi-Tech Glove'. Where it gives hand to blind people with the aid of technology in order to solve some of their problems. The Project results enhance the understanding of the problems faced by blind people daily, and may help to encourage more projects targeted to help blind people to live independently in their daily lives.

Nowadays there are so many instruments and smart devices for visually impaired people for navigation but most of them have certain problems for carrying and the major drawbacks is that they need a lot of training to use. One of the main peculiarities of this innovation is, it is affordable for everyone. There are no such devices available in the market that can be worn like a cloth and have such a low cost and simplicity. When used on a large scale, with improvements in the prototype, it will drastically benefit the community.

A. Literature Survey

There are a variety of schemes that contribute to the implementation of projects for blind people in order to make the system more effective. These literature surveys assist us in overcoming a variety of design and program-related issues.

Ashwini Aher1, Karishma Musale2, Surabhi Pagar3, Sayali Morwal4 suggested a framework for deaf-blind people to work with android mobile phones in their paper "Implementation of Smart Mobile App for Blind and Deaf Person Using Morse Code." As a general communication medium, the device employs the International Morse Code. To see the mobile screen, blind and deaf people can receive Morse code through a vibrotactile system built into every phone. Deaf-blind people will get direct input from their typing and scanning the screen using this system. Its value added services allow deaf-blind people to interact with sighted people using a shared medium. Tactile vibrotactile Morse code is especially useful since it can be tailored to a person's specific tactile sensitivities. In a social facilitation sense for comprehension, Morse encoding communication works well. It is simple and standard in terms of technology.Since it offers new opportunities for contact and vocation, our framework can greatly increase the quality of life for deaf-blind people.

Ayat Nada, Samia Mashelly, Mahmoud A. Fakhr, and Ahmed F. Seddik published 'Effective Quick Response Smart Stick for Blind People.' They note in this paper that visually impaired people have trouble detecting obstacles in front of them when walking down the street, making it risky. The smart stick is a proposed solution for allowing them to recognize the world around them.We suggest a solution in the form of a smart stick with an infrared sensor for detecting stairwells and a pair of ultrasonic sensors for detecting any other obstacles in front of the user within a four-meter range. In addition, a sensor is mounted at the bottom of the stick to prevent puddles. When an obstacle is detected, the vibration motor and speech alert messages are triggered. The microcontroller 18F46K80 embedded device, vibration motor, and ISD1932 flash memory are all used in this system. The stick detects all obstacles within a 4 meter range in 39 milliseconds and sends a suitable respect message, allowing the blind to travel twice as fast as usual so she/he feels secure. The smart stick is inexpensive, has a quick response time, uses little strength, is lightweight, and can be folded.

B. Existing System

The white cane is a mobility aid that allows blind or low-vision people to move about independently. Consider the cane to be an extension of your arm that allows you to reach for items on the ground and in front of you. The white cane assists you in locating obstacles and safely navigating through them. It works like this: the individual keeps the cane in their dominant hand, roughly centered in front of the body, and sweeps it from left to right in a shoulder-width fashion. It sweeps to the left as right foot steps and then back to the right as left foot steps, clearing the path for each step.It is possible to detect changes in surfaces, grates and manhole covers, steps and curbs, and obstacles such as posts, signs, planters, and trees by feeling the tip of the cane against the ground. Each person determines how quickly they walk based on their level of comfort in adjusting to obstacles encountered with the cane.

According to Mazo and Rodriguez, the blind cane is one of the most effective assisting resources for the visually impaired. One of the biggest issues of the visually impaired, according to Herman, is that most of them have lost their physical integrity. They still have no faith in themselves.

This argument has been proved by Bouvrie, who conducted an experiment dubbed "Project Prakash." It was designed to see how well visually impaired people could use their brains to recognize a series of items.

This, according to Chang and Song, can be extended to a variety of circumstances. When visually impaired people enter a new area, it can be difficult for them to remember where objects or obstacles are located. The challenges that visually disabled people face are shown in these cases. The Guide Cane is intended to assist visually impaired users in navigating obstacles and other hazards safely and easily.The Guide Cane is similar to the commonly used white cane in that it is kept in front of the person when walking. The innovation Smart Cane was created by students at Central Michigan University, and it uses Radio Frequency Identification (RFID) (RFID). RFID is used to detect items or obstacles in front of the user, as well as the RFID tag that has been put in a number of locations to help the user navigate.

This invention looks like a regular stick, but it comes with a bag that the consumer wears. The bag powers the invention and communicates with the user through speakers built into the bag.There are special gloves for users who do not have the ability to hear that vibrate at each finger, with different sensations in each finger having different meanings. This invention, however, has many flaws and is only appropriate for small areas. This is because it can only detect areas with RFID tags; otherwise, it's just a normal blind cane. Furthermore, if this invention is used in the external world, it would have a high cost since the greater the region that needs to be tagged, the higher the cost.

II. PROPOSED SYSTEM

A. Scope

To develop a device that would assist visually impaired users to sense objects without touching them than carrying a stick in their hand. The device should consist of a communication system for the people who are unable to communicate (mute) so that they can express themselves and convey messages to others.

B. System Requirements

1) Hardware Requirements

a) Arduino Uno
b) HC-SR04 (Ultrasonic Sensor)
c) Buzzer
d) Buttons
e) LCD Display

2) Software Requirements

a) Morse Code
b) Embedded C
c) Arduino IDE

C. System Description

1) *Arduino:* The Arduino Uno is an open-source microcontroller board designed by Arduino.cc and based on the Microchip ATmega328P microcontroller. The board has a number of digital and analog input/output pins that can be used to connect to expansion boards and other circuits.

Fig. 1 Arduino Uno

2) *HC-SR04 (Ultrasonic Sensor):* The ultrasonic distance sensor HC-SR04 is shown here. This inexpensive sensor has a range of 2cm to 400cm of non-contact measurement capability and a ranging accuracy of up to 3mm. An ultrasonic transmitter, a receiver, and a control circuit are all included in each HC-SR04 module.

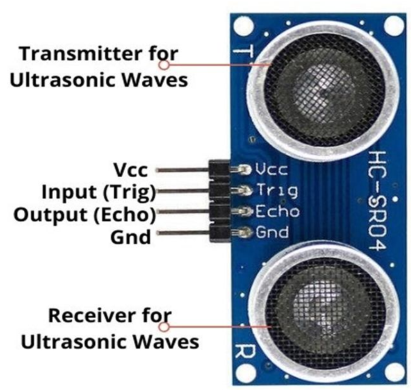

Fig. 2 HC-SR04 Ultrasonic Sensor

3) *Buzzers:* A buzzer is a small but effective component that can be used to add sound to our project or system. Since it has a small and compact 2-pin structure, it can be used on a breadboard, a Perf Board, or even a PCB, making it a popular component in most electronic applications.

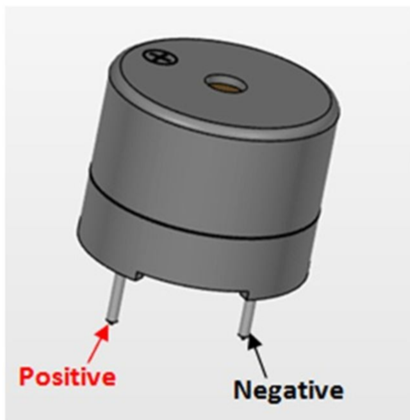

Fig. 3 Buzzer

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4) LCD Display

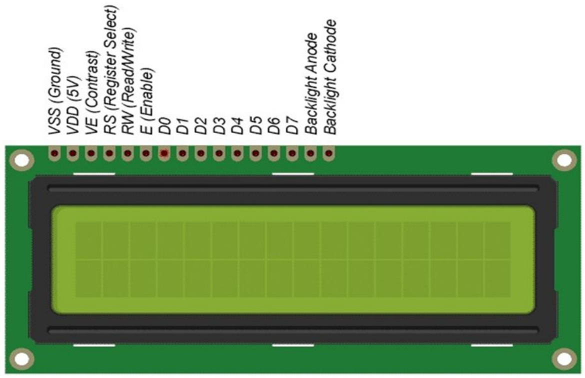

Fig. 4 LCD Display

5) *International Morse Code:* Morse code is a means of transmitting text information as a sequence of on-off signs, lights, or clicks that can be interpreted directly by a professional listener or observer without the use of special equipment. The International Morse Coding system uses uniform sequences of short and long signals called "dots" and "dashes," or "dits" and "dahs," to encode the ISO basic alphabet, several extra letters, numerals, and a limited collection of punctuation and procedural signals. A specific series of dots and dashes represents each character (letter or numeral). The length of a dash is three times the length of a marker. Each dot or dash is followed by a brief pause equal to the length of the dot. A space equal to three dots (one dash) separates the letters of a name, and a space equal to seven dots separates the words. In code transmission, the basic unit of time measurement is the dot length. The length of each Morse character is roughly inversely proportional to its frequency of occurrence in English for quality. As a result, the letter "E," which is very common in English, has the shortest code, a single dot.

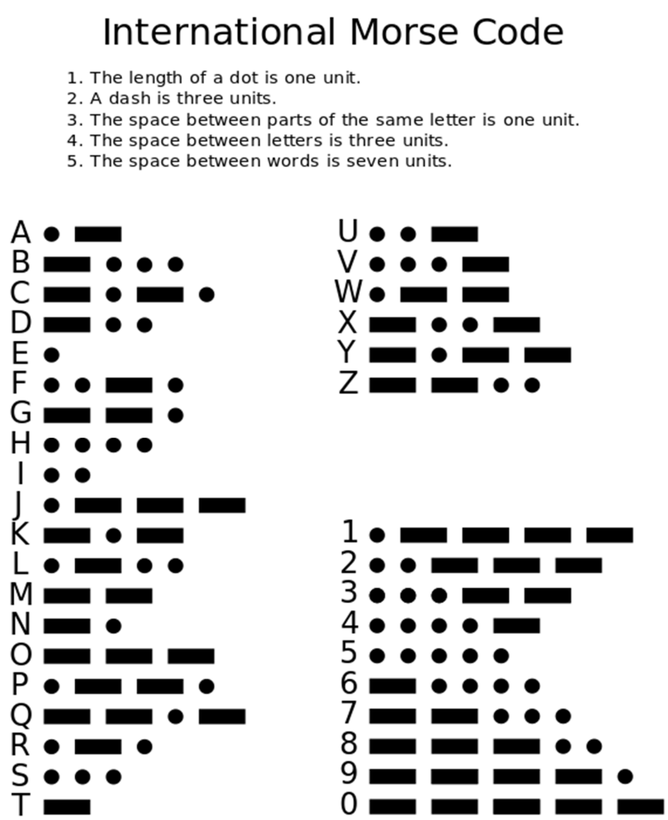

Fig. 5 Morse Code

III. WORKFLOW

A. Object Detection

The system consists of an ultrasonic sensor on the front side of the glove. So when a person wears this glove, he can detect objects in the range of 40 cm which is adjusted in the code. The range of ultrasonic sensors is 1500 cm. (i.e. 15 m).So we can vary the range according to our requirement. When an object obstructs the person in the given range, the ultrasonic sensor detects it, it transmits the signals to the buzzers and they indicate about the same. As the object comes closer the frequency of the buzzer increases and vice-versa. The accuracy of this system is 80%. If the object is continuously moving in sideways then that is the only region where the accuracy might reduce. The system can also tell the distance at which the obstacle is when monitored on laptop or a PC.

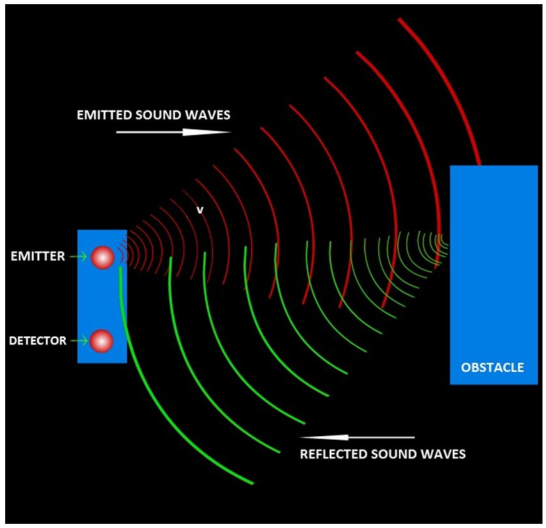

Fig. 6 Object Detection Concept

B. Morse Code Implementation

For morse code implementation we built an algorithm for the conversion of morse code to english. We mapped various combinations of dots and dashes with each english alphabet. Now for the implementation, we have installed 3 buttons onto the glove. Each button has a specific function to perform. The first button was mapped to dot instruction, the second button was mapped to dash instruction and the third button was used for three functionalities.

First functionality was to separate each alphabet by pressing the button once. Second functionality is for spacing between the words by pressing the button twice. Third Functionality is confirming the whole sentence so that it will get displayed on the LCD Screen by pressing the button thrice.

During this procedure when the first letter is completed typing with the help of first two buttons i.e. the combination of dot and dash example: - Letter ‘A’ is represented by “ .- ” so after this when the third button is pressed for letter separation, the translation/conversion of morse to alphabet takes place. Another example for a complete word: Word ‘msg’ is represented by “--..--.” so each letter translation by pressing the third button once, now for the word confirmation pressing the third button twice gives the ‘msg’ as output.

Example
Input: "--...--."
Output: "msg"
Another Example if we want to show HI on screen
H : “ . . . . ”
I : “. . ”

1) press dot button 4 times for H
2) then press the space(3rd) button once.
3) then press the dot button 2 times.
4) then press the space(3rd) button twice.
5) and for confirming the word press space(3rd) button thrice.

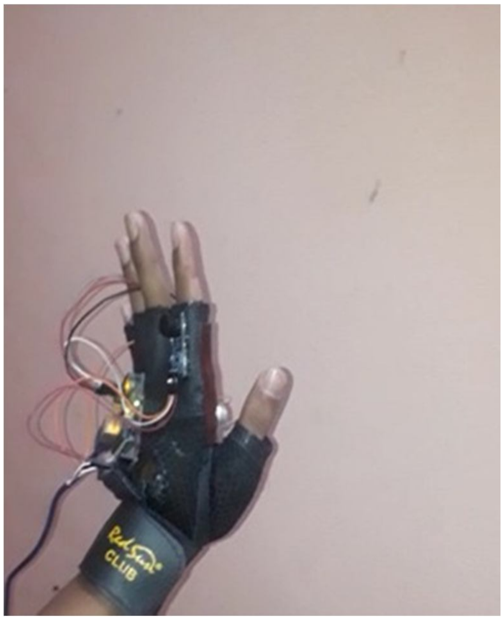

Fig. 7 Project Model

C. Block Diagram

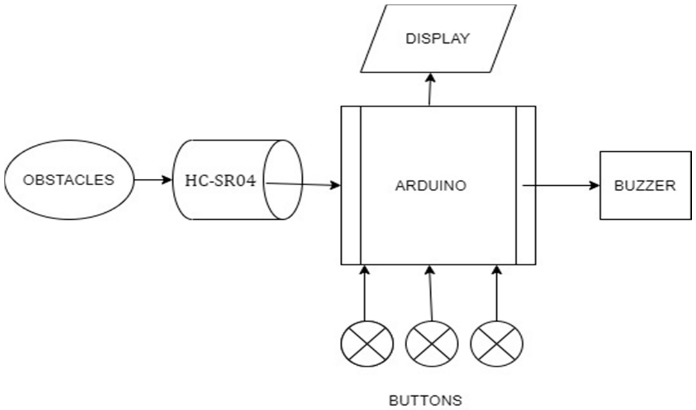

Fig. 8 Block Diagram

D. Benefits

1) Independency of the disabled person increases.
2) Easy to use/learn
3) Cost effective
4) Morse code is universal
5) Low/No Maintenance
6) No use of Internet
7) Can be used in Remote Locations
8) Consumes very less power

IV. CONCLUSION

We were able to successfully develop a product named DivyaDrishti for visually impaired and mute people. The device is full-fledged working and with the motto for a social cause we have tried to make their life easy and communicable. By detecting various obstacles, visually impaired people can be avoided with sudden accidents while walking. The Morse code system helps the mute people to communicate in the easiest way. With the help of this technology, we can make the lives of these people easy.

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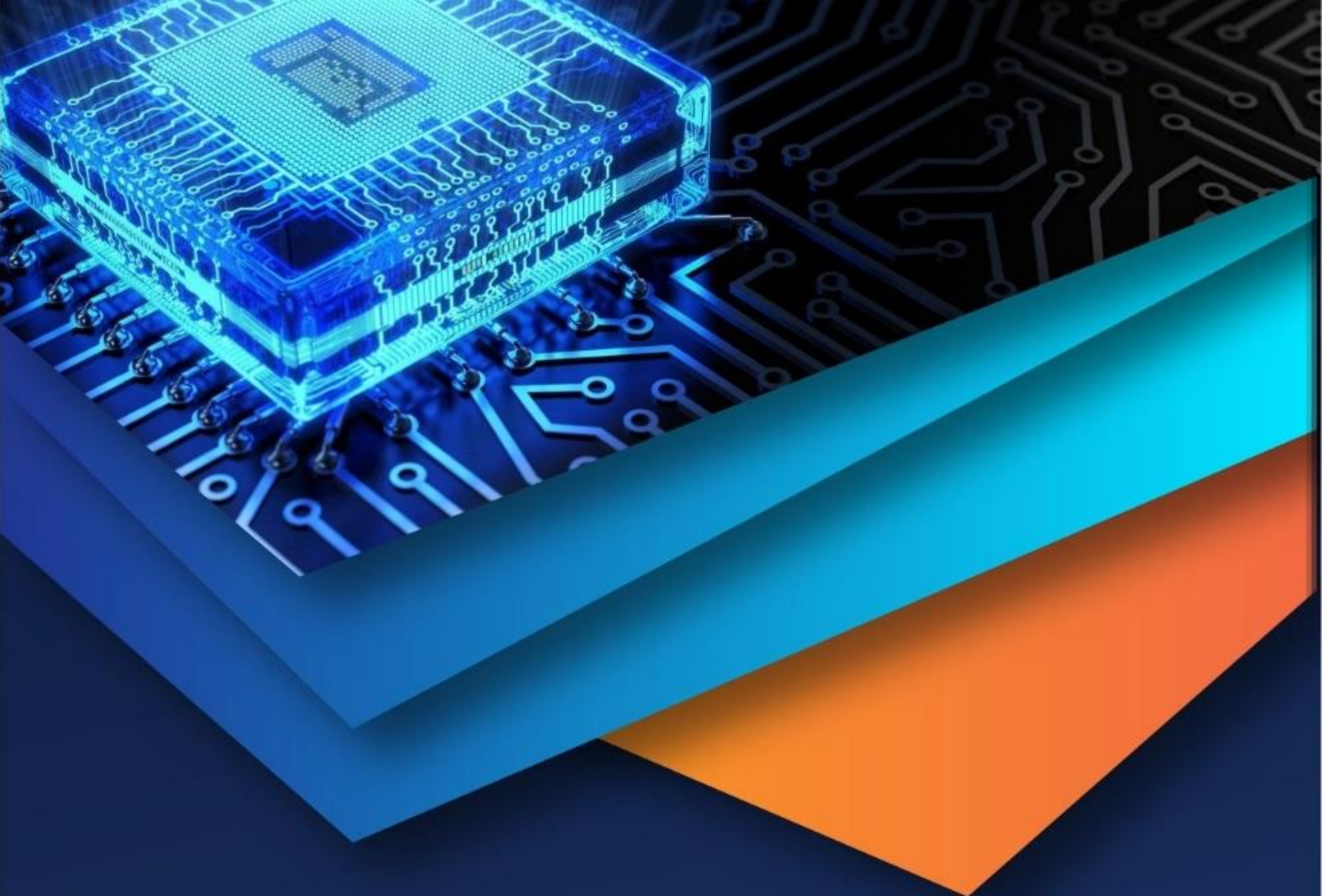

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