THE HAPTIC SHOE FOR BLIND PEOPLE

Cathrine Lenette, Manju V.M, Dr G. Kiruthiga

1 Student, Department of Computer science, IES College of Engineering Thrissur, Kerala, India 2 Assistant Professor, Department of Computer science, IES College of Engineering Thrissur, Kerala,India 3 Associate Professor, Department of Computer science, IES College of Engineering Thrissur, Kerala,India

ABSTRACT

According to the recent report of the World Health Organization (WHO), 314 million people in the world are visually impaired and out of them, 15% are blind. The proposed system is a smart shoe that has been designed to use haptic technology to enable the blind and visually impaired people to walk independently. This project presents a prototype model and a system concept to provide a smart electronic aid for blind people. This system is intended to provide object detection and real-time assistance. It comprises of a microcontroller, ultrasonic sensor, a smart phone, and a vibrating motor. This project aims at the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path. This ETA is fixed to the shoe. When the object is detected, it alerts them through voice command. The shoe enables the user to detect obstacles and helps to walk by using a smart phone. It consists of vibrating motors on the shoes. With the help of a navigation application installed on a smart phone, the users can connect with the shoe via Wi-Fi and interact with the app to set a destination. Once the destination has been set, the smart phone provides the route and through a series of vibrations, guide the user from one point to another. The right shoe will vibrate when the right turn should be taken and left shoe will vibrate when the left turn should be taken. The user is guided via a series of vibrations to the destination. The shoe includes ultrasonic sensors to detect obstacles.

Keywords :- *Haptic shoe, ultrasonic sensors, vibrating motor*

1. INTRODUCTION

Eyes are the vital part of the human body which enables a person to look into his surroundings. Blindness hampers an individual's ability to do daily chores and earn wages for their survival. According to the recent report of the World Health Organization (WHO), India is the home to nearly 30% of total blind globally. The population of visually impaired people in India has now reached 12 million which will be further increased in upcoming years every 1 out of 179 people is blind. In a million populations, there are around 53 visually impaired persons, 46000 are having low vision and around 7000 have completely lost their vision. From the data, it is clear how major is the problem of blindness in India.The proposed system is a smart electronic aid for blind people. This system is intended to provide object detection, alert information and navigational guidance to the blind people. It consists of a microcontroller, ultrasonic sensor, and a vibrating motor.

This project aims at the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find an obstacle free path. When the object is detected, it alerts the user through voice command with the help of an android application. It also provides easy navigation via a series of vibrations. A navigational application is created which gives turn-by-turn navigation. If the route requires the user to turn left, the left shoe will vibrate which informs the user that they should take left. It would signal the vibrating motors to vibrate. Ultrasonic sensors will detect the obstacles and pass the information to the microcontroller.

2. COMPONENTS OF THE INNOVATION

The various components involved in our innovation are as follows:

2.1 Ultrasonic Sensors

Ultrasonic distance sensors are designed to measure distance between the source and target using ultrasonic waves. We use ultrasonic waves because they are relatively accurate across short distances and don't cause disturbances as they are inaudible to the human ear.
HC-SR04 is a commonly used module for non-contact distance measurement for distances from 2cm to 400cm. It uses sonar (like bats and dolphins) to measure distance with high accuracy and stable readings. It consists of an ultrasonic transmitter, receiver and control circuit. The transmitter transmits short bursts which get reflected by the target and are picked up by the receiver. The time difference between transmission and reception of ultrasonic signals is calculated. Using the speed of sound and 'Speed = Distance/Time equation, the distance between the source and target can be easily calculated. It Provide trigger signal to TRIG input, it requires a high signal of at least 10µS duration. This enables the module to transmit eight 40 KHz ultrasonic bursts. If there is an obstacle in-front of the module, it will reflect those ultrasonic waves. If the signal comes back, the ECHO output of the module will be HIGH for duration of time taken for sending and receiving ultrasonic signals. The pulse width ranges from 150µS to 25mS depending upon the distance of the obstacle from the sensor and it will be about 38ms if there is no obstacle

2.2 Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, 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 an AC-to-DC adapter or battery to get started. The Uno differs from all boards in that it does not use the FTDI USB-to-serial driver chip [10] it features the Atmega8U2 programmed as a USB-to-serial converter.The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and VIN pin headers of the POWER connector.

2.3 Vibrating Motor

Vibration motor is a compact size coreless DC motor used to informs the users of receiving the signal by vibrating, no sound. Vibration motors are widely used in a variety of applications including cell phones, handsets, pagers, and so on.

3. BLOCK DIAGRAM

The block diagram of Haptic Shoe shows the entire important component embedded in the haptic shoe. Ultrasonic sensor will detect the obstacles and will send the information to the microcontroller in digital form; the microcontroller will analyze this data/information and will send the command to the user notification setup i.e. vibration according to our program to alert the blind person. Here we have used an ultrasonic sensor, and it is used to detect the obstacles. While it's in working state, when the user is walking and when it detects any obstacle, it will send a data to the Arduino Uno and the Arduino Uno will process that data and will send the information to the app. The vibrating motor is used to direct the user to identify the left and right turns in the navigation mode when a destination is set by the user.

4. FEATURES

The various features of haptic shoe are:

- It can sense obstacles like pits, rocks etc.
- It is easy to use.
- It is cheap hence easy to afford by all users.
- Since this is used for navigation purpose, the user can give their required location through voice command.

5. WORKING

Once the Arduino Uno and the sensor get connected, sensor will start to detect the obstacles, and once it is detected it will send the data to the Arduino Uno. Arduino Uno will process this data collected and will send to the smart phone through the preinstalled app via Wi-Fi. And once it reaches the smartphone, the user will receive a voice regarding the same. In Navigation Assistance process, the user can set the destination through voice commands. Once he gives a command and sets the location, the app will use the google map assistance. Then when he walks, the app will direct him accordingly with the motors present, that is, when a left turn arrive the left motor will start to vibrate and when a right turn arrives the right motor will start to vibrate.

6. CONCLUSIONS

The proposed system is designed to assist the blind person to track the route efficiently. It is designed to navigate the route from source to destination. A navigation application is created which provides turn-by-turn navigation to the user. The shoes sync up with the smart phone application and vibrate to inform users, when and where to turn to reach their destinations. The smart phone would access location and direction data via its internet connectivity. Then communicate those directions to the microcontroller, which would signal the vibrating motors to vibrate. These shoes give signs about when to proceed, where to go ahead and what kind of turn to take (left or right) to the impaired individual wearing these navigational shoes. The control unit gives vibration according to the route coordinates in shoes to guide the blind person. So the visually impaired person moves in the direction of the vibration. A microcontroller is placed in the shoe. The right shoe will vibrate when the right turn should be taken and the left shoe will vibrate when the left turn should be taken. The ultrasonic sensor will detect the nearby obstacles and the user will get informed through voice commands.

7. REFERENCES

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