INTEGRATED SMART ASSISSTIVE SHOE

Arpit Kapoor[1], Ahtesham Ur Rehman Niazi[1], Manmohit Mangawa[1], Gaurang Garg[1], Dikshit Gehlot[1]

[1]Dept. Of Electrical Engineering, Swami Keshvanand Institute of Technology, Jaipur, Rajasthan, India

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Abstract – *Integrated Smart Assistive shoe is a smart shoe equipped with Ultrasonic sensors, Arduino UNO, Bluetooth , Earplug set and power supply unit. Ultrasonic sensor are used to detect any obstacle within the set limit and will send the signal to the alarming device i.e. earplugs attached with Bluetooth.*

Similarly, Ultrasonic sensor are incorporated at the bottom of the shoe which will send the alarming signal if the distance between the sole and the floor exceed a set value.

Key Words: Integrated Smart Assistive Shoe, Smart Shoe, Obstacle Detector, Electronic Travelling Aid

1. INTRODUCTION

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 overall measures object detection, and send information related to blind people. The system consists of microcontroller, sensor, and a vibratory circuit. 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 near to the shoe alerts them with the help of vibratory circuit and also in advancement with help of speakers or head phones that is voice command with the help of android application. Here the power supply is main criteria the shoe is integrated with self-power providing unit such that there is no power backup problem.

1.1 Problem statement

Artificial Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The statistics by the World Health Organization (WHO) in 2014 estimates that there are 285 billion people in world with visual impairment, 39 billion of people which are blind and 246 with low vision. The oldest and traditional mobility aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs. The drawbacks of these aids are range of motion and very little Information conveyed. With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind people to navigate safely and independently. Also high-end technological solutions have been introduced recently to help blind persons navigate independently

1.2 Solution to the problem

With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind people to navigate safely and independently. Also high-end technological solutions have been introduced recently to help blind persons navigate independently. In this project, an effort has been made to improve the quality of the system to be more helpful for the blind people. In this project, the system is has been made as a part of the blind person's shoe. and in this project we are using ultra sonic sensor and speaker which provide more accuracy of object detection and given clean information to blind people respectively.

1.3 Proposed system

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 overall measures object detection, human detection, and real-time Assistance system consist of microcontroller, ultrasonic sensor and a pair of earplugs attached with a Bluetooth. Two ultrasonic sensors will be installed in each shoe. One will be detecting the obstacle within the range of set distance. Other will be installed at the bottom of the shoe to detect the potholes. Upon sensing the obstacle or pothole through Ultrasonic sensor, Arduino UNO will send the signal to the pair of earplugs via Bluetooth module which in turn help the user to avoid that path.

2. RELATED WORK

In the past, the visually impaired used to face difficulties in moving and transporting from a Place to another. Some of them used to have a guide dog to help them walk around and to avoid collisions. Some of them used to ask for someone else's help. This inspired a lot of developers to develop products to assist the visually impaired and to make them feel more independent. Two of these popular products are: White Cane, and Sonic Guide.

White cane also known as a "Hoover" cane, named after Dr. Richard Hoover who designed it. White cane is designed primarily as a mobility tool used to detect objects in the path of a user. But using a cane has some disadvantages. And some of these disadvantages are that using a Cane is difficult while travelling. For example using a cane is difficult in a crowded restaurant, Or in placing it into a car or a plane or even a bus. The White Cane is made from metal, which makes it heavy and inflexible and susceptible for snapping or cracking.

Sonic Guide is a smart head mounted device that uses a camera that takes pictures and analysis them based on an

algorithm to find the abnormal objects in the way and warns the user by sending alarms to a connected earphone. But also this device has some problems on its own. It is heavy and wearing a device on the head all the time may cause pain and some neck injuries. It is also power consuming due to the camera that takes pictures all the time. Some research focus more on new Sonic Guide.

The Smart Shoes is not the only assistive walking device for the visually impaired people, there was some devices such as: Mini Guide and Ultra Cane. We have studied the existing products well enough to develop a better and more efficient one. There is no perfect product, but there is always room for improvement. In Smart Shoes, we tried to give a hand to help those people. We have designed a small, wearable and a hands-free device that allows the user to use both of their hands while walking. Nevertheless we took care of battery issue, so we used the right hardware that does not as power consuming as the other devices.

Portability, low cost, and above all simplicity of controls are most important factors which govern the practicality and user acceptance of such devices. The Smart Shoes device is a kind of portable device. Hence it should be a small-sized and lightweight device to be proper for portability, the device should be easy to control: no complex control buttons, switches and display panel should be present. Moreover, the device should be low-price to be used by more blind persons. Our system is developed for portable (small size and lightweight), connected with Android application, easy to use, and low power consumption (supplied by battery).

3. EQUIPMENT DESCRIPTION

3.1 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 preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter

3.2 Ultrasonic Sensor

Ultrasonic Module is devices that use electrical–mechanical energy transformation to measure distance from the sensor to the target object. Ultrasonic waves are longitudinal mechanical waves which travel as a sequence of compressions and rarefactions along the direction of wave propagation through the medium. Apart from distance measurement, they are also used in ultrasonic material testing (to detect cracks, air bubbles, and other flaws in the products), Object detection, position detection, ultrasonic mouse, etc.

3.3 HC-05 Bluetooth Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications. It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART). HC-05 is a Bluetooth module which is designed for wireless communication. This module can be used in a master or slave configuration.

4. CONCLUSION

We would like to conclude that the proposed system completed successfully. As we stated earlier in a problem statement, the previous problem like a less information conveyed, poor efficiency of IR sensor and dependency on stick are overcome and successfully implemented with efficiency of object detection and with a clear information to a blind people for their guidelines. Hence, it can be concluded that this project is able to play a great contribution to the state of the art and will play a great role to assist the blinds to walk easily.

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