A SMART SETUP FOR VISUALLY IMPAIRED

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Abstract: Eyes play important role in our day to day lives and are perhaps the most valuable gift we have. This world is visible to us because we are blessed with eyesight. But there are some people who lag this ability of visualizing these things. Due to this, visually impaired people face many challenges when moving in unfamiliar public places.285 million people are estimated to be visually impaired worldwide: 39 million are blind and 246 have low vision. Hence, wearable device should design for such visual impaired people. Smart shoes are wearable system design to provide directional information to visually impaired people. To provide smart and sensible navigation guidance to visually impaired people, the system has great potential especially when integrated with visual processing units. During the operation, the user is supposed to wear the shoes. When sensors will detect any obstacle, user will be informed. The Smart Shoes help the user in moving around independently.

Index Terms - Visually Impaired, Smart shoes, Sensors, OCR, Obstacle

I. INTRODUCTION

Blindness, low vision, visual impairment and vision loss have dramatic impacts on individuals experiencing such disabilities. These carry with them physiological, psychological, social, and economic outcomes, hence impacting the quality of life and depriving such individuals from performing many of the Activities of Daily Living (ADL), the most crucial of which is navigation and mobility. Blindness is a qualitative term that describes the clinical condition whereby individuals have no light perception as a result of total vision loss. Blindness also refers to those who have so little vision that they have to rely predominantly on other senses as vision substitution skills. On the other hand, visual impairments is a qualitative term used when the condition of vision loss is characterized by a loss of visual functions at the organ level, such as the loss of visual acuity or the loss of visual field. 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, ultrasonic 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 generation unit such that there is no power backup problem.

I. WORKING PROCEDURE

[1] Keeping the scenario of increasing vehicles and dangers in roads now-a-days, we are intended to design this setup to help the visually impaired person.

[2] The setup consists of a pair of shoes and a cap where they will be having ultrasonic sensors attached in different directions and they will continuously transmit ultrasonic waves.

[3] As soon as any obstacle comes in the way of the waves, the waves will hit the obstacle and come back to the receiver and the receiver will transmit the signal to the microcontroller (Ardunio UNO).

[4] The microcontroller then transmit signal to the particular vibrating motor which is connected in the direction from which the obstacle is approaching.

[5] Intensity of the vibration will depend on the distance of the obstacle from the sensor (the vibrational intensity will be lower when the obstacle is far but in the vicinity of the sensor whereas in case the obstacle is approaching towards the person or the distance between the sensor and the obstacle decreases then the intensity of the vibration increases accordingly).

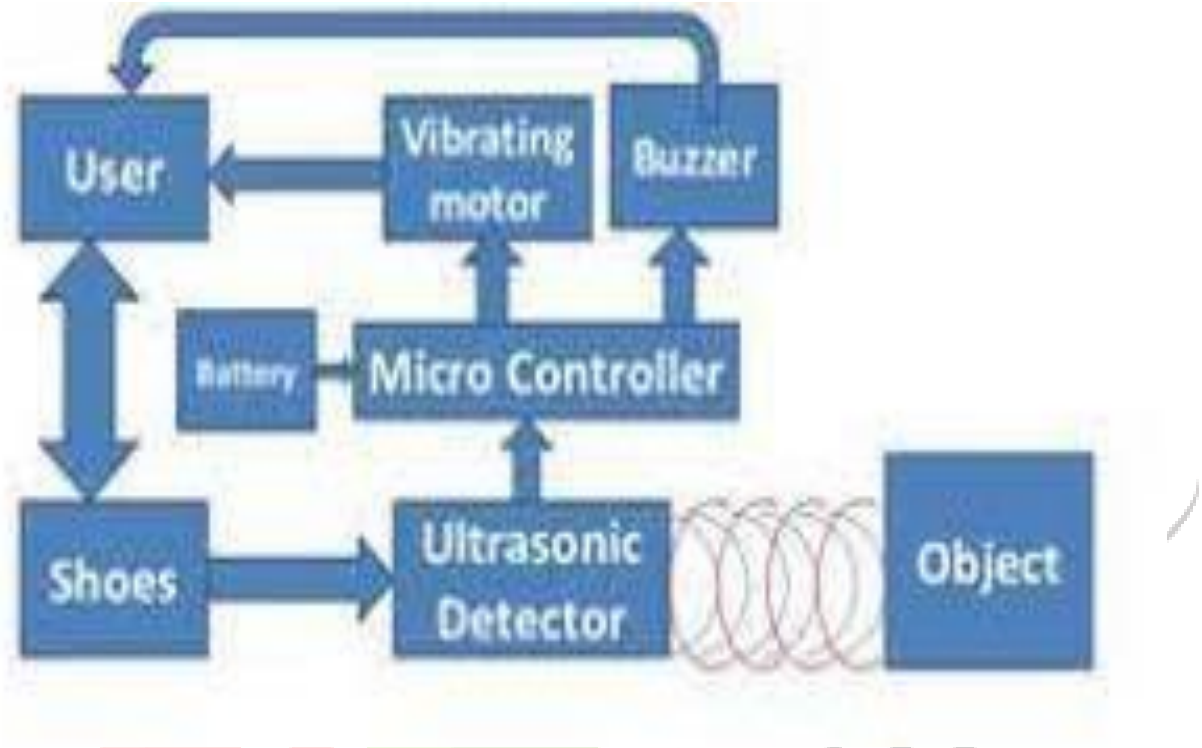

Figure 1. Block diagram of system

II. Circuit Description

The project mainly consists of many important electronic components, and has the PIC Microcontroller. These main components are explained in brief followed by their internal working of the used components in the forthcoming sections. The circuit diagram consists of the following:

- Arduino UNO
- Vibrator
- Ultrasonic sensor
- Battery

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 a AC-to-DC adapter or battery to get started.

Figure 2. Arduino UNO

Ultrasonic Module

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

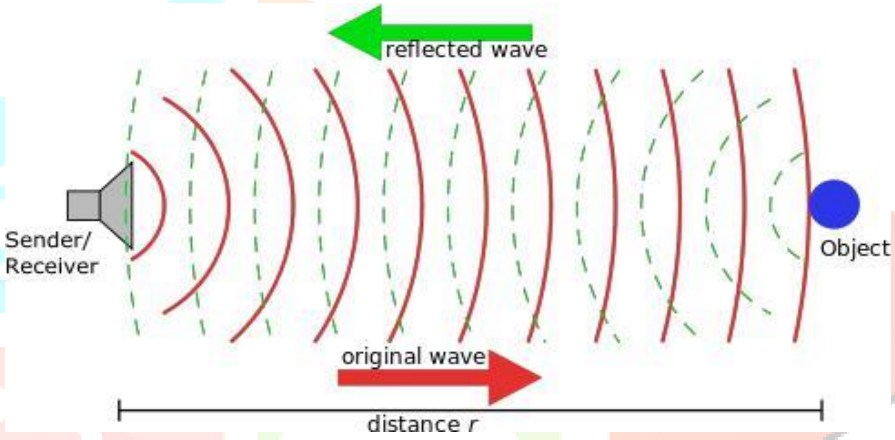

Figure 3. Working of Ultrasonic Sensor

Vibratory Motor

A **vibratory motor** is a three-phase **motor** that is intentionally unbalanced, and is also known as an eccentric rotating mass (ERM) or vibrating **motor**. **Vibratory motors** ensure an efficient and continuous process with an unobstructed flow of material.

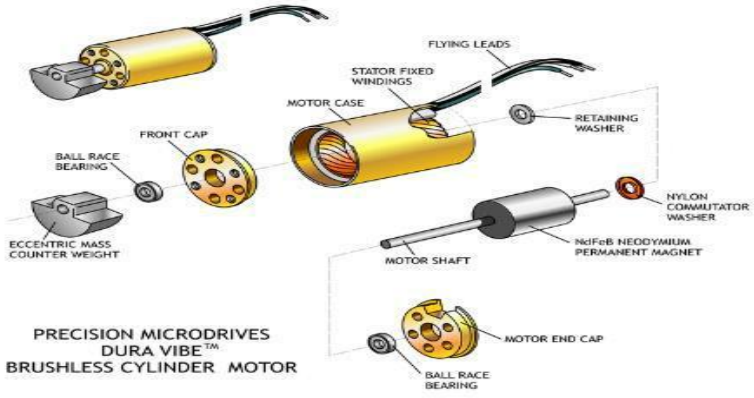

Figure 4. Vibratory Motor

Operation of Vibration Sensor

It works on electromechanical principal vibration velocity sensors operate in accordance with the electro dynamic principle and are used for measuring the bearing absolute vibration based on the peizo-electric effect. Change in resistance due to the force acting on it and convert it into 4 - 20 mA. They're measuring differences in oscillation, so they probably want a -12 and +12swing with 0 as the base line and we have piezoelectric sensor which detects the vibration created on the surface. We can also use shock sensor to detect vibrations.

Accelerometers for the measurement of acceleration, shock or vibration come in many types using different principles of operation.

Inside a piezoelectric version, the sensing element is a crystal which has the property of emitting a charge when subjected to a compressive force.

In the accelerometer, this crystal is bonded to a mass such that when the accelerometer is subjected to a 'g' force, the mass compresses the crystal which emits a signal. This signal value can be related to the imposed 'g' force.

The Application Framework

Proteus 8 consists of a single application with many modules (ISIS, BOM, ARES, 3D Viewer, etc.). Modules open in tabs within the application window but can then be dragged and dropped to create additional windows and enable side-by-side viewing.

This allows you to not only work with ISIS and ARES in the design phase as you did in previous versions but also to split off other modules according to the work you are doing at a particular time.

For example, ISIS and VSM Studio for debugging, ISIS and BOM for report generation, ARES and 3D Viewer for verification and so on.

ARDUINO IDE SOFTWARE

A potentiometer is a simple knob that provides a variable resistance, which we can read into the Arduino board as an analog value. In this example, that value controls the rate at which an LED blinks.

We connect three wires to the Arduino board. The first goes to ground from one of the outer pins of the potentiometer. The second goes from 5 volts to the other outer pin of the potentiometer. The third goes from analog input 2 to the middle pin of the potentiometer.

By turning the shaft of the potentiometer, we change the amount of resistance on either side of the wiper which is connected to the center pin of the potentiometer. This changes the relative "closeness" of that pin to 5 volts and ground, giving us a different analog input. When the shaft is turned all the way in one direction, there are 0 volts going to the pin, and we read 0. When the shaft is turned all the way in the other direction, there are 5 volts going to the pin and we read 1023. In between, analog Read returns a number between 0 and 1023 that is proportional to the amount of voltage being applied to the pin.

RESULTS AND DISCUSSION

Distance (from the shoe in cms)	Type of signals
350 to 300	Very slow Audio
250 to 200	Slow Audio
150 to 100	Audio +vibration
30 to 20	Fast Audio +vibration

Table 1. Test case

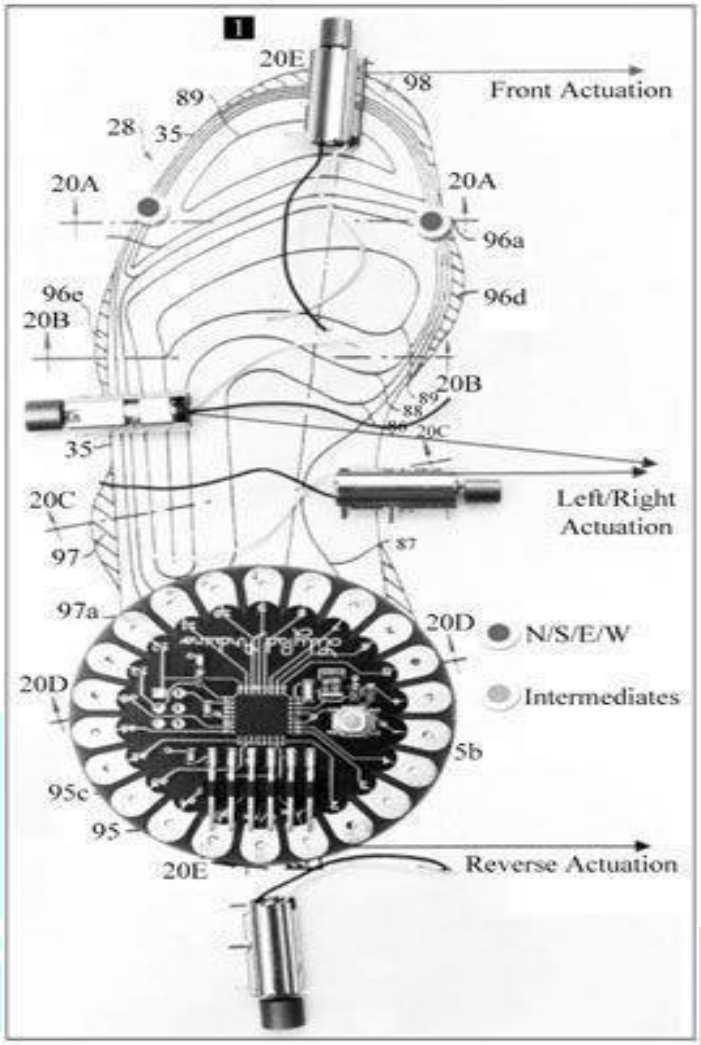

Figure 5. Smart shoe

So, to make the visually impaired person capable of moving or travelling by themselves we are thinking of equipping them with a pair of shoes and a cap which will help them travel safely in their path by avoiding any kind of obstacle, so that they do not get stumbled, fall down and get hurt.

The pair of shoes will be designed in such a manner that ultrasonic sensors will be attached in it in different directions to sense any obstacle in the vicinity of the sensor from any direction.

Similarly, the cap will also be equipped with an ultrasonic sensor so that obstacles at the head height could be avoided and the person could travel safely.

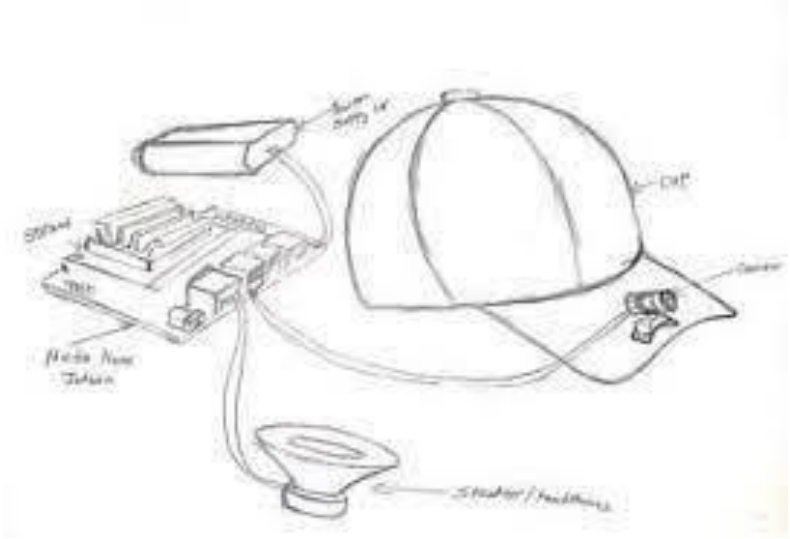

Figure 6. Smart cap

III. CONCLUSION

This work 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. the general body of knowledge. The Smart Shoe for visually impaired persons is a project on embedded systems where software and hardware were integrated with each other so that to create an user friendly environment for he visually impaired persons. Sensors play a major role in this system where they were the major tools for the user guidance, due to this features it is best equipment for the visually impaired persons. Hence this project will solve the consequences faced by the visually impaired people.

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