ULTRASONIC WAIST-BELT FOR VISUALLY IMPAIRED PERSON

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Abstract – **In our project, we present an electronic navigation system for visually impaired and blind people. This system can detect the obstacles around it and in front, left and right direction using a network of ultrasonic sensors. It effectively calculates distance of the obstacles from the user and prepares a safe path for the user accordingly to avoid obstacles. It uses speech or voice module to aware the user about the detected obstacle and its distance. This proposed system uses Arduino Nano microcontroller based embedded system to process real time data collected using ultrasonic sensor network. Based on direction and distance of detected obstacle, relevant pre-recorded speech messages are stored in Voice and play back circuit which warns the user about the obstacles. Such speech messages are conveyed to the user using speaker on voice and playback circuit which is known as voice module.**

I. INTRODUCTION

Generally, lots of people suffer from physical disabilities, one of the most tedious disability is being blind. They suffer a great deal on a daily basis because of the visual impairment. The visual impairment also known as vision impairment or vision loss, defines as reduced vision which is not corrected by glasses or contact lenses. Blindness is defined by the World Health Organisation as vision in a person's best eye with best correction of less than 20/500 or a visual field of less than 10 degrees. Few people born blind due to deficiency or disorders and few lost their eye during an unfortunate accident, but they all face the same challenges. The main challenge for the visually challenged personnel is to navigate themselves outside their accustomed abode and to be dependent is not a choice. Due to their visual disability, they have very less employment opportunities and also suffer economically. The society discriminates sighted people and blind people. As a matter of fact, the blind people have very sharp senses than the sighted people and they can handle themselves without any help. But that doesn't mean people shouldn't lend hand to the blind. If they show any sign of hesitation and going around in circles, help can be offered in a polite way. Squeezing the hands of the blind, dragging them across the street and making them lose consciousness is not the way of offering help.

These sort of courtesy act can shatter their confidence and develop a inferior complex.

Humans are inventive in nature, if pushed to the brink of despair, we, humans find a new way to turn the despair in to hope. Blind people have their own way of doing things. Sighted people rely too much on our eyes, so that, a thought of being without vision is like a living nightmare. This lack of imagination makes the sighted people assume that blind people cannot do things without vision.

Accidents are prone to happen everywhere for everyone, but the blind people have high probability of getting involved in an accident due some law contradicting citizens. Our project is to save the blind people from imminent danger (for e.g., to warn the blind that their in the crash course of a accelerating vehicles).

II. EXISTING SYSTEM

Technology has been developed to help the blind people, this made the visually challenged to lead a normal day-to-day life. There are various systems to help the blind people avoid feeling contempt of their daily life. Few are described below:

A. Electronic Travel Aids (ETAs)
These devices gather information around the user by using the sensor cameras, sonars or laser scanners. It determines the obstacles around the user and provides the information about the distance between the user and obstacle. This also gives the insight of the mental map of the surroundings.

B. Electronic Orientation Aids (EOAs)
These devices provides the pedestrians with directions in the unfamiliar environments. It provides the information about the path and the signs to the user. It also used to trace the path back to the destination.

C. Position Locator Devices
These devices provide the accurate the destination of the user who is holding the device. It uses the GPS (Global Positioning System) technology.

The disadvantages of these devices cannot be affordable by everyone. To overcome these

disadvantages, ultrasonic waist belt sensor is proposed.

III. PROPOSED SYSTEM

A system is proposed to overcome the difficulties of the existing system. Ultrasonic waist belt sensor is device which has the system integrated in the form of belt and this can be wearable in the waist. This system consists of Arduino Nano microcontroller, Ultrasonic sensor, power supply, Bluetooth, Alarm, Voice module, Vibration motor.

1. **Arduino Nano**, a mini sized microcontroller, is a small, complete and breadboard-friendly board based on the AtMega382P. It is very much similar to the Arduino UNO and has same functionality but quite small in size. It operates at an voltage of 5V.
2. **Ultrasonic sensor** measures by using ultrasonic waves. It is a detecting unit which is used to detect the distance between the object and the user, measured by using the time taken between the emission and reception. The distance can be calculated by using the following formula, Distance $L=\frac{1}{2}*T*C$, where T is time between the emission and reception, C is the ultrasonic wave speed.
3. **Bluetooth** is a technology which is used to transfer data over a short distance using shorter wavelength. The IEEE standardized the Bluetooth as **IEEE 802.15.1**. Industrial and medical bands ranges from 2.400 to 2.485 GHz.
4. **Voice module** is a module which is used to provide the instruction to the user about the incoming obstacles. The voice instructions (for e.g., Go left, Obstacle ahead) are programmed in the voice module.
5. **Vibration motor** is to alert the user of the obstacle if the user has hearing disability as well. The motor rotates to produce the vibration which gives warning sign to the user.

IV. BLOCK DIAGRAM AND DESCRIPTION

The block diagram consists of a Arduino Nano microcontroller which operates at an 5V power supply. The ultrasonic sensor acts as a input device, which measures the distance between the user and the object by using the time taken between the reception and transmission. Alarm and Voice module is used to alert the people who have sharp hearing senses. Voice module is generally used to provide instructions about the path, Alarm mainly act as a alerting system.

Bluetooth is used to connect the circuit with the mobile phone. This gives an remote access to the

user to control the circuit. Vibration motor is used to warn the people who are deaf (hearing disability). The motor runs, and the vibrations alerts the user of the imminent danger.
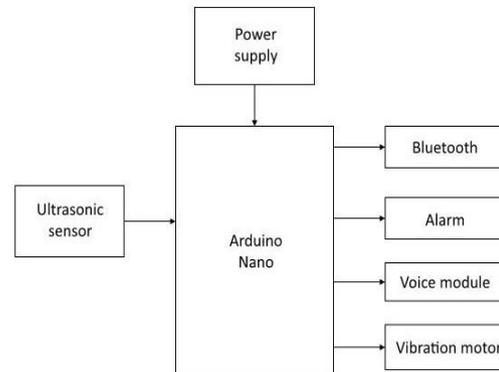

Fig 1(a) Block diagram

The working of the Ultrasonic waist belt for visually impaired person is explained: The ultrasonic waist belt is worn by the user, the ultrasonic sensor sends out the ultrasonic signals in all the direction. When the signal gets reflected by the obstacles, it reaches back to the sensor and the distance is calculated by using time taken for the emission and reception of the signal. The formula used to calculate the distance is $L=1/2*T*C$, where T is the time between the emission and reception, C is the ultrasonic wave speed. This information is shared to the Arduino Nano microcontroller which is programmed to warn the user when the obstacle is in the range near the user. The microcontroller triggers the alarm circuit, to warn the user about the obstacle. Voice module plays the pre-recorded message of the instructions, that is why it is called voice and playback circuit. These modules are used to warn the user who has the sharp hearing senses. Vibrating motor produces vibration as the warning for the visual impairment, to those people who have deafening defects. Bluetooth is used to connect the device with the mobile gadgets. This gives the remote access to the user to control the circuit.

V. TECHNICAL ADVANTAGES

The user usually trip off and the blind assistive devices get damaged, because the user usually wears those in the places where the user gets wounded when the trip. Another disadvantages of using the existing systems, the user loses the devices they wear while travelling or doing some work. The technical advantage of using the ultrasonic waist belt, is that this device won't get damaged due to tripping. There is no need for reinstating the device every single time it gets damaged and it is not affordable by all people. It is very much cost efficient and affordable by

everyone. This device is used for the people who have deafening disability and for the people who doesn't have those disability. The power supply required for the circuit is very minimum and a triple-A battery is enough to power the circuit.

VI. OUTPUT AND RESULT

The output is modelled in the belt form, the Arduino Nano microcontroller, ultrasonic sensor, power supply, alarm, Bluetooth, voice module (voice and play back circuit), vibration motor are integrated with the belt. This belt is worn by the user (blind people) in their waist.
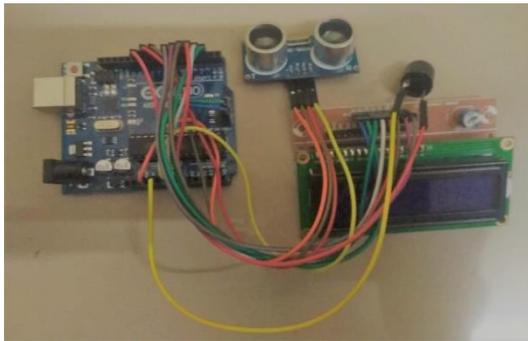

Fig 1(b) Ultrasonic Waist Belt Sensor system

The above given figure is the pictorial representation of the ultrasonic waist belt sensor system. In this representation, the ultrasonic sensor is connected to the Arduino Nano microcontroller. The above figure comprises of the ultrasonic waist belt sensor.

VII. CONCLUSION AND FUTURE DEVELOPMENT

Blind people and sighted people are not that different, only the perspective of the people should change. Blind people do things little different than the sighted people. They have a sharp senses and uses those senses to do the day to day basis work. To assist the blind, ultrasonic waist belt sensor is used. The future development can be made in this field by using AI (Artificial Intelligence).

VII. REFERENCES

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