Advance Smart Blind Stick by using Arduino Board

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Abstract – *The objective of this project is used to help the blind peoples and they are able to easily interact with the physical world by using this smart blind stick. About 285 million of peoples are usually impaired worldwide; 39 million are blind and 246 million have low vision. If we are notice, we know very well about it they can't walk without the help of other. One has to ask guidance to reach their destination. Using this smart blind stick a person can walk confidently. This stick is with ultrasonic sensor detects the object in front of the person and give instant response to the user by alarm from the buzzer and vibrating the handle cause of ERM (Eccentric Rotating Mass vibration motor) brush type coin vibration motor is fixed behind the handle of the stick. The microcontroller (Arduino Uno) to receive the sensor singles and process them to short pulses to the Arduino pins where and ERM motor are connected. This device will be the best solution to overcome their difficulties and help them to live the better life.*

Key Words: Alarm Unit, Arduino Bord, (ERM)Eccentric Rotating Mass brush type coin vibrating motor. Ultrasonic Sensor, Visually Impaired Person, System.

1. INTRODUCTION

The blindness is a state of lacking the visual perception due to physiological or neurological factor. The partial blindness represents the lack of integration in the growth of the optic nerve or visual center of the eye and total blindness is the full absence of the visual light perception. Generally, we observe that white cane is the best friend/support of visually impaired person. But many time this white cane is not useful. In an unfamiliar surrounding visually impaired person get confused So this restricts their mobility.

Smart Blind Stick is an innovating stick designed for visually disable people for improved navigations. We here purpose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. Our purposed project first used ultrasonic sensor to detect obstacles ahead using ultrasonic waves. On sensing, obstacle the sensor passes this data into microcontroller, then microcontroller processes this data and calculate if the obstacles is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends the single to sound a buzzer and vibrate a ERM motor.

1.1 Overview of Project

In normal stick, the detection of the obstacle is not done and normal stick is not efficient for visually impaired persons. Because the blind person does not know what type of things or what type of the objects come in front of them. The person can't recognize how far is he/she from the object. It is difficult for blind person to move here and there.

A lot of study is being done to design a fine instrument that provides the user a better walking experience. According to the famous philosopher and scientist ARISTOTLE, our knowledge about the outside the world depends on the five sense organs and sight is one of those five organs. And visually impaired are those unfortunate peoples who are completely or partially suffering from eye sight issues. According to the WHO (World Health Organization) and IAPB (International Agency for Prevention of Blindness), approximately 285 million peoples are visually impaired worldwide: 39 million are blind and 246 million have low vision (several or moderate visual impairment). But in recent time ETAs (Electronic Travel Aids) with sensors and sound systems are designed for improved navigation of blind peoples.

Fig 1: Outlook of Advance Smart Blind Stick

Here we proposed an advanced blind stick that allows visually challenged people to navigate using advanced technology like ultrasonic sensor and programming in Arduino uno board.

1.2 Materials/Components are Used in System

The system has been developed using both the hardware and software implementations. The list of required materials/software are as follow:

- Arduino Board
- HC-SR04 Ultrasonic Sensor
- Piezo Buzzer
- ERM coin vibrating motor
- Rechargeable Power Supply (Lithium Ion 3.7v battery)
- 1/2'' UPVC Pipe, Plastic Box, Wires, Micro-USB female Jack, etc

Software used in system

Arduino Software IDE (Integrated Development Environment common to all Arduino boards)

Version 1.8.16

We can use Programming Language C, or C++.

- Arduino Board

The Arduino-uno is an open-source microcontroller board based on the microchip ATmega328P microcontroller and developed by Arduino.cc. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via type B USB cable. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, The Arduino project provides an IDE based on the processing language project.

- HC-SR04 Ultrasonic Sensor

The HC-SR04 Ultrasonic sensor is a four pins module, whose pin names are VCC, Trigger, Echo, Ground respectively. This sensor is very popular because used in many applications were measuring distance and sensing the objects. HC-SR04 Ultrasonic Sensor is commonly used with both microcontroller as well as microprocessor platforms like Arduino.

- Alarm Units

The visually impaired person was informed through an alarm unit like

- Piezo Buzzer
- ERM coin vibrating motor

- Piezo Buzzer

A Piezo Buzzer is a type of electronic device that's used to produce tone, alarm or sound. A piezo buzzer has audible frequency range 2KHz to 4KHz are most easily heard.

- ERM coin vibrating motor

Coin or pancake vibrating motor is Eccentric Rotating Mass (EMR) motor. This motor used in our system because of it is compact size coreless DC motor used to informed the stick user receiving the signal by vibration the stick handle.

- Rechargeable Power Supply (Lithium Ion 3.7v battery)

The BL5C battery is a type of lithium ion, it has a relatively light in weight, partially no memory affect and can be repeatedly charged (up to 1000 times) & discharge with almost no loss of capacity. This type of batteries mostly used in mobile phones.

- 1/2'' UPVC Pipe, Plastic Box, Wires, Micro-USB female Jack, etc

In this project we used 1/2'' UPVC Pipe as a stick. The Arduino board, battery piezo buzzer with connections are fixed inside the Plastic Box. Micro-USB female Jack is connected for recharge the battery.
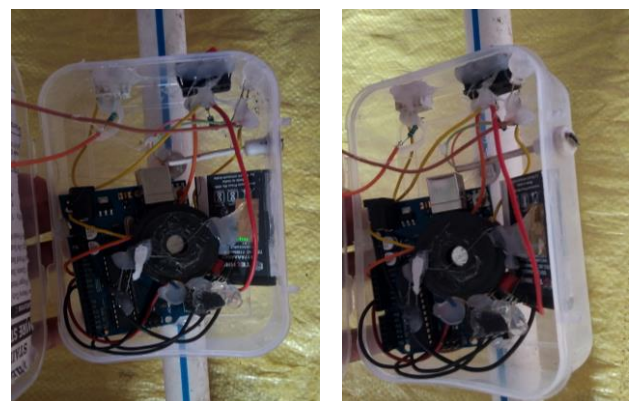

Fig 2: Connections & Materials/Components are Used in System

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2. WORKING

The proposed of project is firstly used the ultrasonic sensor to detect the obstacle ahead using ultrasonic waves. On sense the obstacle the sensor passes the data to the Arduino board. If the obstacle is not that close the circuit does nothing, If the obstacle is close the Arduino board send the alarm units i.e piezo buzzer and ERM vibration motor. It detects and beeping the buzzer also vibrating the handle of stick. If object is closed the beeping frequency of a buzzer is increases and everything is normal the buzzer is not beep. There are switch button to start the system.

Fig 3: Working of Advanced Smart Blind Stick

There are three LEDs (Light-Emitting Diode), out of three two red LEDs are fixed on the plastic box with separate switch button for only start when user goes outside in the night. These lights proved a safety aspect of the user. They show the rear edge of the stick to alert other drivers. In addition, they allow to see the stick/blind person in inclement weather such as rain or snow. One green light is glows when battery is on charging mode.

2.1 Software Details

Software that is needed to control the system is done through programming language C or C++ programming.

Arduino IDE is an opensource software programming that allows user to write and upload a code within a real time work environment, as this code will be stored within the cloud. The system is fully compatible with any Arduino software bord. Arduino IDE can be implemented within windows; MAC & LINUX operating system.

The majority of its components are written in C or C++ for easy editing and compiling, while its primary intention is based around writing codes.

2.2 Advantages

- This smart blind stick is less costly and simple.
- Able to detect with the help of ultrasonic sensor.

- Easy to handle electronics guidance system is proposed to provides constructive assistant and support for blind and visually impaired persons.
- It will help the blind person by providing more efficient and convenient means of life.
- Light in weight.

2.3 Disadvantages

- Need to be install the program into an Arduino board for run the system.
- They can't detect the obstructions such as downward stairs, holes etc.
- Need of charging the battery.
- Structure/connection of circuit is complex.

3. RESULT ANALYSIS AND FUTURE SCOPE

3.1 RESULT ANALYSIS

The presented system is designed and configured for practical use. The system is able to handle several sates that may face the blind people. As ultrasonic sensor works on principle of echo, studying of its reflection on different obstacle is very important.

After testing, it is observed that when sensor detect at the same time buzzer and vibrating motor works simultaneously. The system proposed in this help user walking a relatively safe environment reliably, such as indoors, parks and schools. That system not only make them more face, but also liberated their minds and throw away many worries and doubts. However, in some specific open environment, such as on the road, the blind still needs someone accompany them if they have to take a long trip. The effect of the system will reduce the dependency of other.

3.2 FUTURE SCOPE

The project has a very good scope in future as well as in present. In future, if further improvement and investment is carried out with the stick then it will be an even more effective device for the future world.

The main theme of these project is to help the blind people and make them to interact with physical world. In future this project can be developed by adding GPS and GSM module. The model were used to track the location of the blind people. The emergency button were placed in their clothes or hats to make the device more portable and easy to used by the blind people.

The device is constructed in this work is only capable of detecting obstacle. In future, we can construct a device to detect moisture and holes in moving path.

Therefore, a better device can be constructed using ultrasonic sensors, Arduino uno and other devices.

4. CONCLUSIONS

Blind people face a lot of difficulties while travelling from one place to another. With the intension to help the blind, their difficulties, advance smart blind stick is proposed.

The technologies behind blind stick are upgrading day by day, and comfortable. The tick is very light and handy to carry.

The parts/components that we are used in the stick are easily available and less in cost. Besides all the manufacturing cost is also quite low, that makes the affordable for people of all class and ages.

It leads to good result in detecting the obstacle on the path of the user in a range of two meters.

This system offers a low cost, reliable, portable, low power consumption and robust solution for navigation with obvious short response time.

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