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Arduino Based Safety System for Blind People

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Abstract:

The Blindness is frequently used to describe severe visual deterioration with or without residual vision. According to WHO (World Health Organisation) 30Million people are blind. In India only 6.8 Million people are blind, 46.2 Million people have low vision and 5.3Million people are visually diminished. There is a great dependency for any type of movement or walking within area or out of the particular area, they use only their natural senses such as touch or sound for identification. To gift a simplified and independent life for blind person, this project proposed which is light weight , compact , cost efficient and easy to handle.

Keywords: Arduino UNO, Ultrasonic sensor, Fire sensor, Rain sensor, Blind Stick.

I. Introduction

Blind stick is an advance unconventional stick designed for visually paraplegic people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate within area or particular area with ease using advanced technology. The blind stick is integrated with ultrasonic sensor along with fire and rain sensing. In this proposed project uses ultrasonic sensor to detect obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it detects water and alerts the blind. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled people.

Mathematical expression for ultrasonic sensor: Distance= (speed of sound * time taken) /2

II. Accidents Statistics faced by Blind people

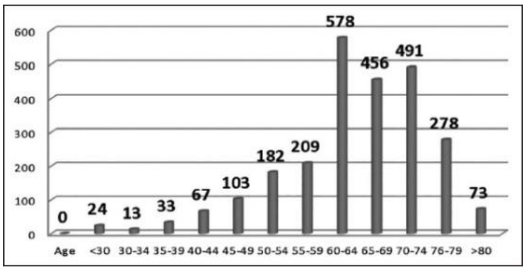


Fig. 1 Blind person according to age

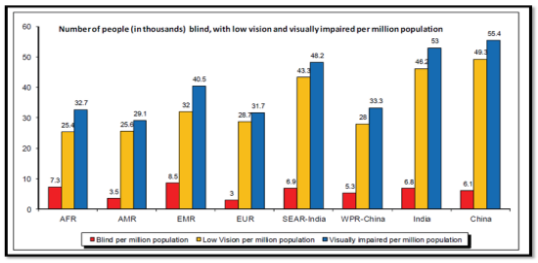


Fig. 2 Blind people in the world

III. System Description

The smart blind stick deals with the obstacle detection of fire and water incidents and this the alarm does alert to the user. The stick is handy and detect the following incidents with good accuracy. In this section, circuit diagram and execution of major portions of this project describes elaborately. The ultrasonic sensor is used here for obstacle detection as well as rain sensor and fire sensor are used here for any type of fire incidents or water clotting detection.

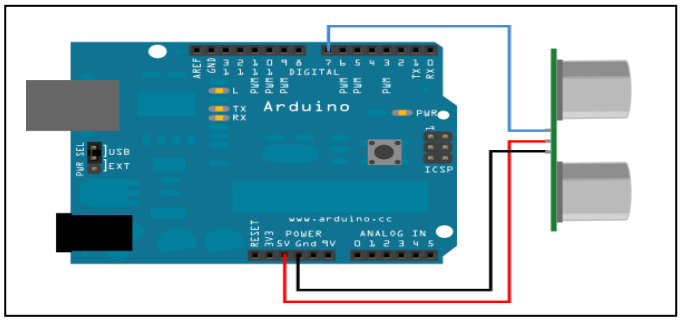


Fig. 3 Circuit representation of obstacle detector

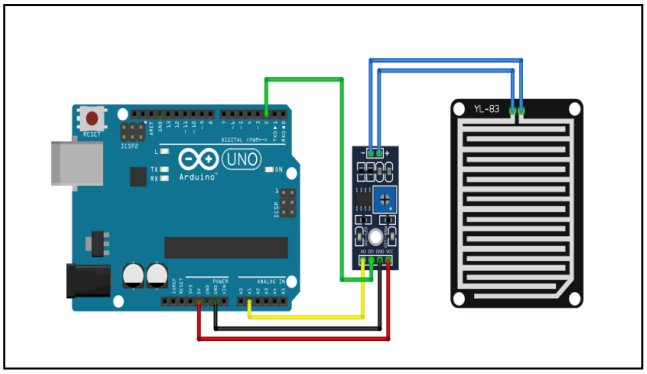


Fig. 4 Circuit of rain sensor

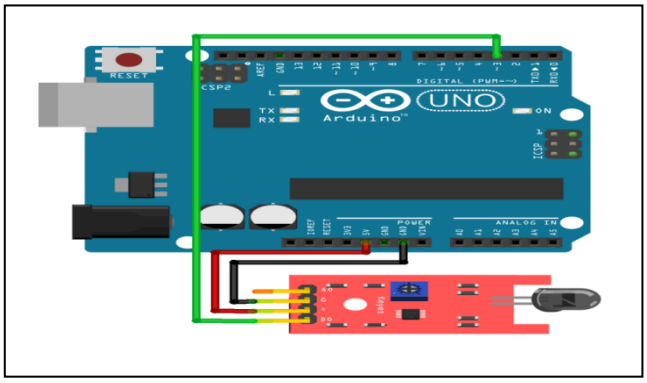


Fig. 5 Circuit of fire sensor

IV. Hardware Specification

The hardware components used in the system design are:

a) Arduino Uno

b) Ultra sonic sensor

c) Fire sensor

d) Flood sensor

e) Buzzer

f) Battery

V. Circuit Component Description

a) Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog input pin, 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 AC-to-DC adapter or battery to get started.

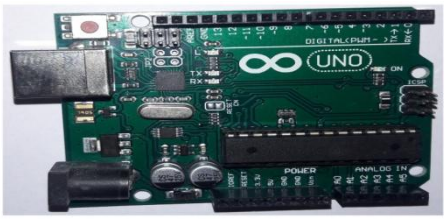


Fig. 6 Arduino Uno

b) Ultra sonic Sensor

The basic concept of an IR sensor which is used as obstacle detector is to transmit an IR signal. The IR portion is divided into three regions: near infrared region, mid infrared region, far infrared region.

Fig. 7 Ultrasonic Sensor

c) Fire Sensor

The Fire sensor as the name suggests is used as a simple and compact device for protection against fire. The module makes use of IR sensor and comparator to detect fire up to a range of 1to 2 meters.

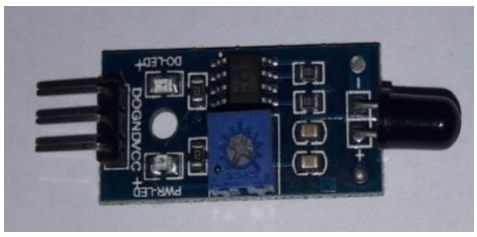


Fig. 8 Fire Sensor

d) Rain sensor

The Rain sensor module is an easy tool for flood detection. It can be used as a switch when water drop falls through the board and also for measuring falling intensity.

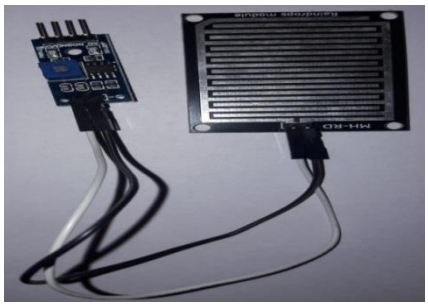


Fig. 9 Rain Sensor

e) Buzzer

A Buzzer is an audio signalling device which may be mechanical, electro-mechanical or piezo-electric.

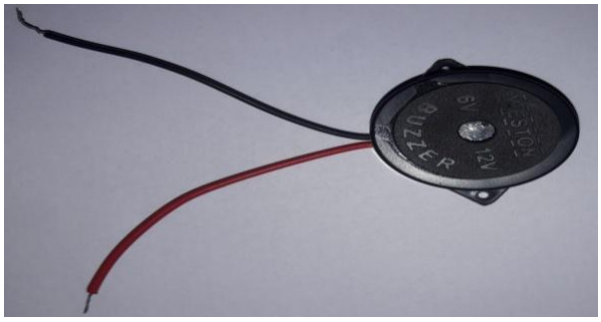


Fig. 10 Buzzer

VI. Flow Diagram and Operation

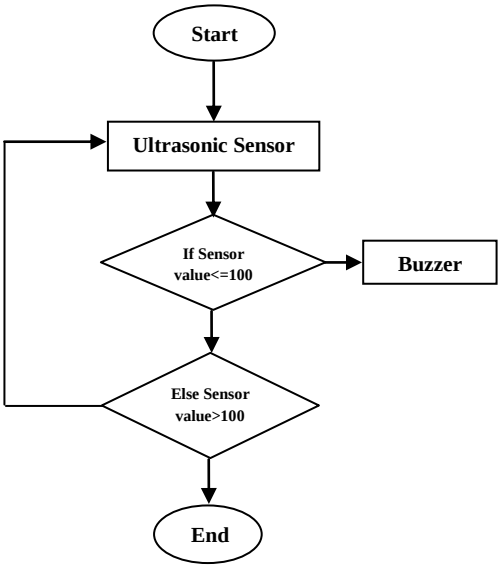


Fig. 11 Primary flow diagram of the stick

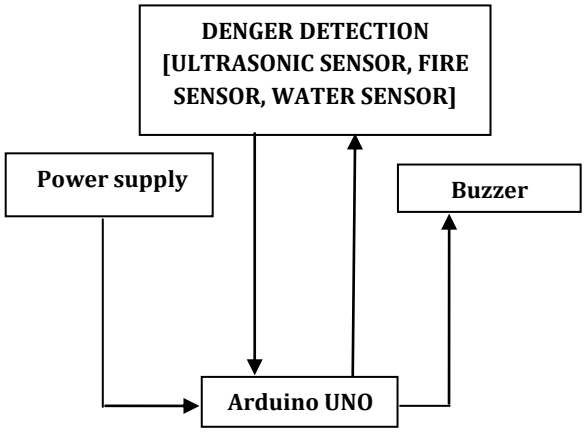
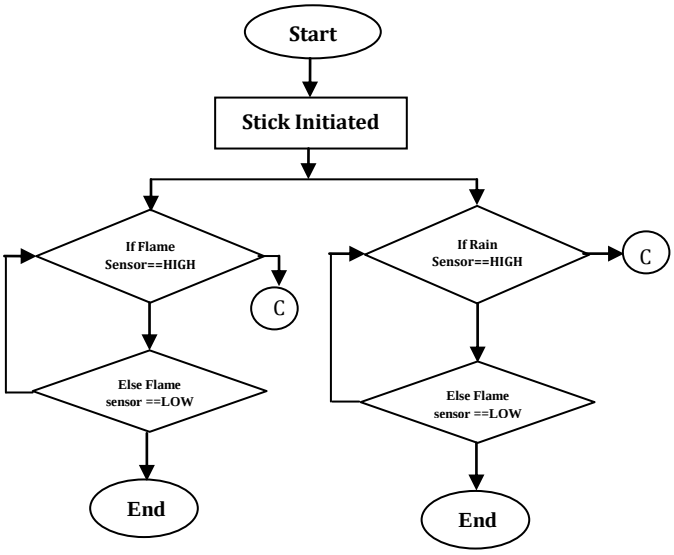


Fig. 12 proposed system design of the smart blind



Fig, 13 Overall flow chart of the smart stick

VII. Result and Discussion

In this section, the proposed model of the smart stick is shown in fig 13. From the analysis of data it can be said that it is accurate and easy to handle and no precaution would be taken for the user. This stick operates on 4V rechargeable battery and is not long time consuming for charging. It is based on electronics components , so they should be take care from any type of hazardous zone. This project is only for testing or research purpose , so that it may not be same as per real data.

VIII. Model of Propose System

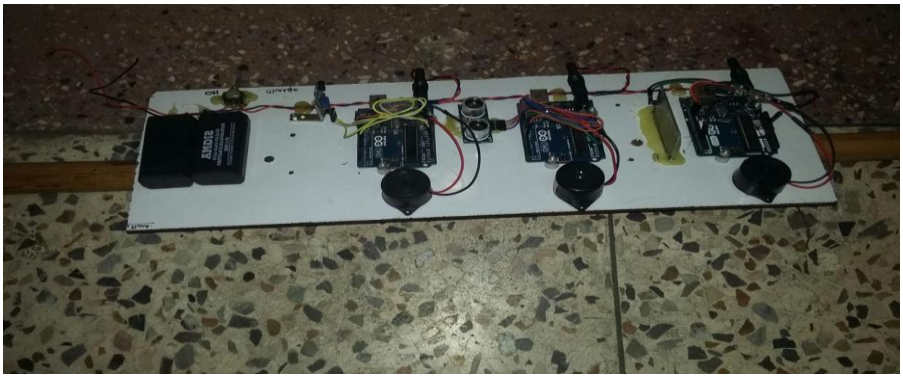


Fig. 14 Real time set up of the proposed system

This device made for research and development purpose. So it can not be used for commercial purpose.

IX. Conclusion

This paper is proposed a smart blind stick based on obstacle detection which overcome the problems faced by blind people. This system is light weight, cost efficient, simple circuitry and low maintenance cost. The circuit of this project was incorporated with arduino uno, which is very reliable and stable with open software It was found to be very reliable and stable. This proposed system helps to quick detection of incidents such as obstacle, fire and water and takes a suitable action by the user. According to our observation and research the smart stick is advantageous to orthopedic sectors. As discussed earlier this device is low cost and less power consuming which is affordable for poor persons. According to proposed model here three arduino uno are used but it can be replaced with one arduino uno which makes this sticks less bulkier and compact in size.

X. Future Scope

Ensuring safety for the blind person there are some future aspects of this project:
1. A future development of this project can be enlarged with GSM and GPS module , so that providing more safety about their movement.
2. Instead of the stick we can also use blind shoe by using same technology for their easy and comfortable movement.

3. Battery is the power house of this project but instead of battery in future we also use solar panel and it is freely available in nature.

XI. Acknowledgement

We hereby express our sincere gratitude to the Associate Prof. Dr. Sudipta Ghosh , Dept. of Electronics and Communication Engineering for providing us with the necessary arrangement for the completion of our project. Without whose valuable guidance and support the project would not have been a success. We thank him for the good will and encouragement extended to us.

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