Electronic Stick for Visually Impaired People With buzzer alert

D.Siva kumar, M.Prem Anand, K.Deepan Raj, P.Thalapathi Raj, R.Yashwanth, S.Yogesh

Abstract:In this paper, we present and describe an electronic stick with buzzer alert to help visually impaired people when they walk in uncomfortable environments.There are more number of people who have difficulties and problems in their day-today life due to their visual problem.Walking with ease and confidence is considered as the one of their difficulties in unstructured environments.By considering this issue, a new electronic stick with Rf remote transmitter and receiver is developed which uses Ultrasonic sensor and buzzer. Ultrasonic sensor is capable of detecting obstacles/objects in front of the visually impaired person if there is any obstacle/object is present in their walking path.Ultrasonic sensor calculates the distance between the visually impaired person and an obstacle.If the calculated distance is in between the given range, there is an alert. Rf remote helps the visually impaired people to find the location of their electronic stick . Many experiments have been conducted in many places by more number of people to check and ensure the correctness of an electronic stick and the outcomes are good enough.

Index terms:ultrasonic sensor; Rf transmitter and receiver; Buzzer; Alert sound.

I. INTRODUCTION

Blind people are not able to visualize objects with their own eyes. Stats concludes that approximately 290 million people are blind. Out of them, 40 million are fully blind and 250 million people have very low visual sight which is reported in [1, 2]. It has also described by World Health Organization (WHO) in [2] that around 85% of total blind persons live in developing nations for example India.

It has been reported, that around one-third population of total visually challenged people live in India only [2, 3]. It is also calculated in [2, 3] that by the year 2020, number of visually challenged people will be doubled. WHO aims to prevent the blindness by providing various strategies and more number of plans and it also plans to take actions in many poor countries.

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WHO has started a worldwide strategies for the year 2014-2019 for universal eye health which has been reported in [4]. Also many eye health organizations are periodically in action for their own people to protect their eyes and help their people to cure from blindness. There are approximately 15 million visually challenged people in India. Though India needs 40thousand optometrists, it has only 8thousand optometrists that is around 23% of total optometrists needed .India needs 2.5 lakhs eye donations every year but it gets only 25thousand eye donations only. There are around 110 eye banks in India but these numbers are not quite enough.

There are many causes for blindness but refractive error is the main cause and and many people are suffer from blindness due to refractive errors. Therefore these blindness difficulties of people are majorly limited by using electronic gadgets which ensure quite good outcomes.

Stick is the main component which is used by the visually impaired people when they walk in unstructured or uncomfortable environments/paths. Initially stick is made up of wood or plastic to help the visually challenged people when they walk outdoor. Since the technologies are rapidly increased,the stick consists of an electronic part to help the blind person with more accuracy. These stick with electronic components are generally called as smart stick.

Many researches have been done in the smart sticks which have been reported in [5-7, 8, 10, 11]. A cane that is fully white in colour indicates only visually impaired people and it is generally called as white cane [5]. Since there is a rapid enhancement in technology, the cane consists many sensors to provide accurate result and also used to provide distance between visually challenged and an obstacle. Some of the sensors used in many smart sticks are Ultrasonic , infrared (IR) , Light dependent resistor (LDR) [6-12]. Among these sensors Ultrasonic sensors are more widely preferred and also used in many smart canes due to its accurate result , ease of work and low cost . It calculates the distance between visually challenged people and an obstacle itself by using Ultrasonic waves(Sound waves) [12-17]. Other than Ultrasonic sensors and many other sensors there can be more technologies used in smart cane for very accurate result in various purposes for visually impaired people. Integration of bluetooth in the smart cane helps visually impaired people drastically when they walk out. Also Global positioning system (GPS) used in smart cane to tell where the visually impaired person actually in and also indicates the current location oh the blind person to their family members when they are in outdoor.Recently, an experiment based on Ultrasonic sensors in a smart cane has been conducted and done in IIT Delhi [12]. This smart cane has more advantages and also some limitations . This stick is able to detect the distance between an obstacle and visually

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impaired person and also gives alert to the visually challenged people in the form of vibration It is very difficult to hear vibration in very noisy environmentsAnd there is no assist for the visually impaired people when they lost their stick or when they drop their smart cane unknowingly.These are some limitations in the above mentioned experiment.

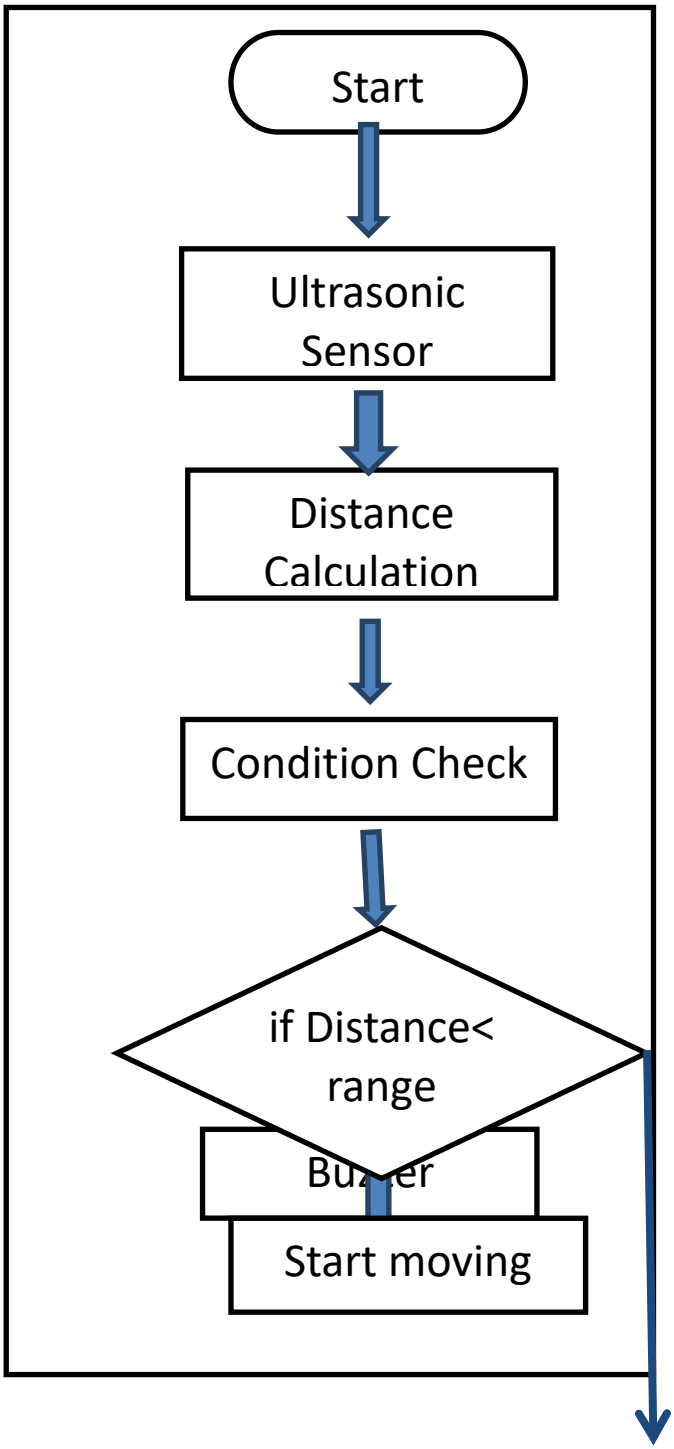
Section 2 consists of Proposed system which removes the limitation of above experiments and integrate more advantages in the smart cane for the visually impaired people . Section 3 consists of real time experiments in an uncomfortable paths. Section 4 consists of conclusion for this proposed experiment.

II. THE PROPOSED SYSTEM

In this proposed system Smart cane which gives buzzer alert to the visually challenged people has been developed and their advantages follow as:

- This proposed Stick is able to calculate the distance between an obstacle and the visually impaired people.
- The stick is also able to detect an object/obstacle upto 20metres.
- When the calculated distance is in between the fixed range then the signal is transferred to microcontroller 433MHz.
- This stick is able to warn the visually challenged people by giving buzzer alert to them with the help of buzzer.
- The proposed system also eliminate the limitation of above mentioned experiment by using RF transmitter and remote.
- This proposed system also use light dependent resistor (LDR) to check the light intensity around the blind person.
- This proposed stick is less expensive and quite accurate .

The proposed stick is the integration of microcontroller , Buzzer , Ultrasonic sensors, Rf transmitter and receiver , LDR .The flow chart of this proposed stick is mentioned in Fig. 1.



This developed stick is used to detect any objects in front of the visually impaired people when they are in unstructured paths.

If the smart cane detects any objects in front the visually challenged people it warns that person by giving beeping sound with the help of Buzzer\. The frequency of the sound increases when that person gets near to an object.That is when the distance is low, there is more beeping sound and when the distance is quite high , the beeping sound also quite low only.

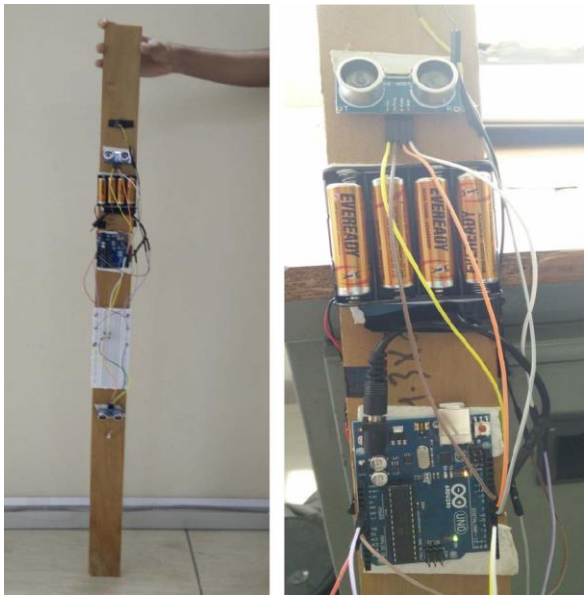
A brief contents about hardware components as well as software components follow as:

A. Hardware components:

The hardware components for this proposed system are briefly explained as:

1*)* Microcontroller

Arduino Uno R3 is the main component which is used for electronics and coding purpose. This is probably called as main control unit of the smart cane which is figured out in the Fig. 3. This ATmega328 Arduino controller is very robust and thus user can play with it easily which shows the ease of work. It has 14 input or output digital pins among them 6 pins can be used as PWM outputs. It contains 6 analog pins also and contains 16MHz quartz crysta. The memory constituents of Arduino Uno are 2KB SRAM memory and 1KB EEPROM memory. It also consists of 32KB of flash memory.. It consists of power socket through which USB is connected. This act as power source and through the USB it can be programmed and functioned accordingly.



(a) (b)

Fig.3.a shows Outlook of the smart stick used .
Fig.3.b shows close view of the cane

2) Sensors used

Sensors used here are Ultrasonic sensor and LDR. An Ultrasonic sensor used in this model is HC-SR04 which is known as standard sensor. It detects an object and calculate the distance between visually challenged person and an object.

An ultrasonic sensor sense an object from 20cm to 400cm and many modern ultrasonic sensors senses upto 20metres also. Therefore using ultrasonic sensors give accurate results.

The frequency range of an Ultrasonic sensor is 20KHz. When it detects an obstacle in the blind person moving path it starts calculating distance and if that calculated distance is less than the given threshold,the signals will send to microcontroller and the microcontroller responsible for beeping sound. LDR is used to find whether the blind person is in dark room or not by himself and also used to find out whether it is a day or not.

3) RF Transmitter and Receiver

Rf transmitter and receiver used here is 433MHz and its frequency range is from3KHz to 300GHz. It mainly used to find the smart cane when the blind person drops that smart cane when moving out. It is simply called as Rf remote. When the blind person clicks the Rf transmitter the signal is passed through the receiver which is fit in smart stick through the air itself. After this it starts beeping. By this way that person can find the stick himself.

B. Software component

Arduino IDE 1.6.8 software is used to perform the coding operation. Since it is robust any user can use it and perform code in it. USB is used for coding part and dumping that coding into the Arduino..

III. REAL TIME EXPERIMENTS

Real time experiments of this proposed systems are tested using Ultrasonic sensor. After dumping the desired code using Arduino IDE. Ultrasonic sensor is ready to do testing. Initially we need to find the calculated value by ultrasonic then after that find the measured values using some standards. After that we need compare both by using tabular form and find the error occured in it. The folowinfg Table.1 indicates the comparision
Between measured value and calculated value by ultrasonic sensor.

Table.1. shows comparison of measured and calculated values.

Distance (cm)	Analog value calculated (mV)	Analog value measured (mV)	error
5	25	23.8	1.2
10	50	48.1	1.9
15	75	72.3	2.7
20	100	96.3	3.7
30	150	145.8	4.2
40	200	194.3	5.7
50	250	243.6	6.4
75	375	367	8
100	500	489.8	10.2
150	750	735.3	14.7
200	1000	981.1	18.9
250	1250	1224.4	25.6
300	1500	1468.2	31.8
350	1750	1712.8	37.2

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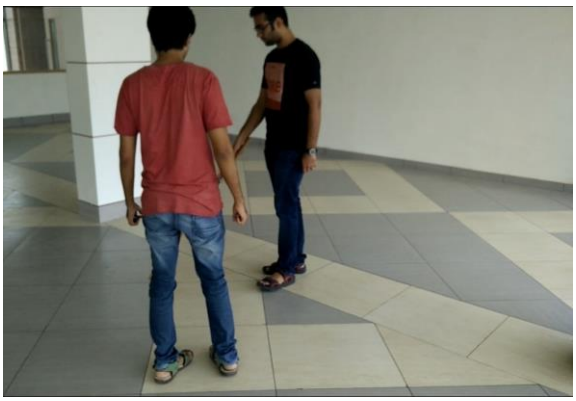
More number of experiments were done in many different paths by more number of people to test the ability of smart cane. From this test, we can say that the smart cane deliver high accuracy and warns the visually impaired people when there is an object in front of them. Some of the photocopies of test are shown below as:

(a)

(b)

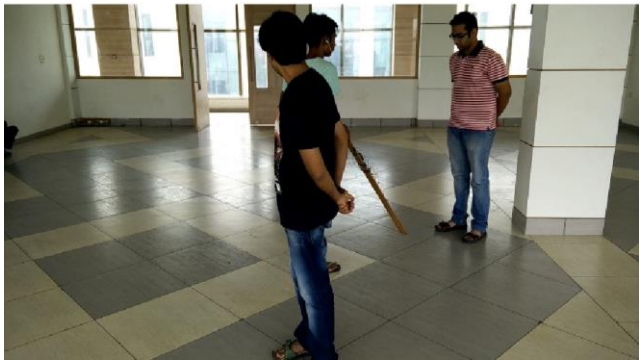


(c)

Figure 4. (a) There is no object in front of a Person (b) An object is in the way of that person and it warns by beeping.

(c) After hearing beep sound person avoids collision .

(a)



(b)

(c)

Figure 5 it is tested with different people in different environment. (a) Distance between object and person is more enough (b) when obstacle is closer and it starts beeping
(c) After warning person avoids obstacle.
These experiments show that this stick can produce high outcomes and also suitable for many users in many uncomfortable paths. This smart cane delivers accurate output and also less expensive.

IV. CONCLUSION

This paper shows that there is an increase in the mobility and accuracy of the smart cane for the visually impaired people. The main aim of the project is to detect objects in front of the blind people and make them to walk with ease and more confidence in an unfamiliar paths and also ensure their safety.

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