Smart Blind stick for Visually Impaired People

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ABSTRACT-This paper presents the Electronic travel Aid (ETA) i.e. the electronic smart stick which guides the blind person by a buzzer which beeps when the ultrasonic sensors, infrared sensor detects any obstacles present in its way. Moreover the smart stick presented here also incorporates the LDR sensor and the water sensor for detection of the dark by the LDR and the potholes filled with water by the water sensor. With this smart stick the blind person can be more self-dependent in comparison to the white cane or the trained dogs.

KEYWORDS-*Ultrasonic sensor, infrared sensor, LDR, water sensor, Radio-frequencyreceiver transmitter.*

INTRODUCTION

Vision is a very special gift provided by the god to humans. It is due to vision only that the persons are able to see and interact with the environment. But this vision may get lost due to some accident or due to the chronic eye diseases which are not cured on time leading to permanent blindness. According to the WHO report about 236 million people are visually impaired out of which 37 million are blind and are having severe or moderate vision impairment [1]. The stick which is presented in this paper is very cost effective and can be taken into use by the blind persons to guide them though the obstacles which further enhances their mobility so that they can move independently with a greater accuracy.

LITERATURE REVIEW

-Moving ahead from the simple white cane the first electronic blind stick which got a wide popularity is the Benjamin C5 Laser cane[2] .Thereafter comes the use of the Mowat sensor which uses the ulstasonic for detection of any obstacle[3]-[4]. Just as the Mowat sensor there is also one other type of ETA popularly known as the Sonic Path finder which has two transmitting and three receiving transducers for detection of the obstacles[5].Navbelt used ultrasonic sensors for a wide view of about 120 degree with a computer which produce (stereophonic) audio cues of the image so that the user can determine the obstacle by listening them on the receiver[6]. Thereafter taking inspiration from these works the electronic stick which is presented in this paper is not only efficient but also very cost effective.

PROPOSED STICK –The stick which is presented in this paper consists of integration of the following sensors ultrasonic sensors,infrared sensor, Water sensor, LDR, radio frequency receiver together with a transmitter at the user end. With the ultrasonic sensors and the infrared sensors the stick would be detecting the obstacle which will indicate to the blind person with the help of the buzzer and the vibrating motor mounted on to the stick.Apart from the obstacle detection the stick also has certain many other features such as the detection of water to acknowledge the person about the water at the surface so that he might not get slip. The stick has also an LDR sensor which gives the indication of the dark in the near surroundings as soon as the power switch of the switch is turned on.

The stick presented here has an additional feature which is that it cannot be easily displaced by the blind person. It contains a rf receiver which receives the radio signal of 433 MHz when the user displaces it with the help of a remote containing the transmitter.

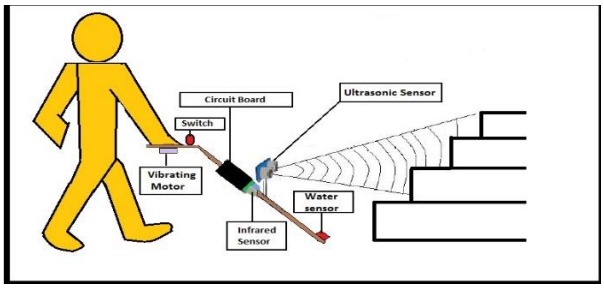

Figure 1. Proposed stick illustration

IMPLEMENTATION OFVARIOUS SENSORS AND MATERIALS USED

ULTRASONIC SENSOR HC SR04-

This sensor consists of a 4 pin module. The pins are namely V_{cc}, Echo,Trigger and Ground.These 4 pins are connected to the Arduino Uno.The module has two eye like structure where one transmits a wave and the other receives it. This sensor is widely used for obstacle detection and also for measuring distances[7]. The working frequency of the sensor is 40 Hz and the maximum range is 4m and min range is 2 cm.

LIGHT DEPENDENTRESISTOR (LDR)-

Light dependent resistor is a 3 pin module.This sensor has sensitivity to the Light and it gives a high output as soon as the darkness is observed by making the buzzer sound.

INFRARED SENSOR-Its functioning is also same as that of the Ultrasonic sensor since it also detects the obstacles[7]-[8]. But the range is only 10-12 cm so its is used here for detecting very small distance obstacle or the stairs.

433 MHZ RECEIVER TRANSMITTER MODULE- This receiver is connected to the Arduino board which in turn is connected to the Buzzer. As soon as the button on the transmitter is pressed the receiver receives it and the buzzer beeps such that the stick can be easily located in the nearby surroundings.

WATER DETECTION SENSOR-This sensor is used here as it detects the water and gives out the signal to the vibrating motor by which the blind person can move safely understanding the fact that the surface may be slippery.

BLOCK DIAGRAM OFSTICK

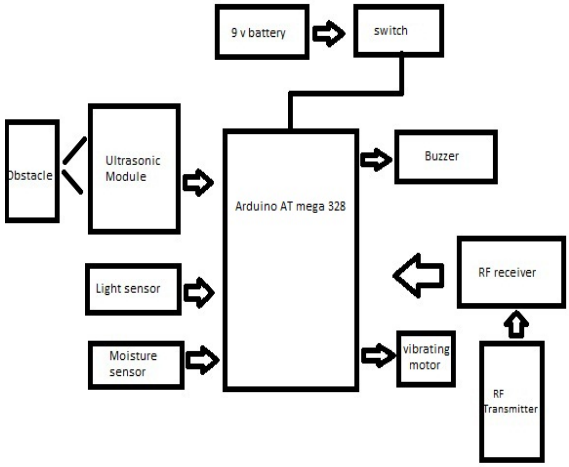

Figure 2. Block Diagram of the Stick

From the block diagram shown above we can clearly understand the dependence and the connections of various sensors to the Arduino board. These all the sensors are integrated on to the stick for the guidance of the blind person. The ultrasonic and the infrared sensor detects the long and short range obstacles.The water sensor detects for the water and can indicate to the blind person with the help of a vibrating motor present at the handle of the stick.As soon as the device is turned on the first indication is from the LDR about the dark and the light condition of the surroundingsindicated by a long beep by the Buzzer for 5 seconds.

After that the stick comes into its normal mode of operation and can be used for detecting obstacles.

HOW TO USE THE STICK?

1) Switch on the main switch present just below the handle to make the device on.

2) As soon as the device is made on it indicates us about the dark and light conditions in the near surroundings by a long beep.

3) The stick can also be located from far by pressing a button on the remote containing a transmitter whenever the blind person displaces it.

The stick after being implemented with all sensors in the look like this-

Figure 3. The modelled stick

FUTURE SCOPE OF THE STICK

The stick presented here is very cost effective and can be used by the blind persons and further many more advancement can be made into it.It can also have the facility for the GSMsuch that it can send and receive messages whenever there is an emergency.

Moreover the stick can also have a GPS (Global Positioning System) for the blind which can also communicate with the blind with the help of a voice aid.

CONCLUSION

The stick presented here is making the life of visually impaired people much easier than before. It makes them independent and also mobile. Moreover its cost effectiveness would never be a hindrance to them in purchasing this device. With this the visually impaired person will be more mobile and hence independent.

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