

A review of Smart stick for blind people with obstacle and water detection

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Abstract

Visually impaired individuals have a tough time navigating independently due to compromised vision. Moreover, the capacity to perform a simple task becomes arduous in the given environmental setting. Any kind of setting for this individual to navigate through hurdles by physically touching every object by hand can be hazardous as well as dangerous in the current world scenario. The disheartening fact is tens of millions of people have to struggle due to this complication and are dependent on others for their wellbeing. The comforting news however due to rapid advancement of technology has abled us in helping impaired people, including visually impaired individuals such as sensors which empowers them to navigate safely and efficiently. A smart stick is one such device which helps them.

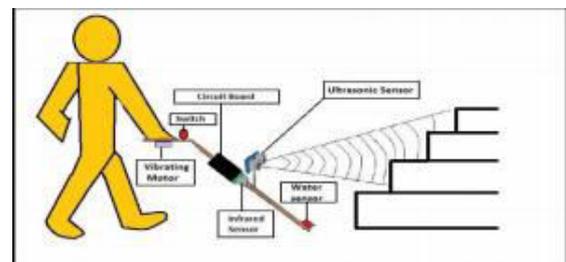
1. Introduction

Vision, a vital part that most of us are blessed with, although not all. Most of us perceive information through sight which plays a major role in our day to day life to help us navigate through life individually. Some of us who are visually impaired prevents them from travelling individually. According to a report from 2019 an approximate of 285 million are visually impaired out of which 39 million are completely blind. A whopping 82% of people with ages of 50 and older and blind. As a result these individuals must use a range of techniques and tools to aid them in movement. Some of the conventional aids for the visually impaired have been the walking cane (white stick) and the guide dog. Although useful, these aids have significant setbacks.

The traditional white cane is cost-effective, lightweight and small, which makes it foldable able to fit in a pocket. Though useful, the traditional white cane has vital setbacks, including the fact it takes training and experience for one to be able to use them effectively. This is a significant

“hidden” cost. Further, there is a limited amount of information and allows a limited range of motion because the user can only scan the small area ahead of the individual and objects can only be detected through contact. This can be inconvenient to a traveller and those around the individual as well. For instance, if one is traveling in a crowded place. On the other hand guide dogs, can be capable guides for the blind, though they need extensive training. Moreover, a fully trained guide dog can cost anywhere from \$40,000 to \$60,000, which is quite high, considering that their useful life is only about five years. Furthermore, many visually impaired persons are elderly and find it very difficult to provide appropriate nurturance to another living being.

The smart stick is an alternative to the common/traditional walking stick, which is a purely mechanical device used to detect ground obstacles, including holes, steps, uneven surfaces, and other things that may pose a danger.



2. 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.

3. IMPLEMENTATION OF VARIOUS SENSORS AND MATERIALS USED ULTRASONIC SENSOR HC SR04

This proposed sensor contains of a 4 pin module. The pins are namely Vcc , Echo, Trigger and Ground. These 4 pins are connected to the Arduino Uno. The module has two eyes 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. The working frequency of the sensor is 40 Hz and the maximum range is 4m and min range is 2 cm. LIGHT DEPENDENT RESISTOR (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. But the range is only 10-12 cm so it is used here for detecting very small distance obstacle or the stairs.

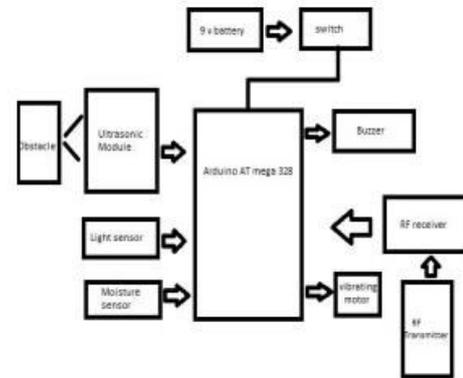
4. 433 MHZ RECEIVER TRANSMITTER MODULE

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.

5. 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 OF 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 detect 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 surroundings indicated 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.

6. 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 GSM such 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

In conclusion, the advent of ultrasonic and radar technologies have brought about significant developments in the world, and most. Researchers have done commendable work in developing many different kinds of assistive technologies to assist the disabled, and more so the blind and visually impaired to become more independent. The smart cane assists the blind to perform navigation and do their work easily by and comfortably. The ordinary blind stick

cannot detect obstacles that are out of range of contact, which makes it highly inefficient. Moreover, the user cannot tell the kind of object in front of him nor his distance from it. As for the smart walking stick, objects are not only detected by ultrasound sensors but are also identified through a camera system, and the user is notified accordingly. In this sense, the user will know what is before him/her. Thus, the smart cane is a boon for the blind. It is a masterpiece of technology that has revolutionized the care for the blind. Its relatively low cost implies that soon, many even in developing nations will also be able to access them. Hopefully, even better technologies will be developed to alleviate the hardships and pains that some may be forced to endure in life to a greater extent.

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