Smart Blind Stick

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***Abstract*—This project describes ultrasonic blind walking stick with the use of arduino. According to WHO, 30 million peoples are permanently blind and 285 billion peoples with vision impairment . If u notice them, you can very well know about it they can't walk without the help of other. One has to ask guidance to reach their destination. They have to face more struggles in their life daily life. Using this blind stick, a person can walk more confidently. This stick detects the object in front of the person and give response to the user either by vibrating or through command. So, the person can walk without any fear. This device will be best solution to overcome their difficulties.**

***Keywords*— Ultrasonic Sensor, Visually impaired.**

I. INTRODUCTION

An Intelligent Mobility Cane, or "Smart Cane" is a cane designed for the visually impaired which can offer the user the ability to navigate their surroundings, rather than simply avoid hitting things.

To record information about the obstacles presence in a road, active or passive sensors can be used. In case of a passive sensor, the sensor just receives a signal. It detects the reflected, emitted or transmitted electro-magnetic radiation provided by natural energy sources. In case of using an active sensor, the sensor emits a signal and receives a distorted version of the reflected signal. It detects reflected responses from objects irradiated with artificially generated energy sources. These kind of active sensors are capable of sensing and detecting far and near obstacles. In addition, it determines an accurate measurement of the distance between the blind and the obstacle.

Fig. 1. Smart stick Smart stick detects obstacles in front of the blind.

These solutions still have many disadvantages for example;

They can't detect obstructions that are hidden but very dangerous for the blind such as downward stairs, holes etc. Usually, the feedback information comes out as either vibration or sound signals. Thus, these systems communicate their recommendations to the user through sound or frequency vibration.

Consequently, training is then necessary to help the user understand the signals and to react to them in real time. However, such training is sometimes more expensive than the product itself. Therefore, users can't afford it . Otherwise, the information is transmitted as a sound it may be embarrassing for the blind person in public.

In our work we tried to overcome some of disadvantage:

- We designed stick to detect obstacles.
- The training of our product isn't as expensive as training in other product. Our training is just description of stick component and usage position.
- We use two facilities to transmit information to the blind. We integrated vibration motor in the hand of stick and buzzer to alert the obstruction.
- We achieved very fast response time in average distance ≤100 cm before hitting the obstacles.

II. PROPOSED SYSTEM

We have many reasons to design smart stick for blind; firstly, the blind to feel free, isn't surrounded by wires as in belt and its content. Secondly, is easy to use because it is familiar and affordable. Thirdly, to be able to detect obstacles that exist on the ground (this is not available in glasses), which he walks indoor and outdoor is faced by obstacles such as puddles and sidewalks.

As we can see in Fig. 3 an Arduino UNO is used to control all the sensors. The complete board is powered by a 9V battery which is regulated to +5V using a 7805 Voltage regulator. The Ultrasonic sensor is powered by 5V and the trigger and Echo pin is connected to Arduino UNO pin 9 and 10 The output of the board is given by the Buzzer which is connected to pin 11 and Motor which is connected to pin 13.

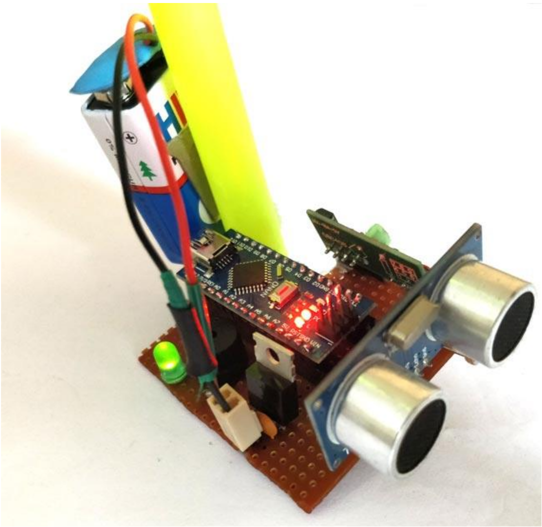

Fig. 2. Design of smart stick Smart stick detects obstacles in front of the blind.

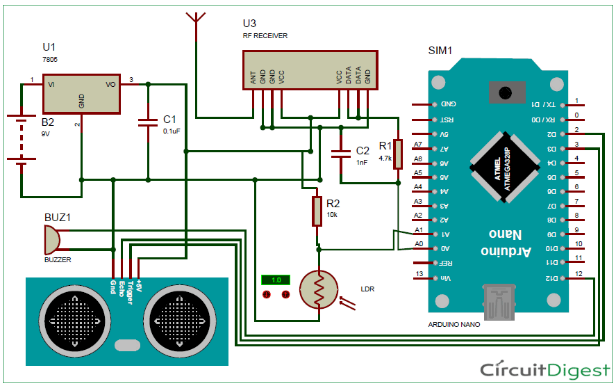

Fig. 3. Circuit diagram of smart stick Smart stick.

III. Results and Discussion

Ultrasonic sensor, arduino are tested individually as well as integrated. As ultrasonic sensors work on principle of echo, studying of its reflection on different obstacle is very important.

The measurement cycle starts with transmitting the 10µs high level pulse to the sensor trigger pin to start ranging (T1), then the sensor will send out ultrasonic signal with 40 kHz and 450µs (T2) and then wait to capture the rising edge output by echo port (T3) from 150µs: 25ms, depending on measured distance as shown in Fig. 4. In case of no obstacle (no signal reflected) it waits 38ms before it restarts transmission.

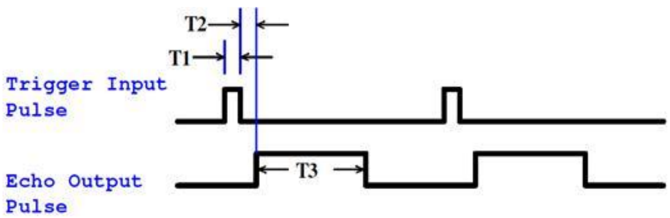

Fig. 4. Timing diagram

TABLE II. RESULT OF ULTRASONIC SENSOR COMPARISON

Distance (cm)	Analog value calculated (mV)	Analog value measured (mV)	error
5	25	24	1 mv
10	50	48.8	1.8 mv
20	100	97.6	2.4 mv
30	150	146.4	3.6 mv
40	200	195.3	4.7 mv
50	250	244.15	5.85 mv
75	375	366	9 mv
100	500	489	11 mv
150	750	732	16 mv
200	1000	976.6	23.4 mv
250	1250	1220.7	29.3 mv
300	1500	1464.9	35.1 mv
350	1750	1709	41 mv
400	2000	1953.2	46.8 mv

We tested how the ultrasonic sensors performance in lab compared to simulated calculation. TABLE II and Fig. 6 are present comparison of the ultrasonic sensor analog voltage value between the calculation value and measurement value. Thereafter the error is calculated in small range 5:50 cm error is 1– 6 mv, medium range 75:200 cm error is 9 – 23 mv and far range 250:400 cm error is 30 – 47 mv.

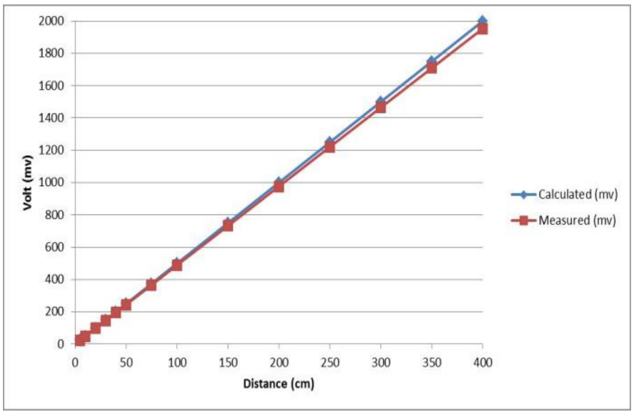

Fig. 5 . Difference between calculated and measured value

CONCLUSION

Humans are not disabled. A person can never be broken. Our built environment, our technologies, is broken and disabled. We the people need not accept our limitations, but can transfer disability through technological innovation.

This system offers a low-cost, reliable, portable, low-power consumption and robust solution for navigation with obvious short response time. Though the system is hard-wired with sensors and other components, it's light in weight. Further aspects of this system can be improved via wireless connectivity between the system components, thus, increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles. While developing such an empowering solution, visually impaired and blind people in all developing countries were on top of our priorities.

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