Arduino based smart blind stick using ultrasonic sensor

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***Abstract*--This paper describes ultrasonic blind walking stick with the use of Arduino Uno. According to WHO (World Health Organization), 30 million peoples are permanently blind and 285 billion peoples with vision impairment. If we notice them, we can know very well about that 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. Our proposed stick can detect the object in front of the person by ultrasonic sensor and give response to the user if the object is in front, right or left. So, the person can walk without any fear. This device will be best solution to overcome their difficulties.**

***Keywords*—Arduino Uno, Ultrasonic Sensors, Vibration Motors.**

II. INTRODUCTION

Vision is the most essential bit of human physiology as 83% of the information an individual gets from the earth is by methods for sight. Those individuals who can't just recognize the littlest subtleties with their sound eye are called outwardly cripple individuals. Such individuals are needing helping gadgets for visual deficiency-related inabilities. The 2011 estimations by the World Health Organization (WHO) assess that there are 285 billion people in the world with visual weakness, 39 billion of which are outwardly impeded and 246 with low vision. The traditional and most prepared convey ability that helps people with visual weaknesses are the walking stick and guide dogs. With the assistance of this visually impaired stick, they can move with no one help. This visually impaired stick is an option in contrast to the conventional walking stick. As they are outwardly impaired, this stick can make their life simpler by revealing to them where is the obstruction. In this computerized daze stick, the ultrasonic sensor detects impediments area when this hindrance coming to the visually impaired man it creates a sound and the servo engine gives a sign by contacting the blind man hand. This makes their more life simpler and they do not reliant on others help. They can play out their everyday undertaking without anyone else.

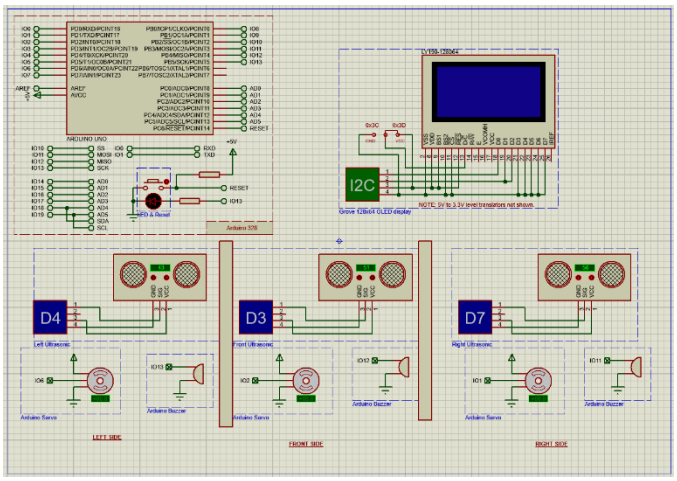
III. LITERATURE SURVEY

1. An effective fast response smart stick for blind people which approach to assist visually impaired people by Ayat Nada, Ahmed Farag Seddik & Mahmoud Fakhr in this paper are the sensor-based circuitry consisting of infrared sensor to detect stair-cases, pair of ultrasonic sensor to detect any other obstacles, extra sensor is placed at the bottom of the stick for the sake of avoiding puddles, microcontroller 18F46K80 embedded system, vibration motor and ISD1932 flash memory. Besides Speech warning messages and the vibration motor are activated too.[1]
2. Arduino based Smart Walking Stick for Visually Impaired to Identify Bus Route which approach to help physically challenged people when they travel from one place to another by Mrs. S. Rangeetha, B.Rillvana Fathima, R.Sanjana & S.Nivetha Rajam in this paper. They are proposed to placing ZIGBEE transmitter on all the buses and also placing ZIGBEE receiver on the walking stick, which will eventually get the data from transmitter implanted on the bus and intimates the bus route to blinds. The walking stick will read the ZIGBEE placed on the bus route and intimate the name of the bus route to the blinds.[2]
3. Voice Based Guidance and Location Indication System for the Blind Using GSM, GPS and Optical Device Indicator-Arm7 based electronic travel aid system for blind people navigation and monitoring by M. Naveen Kumar & K. Usha. In this paper aims that the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path. When the object is detected near to the blind stick it alerts them with the help of vibratory circuit (speakers or head phones).[3]

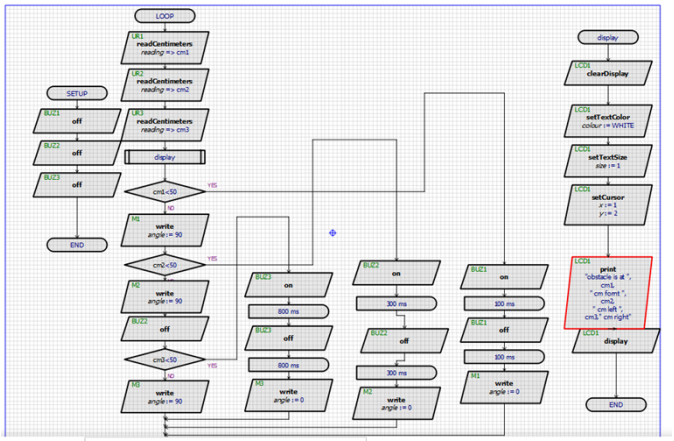
IV. BASIC IDEA OF THE PROJECT

The smart blind stick automatically detects the obstacle in front of the person and give him a response to the person by a warning sound. Through this, the blind person can aware about the obstacles in front of him. We used Ultrasonic sensor for detecting the obstacles. When obstacle comes near. Then the buzzer will sound. Using this stick blind man can save him from any dangerous obstacle.

V. HARDWARE & SOFTWARE DESCRIPTION

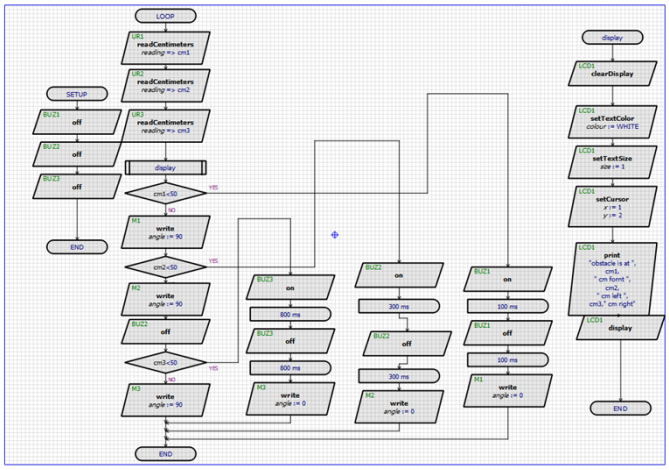


Hardware for the project: This is consisted with three sensors and they are UR1, UR2 & UR3 which are connected with D3, D7, D4 of Arduino. There are three Buzzer have been used which are 1013, 1012, 1011. Grove 128*64 OLED display has been used here to demonstrate the reading of these sensors. There are three Servo motors have been used which are connected to the 101, 102 and 106 of Arduino.

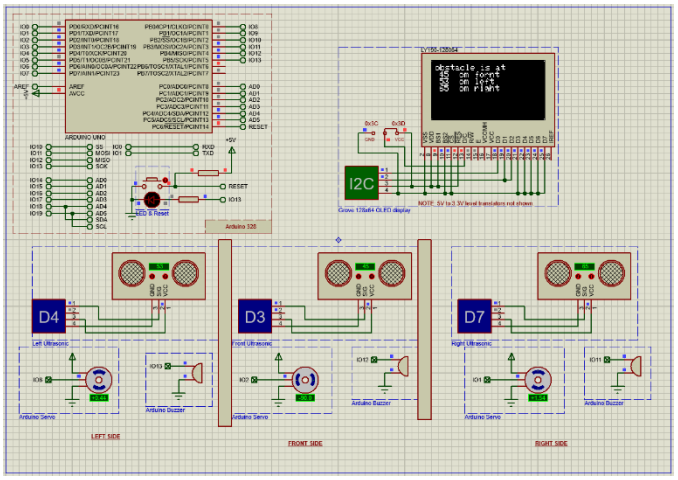


Software for the simulation or Flowchart: Here in set of function all the Buzzers are in off state mode. In the loop function the readings are UR1, UR2, UR3. After that we use a display assignment. After we have used a decision block, where if CM1 value is less than 50 then buzzer1 will be in on state mode and servo motor 1 right angle 0 otherwise the servo right angle will be 90 degree. After that we use another decision block where if CM1 value is less than 50 then buzzer2 will be in on state mode and servo motor 2 right angle 0 otherwise the servo right angle will be 90 degree. Then in the third decision block where if CM1 value is less than 50 then buzzer3 will be in on state mode and servo motor 3 right angle 0 otherwise the servo right angle will be 90 degree. There we have used three types of time interval for buzzer1, buzzer2 and buzzer3 so that the blind person can understand the obstacles are. In the display function there have been used clear display, set text color and set text size, set cursor, print and display commands sequentially.

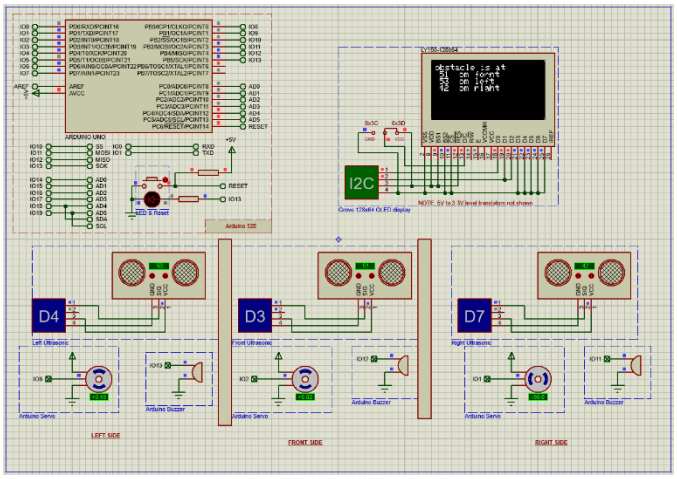
VI. RESULTS



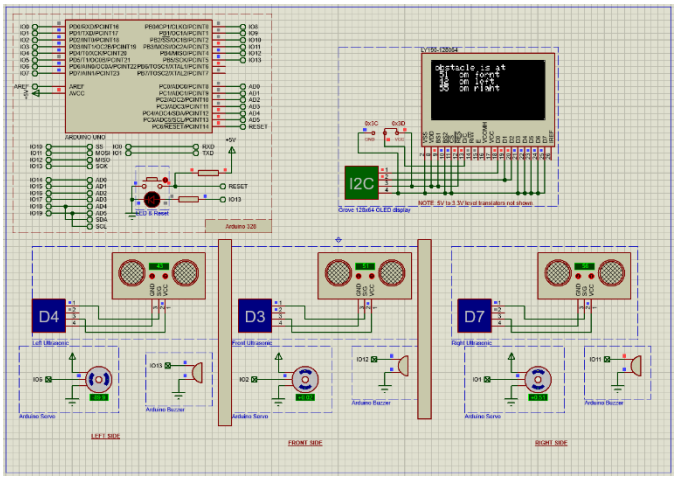
After implementation of the project in proteus software, we have built the visual design & compiled successfully. Now as we have seen in the visual design that three ultrasonic ranger (UR 1, 2, 3) for object capturing, three Arduino buzzer (BUZ 1, 2, 3) for giving the signal and three Arduino servo (M 1, 2, 3) for capturing 90 degree angle and give signal by touching to the blind man's hand have been used.



In our ultrasonic ranger we took a fixed centimeter value of any distance. So, for UR 1 which is the front view, when an object distance is less than 50 cm (cm1 < 50), the first BUZ 1 will start beeping for 100ms (1 second) and the servo motor M 1 will touch the hand sending signal to the blind people that there is an object in front of them and so the angle will be 0 degree.



In the second for UR 2 which is the right view, when an object distance is less than 50 cm (cm2 < 50), the second BUZ 2 will start beeping for 300ms (3 second) and the servo motor M 2 will touch the hand signal sending signal to the blind people that there is an object in right side of them and the angle will be 0 degree.



Same as the first and second, the third sensor which is UR 3 works for the left side view, so when an object distance is less than 50 cm (cm3 < 50), the third BUZ 3 will start beeping for 800ms (8 second) and the servo motor M 3 will touch the hand sending signal to the blind people that there is an object is left side of them and the angle will be 0 degree.

Thus, if the blind person has not any hearing issue than it can be easily detected the obstacle just by hearing. And of course, in this process they just need to memorize or capture in mind the sound variation of each sides.

VII. SOCIAL IMPACT ON SOCIETY

We have done an online survey about our project and its potential impact on the society. These are some necessary questions that we wanted to know about our proposed project from the society.

- Are you aware of the difficulties that a visually impaired person may face?
- Are you aware of smart walking stick for visually impaired people?
- Do you think the conventional wooden stick (used by visually impaired person) should be replaced by smart stick?
- Do you think our smart walking stick can make their movement easier?
- Do you think it can help them to avoid accident?
- Would you want to recommend this system to visually impaired people?
- Have you seen a smart stick before?
- Do you think our project would benefit to visually impaired people?
- Do you think the audio notifications can help them better to visualize surroundings?
- Is this project a contemporary idea?
- Do you think this system may hold a positive impact on our society?

We have done an online survey about our project and its potential impact on the society. The survey output comes from more than 20 responses.

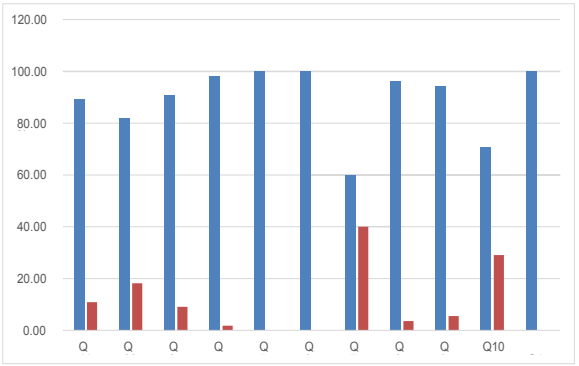


Figure: Representation of survey data

From the chart above shown in Figure, we can identify that from the responses that have been collected through a survey conducted from 20 people, among which 18 people that is almost 89% are not familiar with the difficulties a visually disabled person has to face. In counter to the questions whether they are aware of smart stick, around 82% people heard of smart stick, where as 91% agreed that they think the wooden stick should be replaced by smart stick.98% people think the smart stick can make their movement easier. 100% people believe that this stick can help to avoid accidents and also want to recommend this system to visually impaired people. 60%

people agreed that they have never seen any smart stick. Almost 96% people think it can be useful for visually impaired people. And 95% people think that the audio notifications can help visually disabled people to visualize the surroundings. 71% people think that it's a contemporary idea.100% people think it may hold a positive impact on our society.

VIII. CONCLUSION

It is necessary that visually impaired people get access to an efficient and comfortable object in order to live their daily life comfortably. In a developing country like Bangladesh, there is a need for a cost-effective solution so that most of the people can have an effective product as proposed in this paper. This paper proposed the design and architecture of a new concept of Smart Stick for blind people. The sensor emits high frequency of ultrasonic waves and give an analog value at the output. The sensor is able to detect objects at ranges between 2 to 50 cm long. The ultrasonic sensor used gives the information about the distance within a specific range. Finally, Smart blind walking stick was successfully developed.

IX. REFERENCES

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