SMART STICK FOR BLIND PEOPLE

MANISH YADAV, RAVI KUMAR GUPTA, MOHD. NAIMUL
STUDENT, ASSISTANT PROFESSOR, STUDENT
BACHELOR OF TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS
PRANVEER SINGH INSTITUTE OF TECHNOLOGY, KANPUR, INDIA

Abstract:-

In this paper, we have present a smart stick framework for blind individuals. This stick encourages blind human to perform route and to accomplish their work effectively and serenely. This is an inventive stick intended for visually handicapped individuals for finding their path. For a visually disabled individual it gets difficult to do his/her everyday work, in this manner Smart Blind stick can help blind individuals in moving and to do their works. The brilliant stick comes as a proposed answer for empower blind person to discover challenges in recognizing hindrances and perils before them during strolling and to know the world around. c sensor, IR sensor, water sensor, fire sensor, and light (LDR) sensor, microcontroller (Arduino Uno R3) to get the sensor signals. GPS system in the Mobile can be utilized to manage the visually impaired for new places and unknown places. The visually impaired man utilizes a headphone to tune in to the route bearings that are originating from the GPS. Planning a financially smart and proficient visually impaired stick is the principle point of the project.

Keywords:-

Ultrasonic Sensor, Smart Stick, Blind People, Arduino Uno, Heat Sensor, Ir Sensor, Buzzer, Vibrator

I. INTRODUCTION

There are around 258 million people live with blindness, 47 million are blind and 211 million have moderate to severe vision disability. 80% of people who are blind are aged 50 years and above (WHO estimation).Blind persons have problem to interact and feel their world around. Body movement is a big difficulty for these persons, because this may be confusing to know where he is, and how to get where he wants to go from one place to another. These types of person depends on another person for movement and financial support.

Their movement restricts them from communicating with persons and social work. Prior, various devices were structured with different confinements without strong comprehension of the non visual discernment. Analysts have gone through the decades to build up an intelligent and smart stick to help and alarm blind people from danger and give data about their area. In the course of the most recent decades, research has been led for new gadgets to structure a decent and dependable system for blind people to distinguish danger and alarm them at peril places. Most visually impaired person help system use ultrasound as a result of its immunity to the nature noise.

The smart walking stick is a simple and totally mechanical device to detect the object on the ground. This device is light in weight and portable. But its range is small due to its own size. It provides the best travel aid for the person. The blind person can walk from one place to another independently without the others help. The main purpose of the system is to provide a efficient route aid for the blind persons which gives a sense of vision by giving the signal about their surroundings and objects around them. Smart walking stick is basically designed to detect obstacles which may help the blind to navigate care-free. The audio alert will keep the blind person alert and considerably reduce mishappen.
A voice enabled automatic switching is also added to help them in private space as well. This system presents a concept to provide a smart electronic aid for blind people, both in public and private space. The Stick measures the distance between the objects and smart walking stick by using an ultrasonic sensor. Ultrasonic sensor have the capacity to detect any obstacle within the distance range of 2cm-400cm.

Water sensor is used to detect if there is water in path of the user.

II. PROPOSED SYSTEM

In the proposed research, the ultrasonic sensor is utilized to detect the hindrance distance from the person. This reference separation can be utilized to choose whether the person can move or not. The ultrasonic sensors take a signal at the premise of sound. The sound waves are transmitted ahead from the sensors towards the obstacle which can detect the separation up to a separation of 12 feet with a resolution of 0.3cm. The sensors are put in five areas in order to cover greatest sides possible with least utilization of the sensors. The sensors are put in left, right, center left, center right and base separately. For the most part, the visually impaired individual can't see the object present on the ground. So the base sensor monitors the ground clearance giving necessary safety efforts.

The proposed system tries to giving signal to the person so we need to consider and process the image ahead as well. The image is detected using image sensors (camera). The image manipulation here is done in order to detect the obstacles present ahead and also to detect the indoor objects. Raspberry pi keeps the image dataset which consists of lot of collected samples of the different obstacles. The images which were sent from the camera are compared with the images stored in the dataset using the image processing.

III. METHODOLOGY

A. Obstacles and Dangers Detection unit:

It consists of Five sensors:

1. Ultrasonic transducers:

An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturisation of the sensor head.

An optical sensor has a transmitter and receiver, whereas an ultrasonic / level sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic / level sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturisation of the sensor head.

Ultrasonic Ranging Module HC - SR04 in Figure 1 Features:

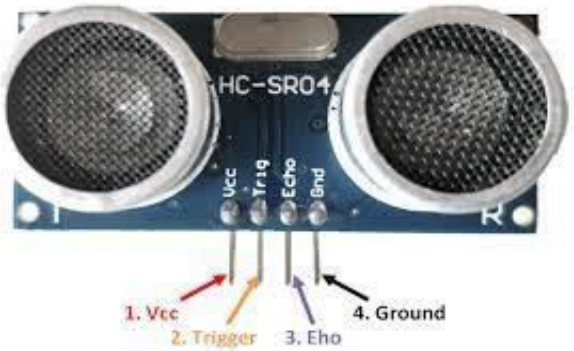

Figure1: ultra-sonic HC-SR04

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

- Using IO trigger for at least 10us high level signal,
- The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back
- IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.
- Test distance = (high level time×velocity of sound (340M/S) / 2,

The Flow chart of obstacle detector using ultrasonic sensor in Figure 2 which is having two parts, first part deals with the obstacle detection while the second part deals with distance measurement, and alerting the users depending on distance of the obstacle to avoid collusion. Depending on the distance of the obstacle from the person four zones are formed: far zone, near zone, close zone and danger zone. If the detected object is at 4 meter or more then it comes under far (safe) zone. If the object is found at 2 meter or more then it comes under near zone, if the object is found at 1 meter or more then it comes under close zone, and if the object is detected at less than 1 meter then it comes under danger zone. A voice instruction along with vibrating alert and a buzzer voice will be send to user at every zone to alarm him and let people around that blind person to help him.

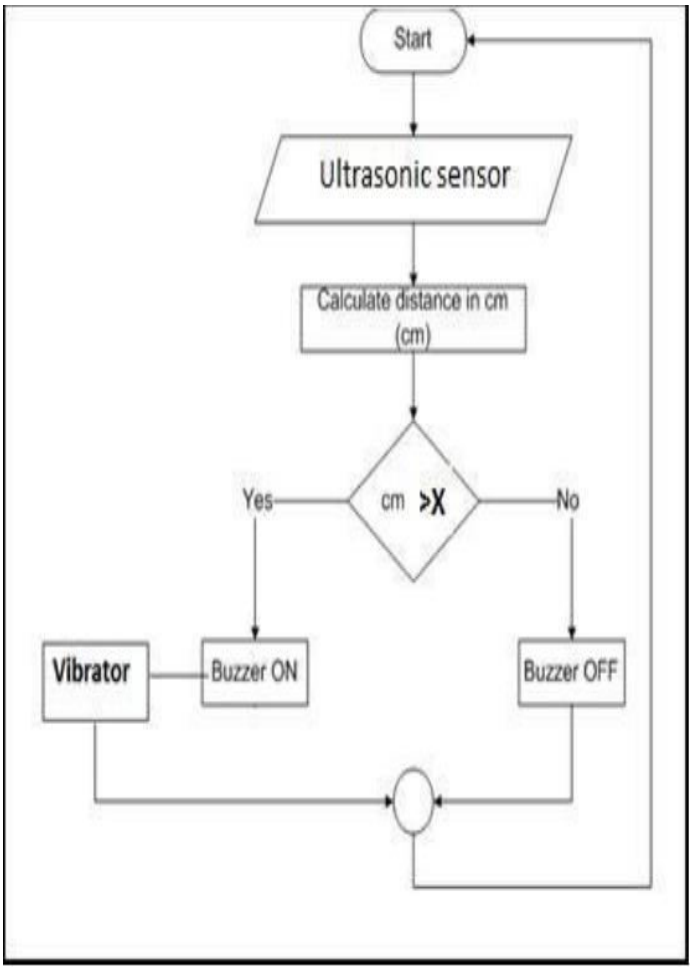

Figure 2: Flow chart

2. IR sensor:

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800. While measuring the temperature of each color of light (separated by a prism), he noticed that the temperature just beyond the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same electromagnetic spectrum). Anything that emits heat (everything that has a temperature above around five degrees Kelvin) gives off infrared radiation.

There are two types of infrared sensors: active and passive. Active infrared sensors both emit and detect infrared radiation. Active IR sensors have two parts: a light emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver. Active IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems (such as in robots).

To detect small obstacles: pit, staircase, or stone, as it located at the lower side of the stick. After detecting the small obstacles on ground, IR sensor will send the signal to the Arduino, as result it will send a voice instruction for small obstacle available. And at the same time it will enable the buzzer for informing the blind person about presence of obstacles on ground.

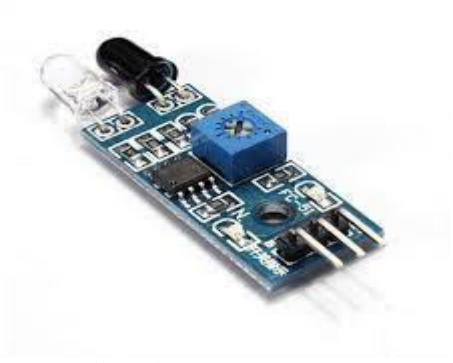

Figure 3: IR obstacle sensor

3. Water sensor:

A water sensor is a device used in the detection of the water level for various applications. Water sensors can come in several variations that include ultrasonic sensors, pressure transducers, bubblers, and float sensors.

A water sensor is fitted at the bottom of the stick to have precaution against the wet surface which it can causing slipping on the surface and thus can serious damage. When the water sensor comes in contact of the wet surface, it produces an electrical signal which trigger the Arduino controller. Aaudio instruction for wet surface is produced and also a buzzer is enabled for alarming against a wet surface.

Figure 4: water sensor module

4. Heat sensor:

A heat detector is a fire alarm device designed to respond when the convected thermal energy of a fire increases the temperature of a heat sensitive element. The thermal mass and conductivity of the element regulate the rate flow of heat into the element. All heat detectors have this thermal lag.

It is very sensitive to the heat and can detect the heat from far distance. If the sensor detects the heat radiation it will send an electrical signal to the controller and thus audio instruction will be sent to person and also the vibrator and buzzer start alarming.

5. LDR sensor:

An **LDR** is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light **sensing** circuits.

Light Dependent Resistor, changes its resistances due to change of the light intensity. During night, LDR will have high resistance and no current pass through it but through a LED connected parallel to it which illuminates and acts as a Flashlight, which can be easily noticed by others. It alerts people about the presence of blind person to let him to pass the way.

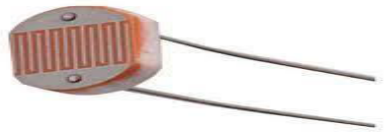

Figure 5: light dependent resistor

B. Alarm unit

The person was informed through a vibrator and a beep sound of buzzer.
It consists of two parts:

1. Buzzer

A transducer (converts electrical energy into mechanical energy) that typically operates A buzzer is in the lower portion of the audible frequency range of 20 Hz to 20 kHz. This is accomplished by converting an electric, oscillating signal in the audible range, into mechanical energy, in the form of audible waves. Buzzer is used in this research to warn the blind person against obstacle by generating sound proportional to distance from obstacle.

Figure 6: Buzzer

2. Vibrator

A vibrator motor is included to enhance the overall feedback for the person who receives the warning against obstacles closeness in different formats of vibrations.

C. Global Positioning System (GPS) unit:

It provides reliable positioning, navigation, and timing services to civilian users on a continuous world basis freely available to all. For anyone with GPS receiver, the system will provide location with time. The GPS based blind device with user input interfacing get alert the blind person when reaches his destination by voice.

The candidate type to use:
Skylab UART GPS Module (For Microcontroller and Arduino).

D. Microcontroller:

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip.Sometimes referred to as an embedded controller or microcontroller unit (MCU), microcontrollers are found in vehicles, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances, among other devices. They are essentially simple miniature personal computers (PCs) designed to control small features of a larger component, without a complex front-end operating system (OS).

Arduino Uno Microcontroller
Arduino can control the environment by receiving input signals (Digital/Analog) and can effects its surroundings by controlling lights, relays and other devices.

The microcontroller on the board is programmed using Arduino software.

Figure 7: Arduino uno micro controller

Results:

I. Interfacing the Arduino

As shown in Figure connections between ultrasonic, Buzzer, and vibrator motor with the Arduino uno3 as follows:

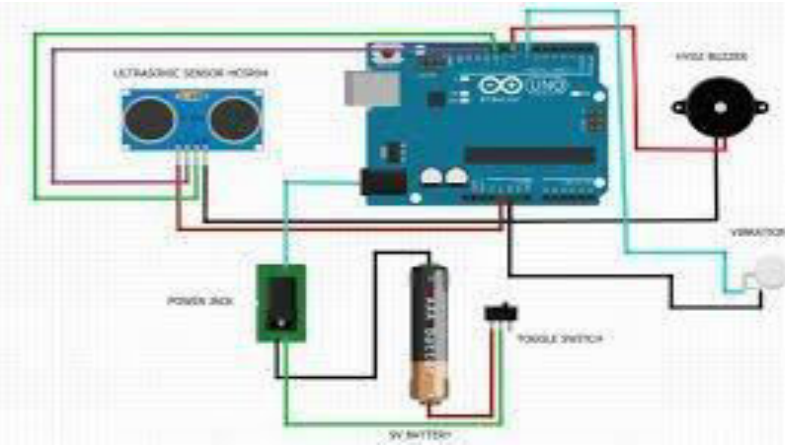

Figure 8: Arduino uno connection

Ultrasonic VCC to Arduino 5v.
Ultrasonic GND to Arduino GND.
Ultrasonic TRIG to Arduino D12.
Ultrasonic ECHO to Arduino D11.
Buzzer RED to Arduino D8.
Buzzer BLACK to Arduino GND.
Vibrator motor pin 1 to Arduino D7.
Vibrator motor pin 2 to Arduino GND.

IV. CONCLUSION

The smart walking stick, built with all things considered precision, will assist the visually impaired individuals with moving starting with one spot then onto the next without others help. This could likewise be viewed as an unrefined method of giving the visually impaired a feeling of vision. This stick decreases the reliance of blind individuals on other relatives, person and guide hounds while strolling around. The proposed combination of different working units makes a real time device that monitors position of the user and gives double input making navigation increasingly sheltered and secure. The created model gives great outcomes in recognizing hindrances paced at separation before the user; it will be genuine boon for the visually impaired. Simultaneously global positioning system (GPS) can be connected with the voice stick for navigation, so individual can know his present position and good ways from the destination which will be inform to user through voice directions.

V. REFERENCES

[1] DuraisamySathya&Pugalendhi Ganesh Kumar, 'Secured Remote Health Monitoring System, IET Healthcare Technology Letters', vol. 4, issue. 6, pp. 228-232, 2017.

[2] Y. Kawai and F. Tomita, "A support system for visually impaired persons to understand three-dimensional visual information using acoustic interface", IEEE Conference on Pattern Recognition, Vol.3, pp.974-977, 2002

[3] Shruti Dam bhare, et al., "Smart stick for Blind: Obstacle Detection, Artificial vision and Real-time assistance via GPS", 2nd National Conference on Information and Communication Technology (NCICT), 2011.

[4] J Na, "The blind interactive guide system using RFID based indoor positioning system, "Lecture Note sin Computer Science, Springer Publications, vol.4061,pp.1298-1305, 2006.

[5] S.Innet, N. Ritnoom" An Application of Infrared Sensors for Electronic White Stick" 2008 International Symposium on Intelligent Signal Processing and Communication Systems, Bangkok, Thailand

[6]Smart walking stick - An electronic approach to assist visually disabled persons Mohammad Hazzaz Mahmud, RanaSaha, Sayemul Islam