**Smart Blind Stick**

Project Report

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**Abstract**

Blindness or visual impairment is a word used to describe those who are unable to see. They suffer from a lack of capacity to perform daily tasks such as strolling down the street, visiting friends or relatives, or doing anything else. As a result, the solution to this big difficulty is provided by constructing a stick that may assist the individual in walking securely without the worry of colliding with anyone on the road or any solid objects. We created a Smart blind stick that scans for objects in front of it and responds by vibrating the stick and emitting a warning sound using an ultrasonic sensor. Using Arduino NANO, this system is designed to deliver artificial vision and object detection. A buzzer will provide the user with all input. A buzzer is used in conjunction with a vibrator motor. Another goal of this technology is to create low-cost and efficient obstacle detection assistance for the blind, allowing visually impaired persons to do the same maneuvers as sighted people.

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**Introduction**

One of the most significant problems for a completely or partially blind person is obstacle detection. So, a blind stick is a novel stick intended for visually impaired persons to aid in navigating. Using modern technology, our suggested smart blind stick enables visually impaired persons to travel with ease. The blind stick is made up of five major components: two ultrasonic sensors, an Arduino board, a buzzer, and a vibration motor. This technique begins by employing ultrasonic sensors to identify impediments ahead through ultrasonic vibrations. When an obstruction is detected, the sensor reports that fact to the microcontroller. As a microcontroller, we utilized an Arduino NANO. The microcontroller then estimates sensor-to-obstacle distance. If the obstacle is not within a certain distance, the circuit has no effect. If the barrier is nearby, the microcontroller transmits operational voltage to the buzzer and vibration motor. The buzzer is transmitted in the circuit as a warning signal, with the frequency changing depending on the object's distance. Another advantage is that it helps the blind to identify whether the room is lit or dark. As a result, this system is beneficial for visually impaired persons since it uses a variety of components to identify obstacles.

**Literature Review**

Blind individuals usually use either the standard white cane or the guide dog to travel. The white cane is a vastly used mobility aid that helps blind them to navigate in their surroundings. The idea of planning and creating ultrasonic sensor combines the properties of sound monition and which profit the blind and vibrating alert feature, which benefit from the experience of hearing impairment. Sensor can detect obstacles within the given range to avoid the visually handicapped person through the issuance of distinctive sound or vibration is issued by the sense of the deaf when there is a risk.

A Brief Study and Survey has been disbursed to grasp varied problems associated with the project which involves providing a smart electronic aid for blind people to provide artificial vision and object detection. A survey is created among the Blind individuals finding difficulties in detecting obstacles during walking in the street.

Our project chiefly focuses on the visually impaired people who cannot walk independently in unacquainted environment. The main goal of our project is to develop a system that helps the blind people to move independently. Smart Blind Sticks typically consist parts to help people travel with a greater degree of psychological comfort and independence: sensing the immediate setting for obstacles and hazards, providing information to move left or right and orientation during travel.

• “Navigation Tool for Visually Challenged using Microcontroller”, Sabarish.S.

• “Smart walking stick - an electronic approach to assist visually disabled persons”, Mohammad Hazzaz Mahmud, Rana Saha, Sayemul Islam

• “Ultrasonic smart cane indicating a safe free path to blind people”, Arun G. Gaikwad 1, H. K. Waghmare2 1ME Embedded system Design, MIT Aurangabad 2 Assistant Professor Department of E&TC, MIT Aurangabad

• “A Multidimensional Walking Aid for Visually Impaired Using Ultrasonic Sensors Network with Voice Guidance”, Olakanmi O. Oladayo

**Methodology**

The working method behind this visually impaired stick is based on a simple concept. We are using five key components to build this project - an Ultrasonic Sensor HC SR 04, an Arduino Nano board ,a Buzzer, a Vibration motor and a 9V Battery. Using the ultrasonic sensor, the device detects any obstacle that come in the path of the use and send warnings to the user. The proposed method is shown in the diagrams below.

1. **Block Diagram**

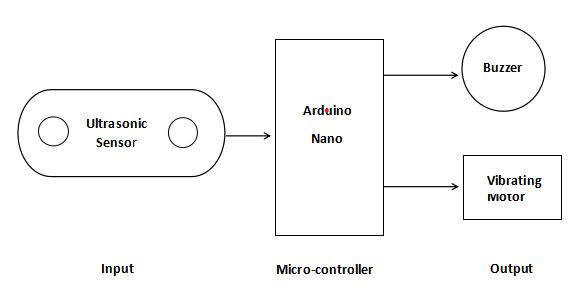
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Fig. 1. Block Diagram of the Smart Blind Stick.

1. **Circuit Diagram**

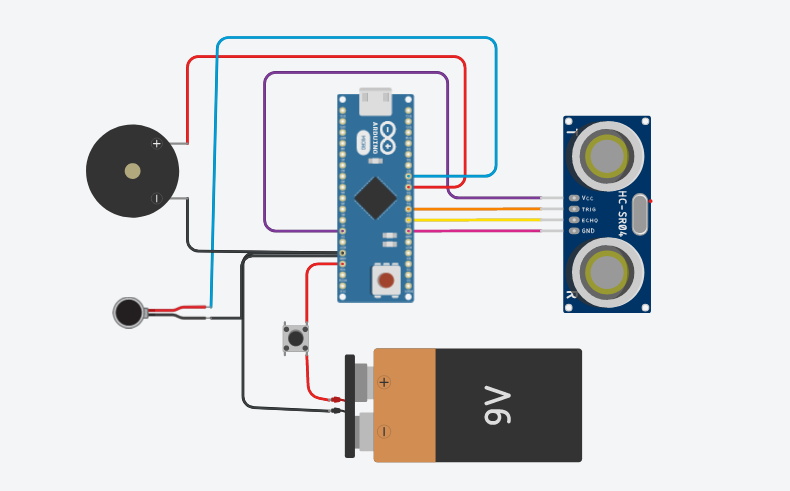
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Fig. 2. Circuit Diagram

As shownin Fig.2. From the ultrasonic sensor- Power, Trigger, Echo and Ground Pins are connected respectively to 5v,D3,D2 and GND pin of the Arduino Board.The positive pin of Buzzer is connected to D5 pin of the Arduino and negative side goes to GND. There is also a connection between GND of Arduino and the negative pins of Vibrating Motor and Battery.The other wire of vibrating motor is connected with D6. A Switch connects the Battery to VIN pin of Arduino Nano.

1. **Flow Chart:**

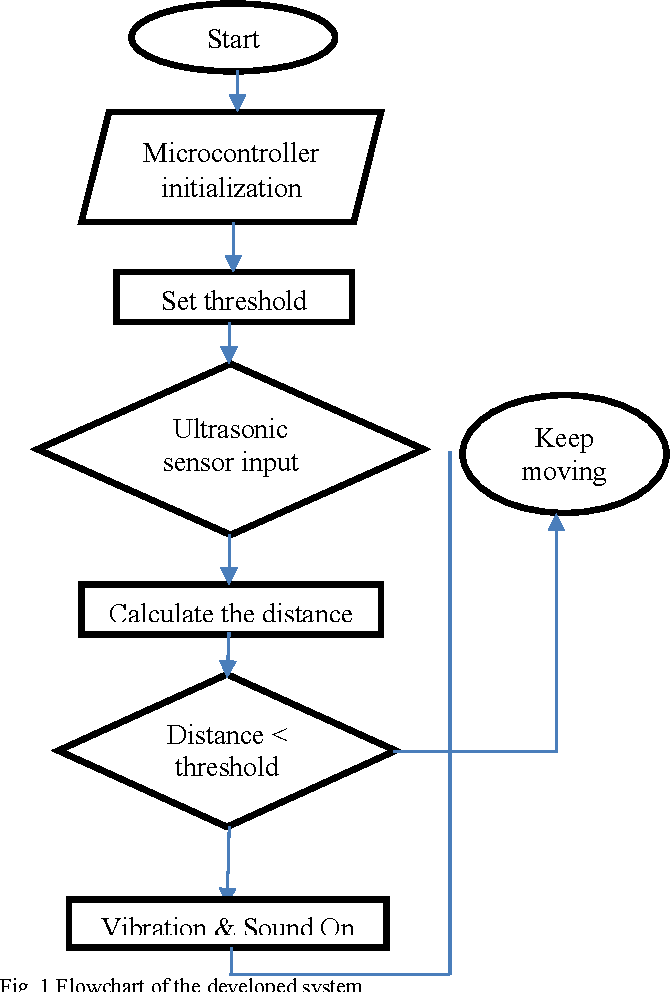
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Fig. 3. Flow Chart of the circuit

1. **Description**

In this system, as shown in Fig. 3. The Ultrasonic sensor transmits ultrasonic sound waves from the transmitter portions as soon as the circuit power supply is turned on.When an item passes in front of the sensor, its surface reflects ultrasonic sound waves back to the sensor's receiver portion, which subsequently picks up the wave and produces an output.

The Arduino Nano receives this output data.The device's primary controller is an Arduino board. Using this data, microcontroller calculates the distance between the obstacle and the device. If the distance is within the threshold limit(which is 30cm in our project) then the microcontroller sends signal to Buzzer and Vibrator.The buzzer and vibrating motor are then both given operational voltage by the Arduino. The buzzer now starts to make noise, and the motor begins to vibrate.If not, then device will not give any warning.when an item is not detected by the sensors.Both the buzzer and the motor are disabled in this situation.

1. **Mathematical Analysis**

The "Time of Flight" idea governs how ultrasonic sensors work when using the speed of sound.

Since they have a frequency in the ultrasonic range (>20kHz), the soundscapes created by the ultrasonic sensors are inaudible to human ears. .The sensor emits a range of pulses between 20 KHz and 200 KHz.When sound waves encounter an obstruction, they reflect back to detectors.

Based on the following calculation, we have determine the precise distance we need to measure from the sensor:

Distance = ½( t \* c) (t = time and c = the speed of sound)

Distance = ½ ( 0.034\*duration)

The speed of sound at 20oC is equal to 343.5 m/s(0.034cm/microsecond), and the time difference between the transmitted signal and the reflected signal is known as (duration).

1. **Arduino Sketch**

const int trigPin = 3;

const int echoPin = 2;

const int buzzer = 5;

const int motorPin = 6;

long duration;

int distance;

int safetyDistance;

void setup()

{

pinMode(trigPin, OUTPUT);

pinMode(echoPin, INPUT);

pinMode(buzzer, OUTPUT);

pinMode(motorPin, OUTPUT);

Serial.begin(9600);

}

void loop()

{

digitalWrite(trigPin, LOW);

delayMicroseconds(2);

digitalWrite(trigPin, HIGH);

delayMicroseconds(10);

digitalWrite(trigPin, LOW);

duration = pulseIn(echoPin, HIGH);

distance= duration\*0.034/2;

safetyDistance = distance;

if (safetyDistance <= 30)

{

digitalWrite(buzzer, HIGH);

digitalWrite(motorPin, HIGH);

}

else

{

digitalWrite(buzzer, LOW);

digitalWrite(motorPin, LOW);

}

Serial.print("Distance: ");

Serial.println(distance);

}

**Required Instruments**

**A. Hardware**

|  |  |  |
| --- | --- | --- |
| **Picture** | **Product** | **Quantity** |
|  | Arduino Nano R3 | 1 |
|  | Ultrasonic Sensor HC-SR04(Generic) | 1 |
|  | Buzzer | 1 |
|  | 9V battery (generic) | 1 |
|  | 9V Battery Clip | 1 |
|  | Pushbutton Switch | 1 |
|  | Vibrating Motor | 1 |
|  | Jumper Wire | Required |
|  | Stick | 1 |
|  | Glue | 1 |
|  | Scotch tape | 1 |

**B. Software**

1) Arduino

2) Tinker cad

3) GitHub

4) WPS

**Image of the Implemented Project**

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**Result Analysis**

The smart blind stick for blind people that used ultrasonic sensor technology.The ultrasonic sensors with a large beam angle which can detect a wide range of objects.The blind can sense objects up to 30 centimetres away and receive feedback in the form of sound via buzzer. At the same time the vibrating motor also vibrate. Within a 30 centimetres range, it performs well to detect objects.With a noticeable short response time, this system provides a low-cost, dependable, lightweight, low-power, and robust navigation solution.The Smart Stick is a building block assistive technology that can help the visually impaired navigate both indoor and outdoor environments safely.

**Future scope**

Our smart blind stick has some deficiency in present as it’s now in a trial period. We will work on it in future. Now our blind stick has just 30 cm distance measurement system but in future we will build up this system. As a result, user will warn for repudiates obstacle from long distance. We will add robotic voice system which will inform the user what type of obstacle, it’s height or deep and how much distance it is in, in front of him/her. We will also add here voice GPS tracking system which will help user to find out the user’s present location and it will also give direction to the user to reach his/her destination safe and sound.

**Conclusion**

We conclude that our project "Smart blind stick" is helpful to the visually impaired people. This stick presented here is making the life of visually impaired people much easier than before. It makes them independent and help to walk at the public place more easily and safely. It targets to solve the issue faced by blind people in their day-to-day life. The smart stick finds object and obstacles in front of users and feeds warning back. The system is hard-wired with sensors and other components but its light in weight. The superiority of the system shows to be a low-cost solution millions of blind people of the world.

**References**

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Zurich, Switzerland, 249-256, 2002.

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[8] Shantanu Gangwar , “Smart stick for Blind”, New Delhi, Sept. 26.

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**[**10] Shruti Dambhare and Prof. A.Sakhare, G.H.R.C.E. Nagpur, “Smart stick for Blind: Obstacle Detection, Artificial vision and Real-time assistance via GPS”, International Journal of Computer Applications (IJCA), No. 2, 32 – 33, 2022.

**Appendices**

* GitHub Repository: <https://github.com/Kanita-Haider/Smart-Blind-Stick>
* Circuit Diagram:<https://www.tinkercad.com/things/j9AF7FUZNwZ-blind-stick-circuit>
* Project Video: <https://drive.google.com/file/d/1TMMAnLTu7pdMew4RJwiI-FonJoN4GLIq/view?usp=drivesdk>