

# IoT Based Novel Smart Blind Guidance System

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## ABSTRACT

*In this research paper the system which is proposed that can be used for safe walking for blinds. This system consist of wireless sensor within the stick which provide the information of the obstacle between the way. The main advantage of this system is the safe for the blind people walking on the road, and make them independent while walking. When obstacle is detected an alert will be given to user with the help of buzzer an vibration . The unique feature of the system is to detect the temperature of a person who passes within the range of 6 feet of which helps in maintaining the social distancing in COVID situation. The system contains a wireless sensor that integrates temporary networks that can be made within the navigation stick, which can provide group communication between them, where roaming information and networks can be provided. With the help of IOT the location and alert message shared with family members in case of emergency. The system proposed in this research study is 60% more efficient then conventional system. The information is included in table1 to validate the result.*

## 1. Introduction

Eyes is the most part of the body for any human being and most of the information is delivered through the vision of the environment[1]. Worldwide, the number of people of all ages of blindness is estimated at 285 million, of which 39 million are blind. People 50 years and older make up 82% of all blind people [2].

In today's scenario blind people use simple stick to walk just to get an idea of the obstacle and the way but it was not enough practically convenient but this system will help them to alone which will detect the obstacle within the range and vibrate the stick to give them alert[3-4]. With this the is in major problem then press a button through which a alert message is send to all the emergency contact person so that one can track him/ her . PIR sensor detect the person temperature passes within the range to the stick and give the alert to maintain the distance [5].

There are many people who developed this system "James Biggs" of Bristol claimed to have invented the white cane in 1921. and a lot corporate also working on it [6]. Research done on this system by Pratik N K,Shubham Bele , Amit Thakurand many more .The Blind stick is a revolutionary stick designed for better navigation for disabled persons. We here suggest an innovative blind stick that helps disabled persons to use advanced technologies to maneuver with ease [7-8]. Ultrasonic sensor and vibration sensor are built into the blind stick. GSM module, PIR sensor, GPS module.It is well known that visually disabled individuals experience numerous challenges while travelling alone. The aim of this project is to create a blind man stick that can recognize walls, traverse and keep distance while sensing temperature, potholes and thereby assist the blind person to ride independently [9].

Today, the main use of the Internet of Things [10] is a wearable health tracking device. Some flexible programs are usually equipped with visually impaired people. Few structures are mentioned here. A blind sensor rod in [11] describes a wearable interface made of a lightweight

blind rod and a tracking circuit for sensor-dependent barriers. It is designed specifically to help the blind to move safely from one place to another and to avoid any obstacles. The machine hears all the planned and moving objects so they can help prevent accidents. A key part of the program is the Ultrasonic Distance sensor, which is used to search a predetermined location around a blind person by exposing the waves, and the GPS module navigates that person's location to the family with a message warning via GSM module in case of emergency and PIR sensor it senses human heat and lets the person know that it is safe to do so.

The embedded symbols are inserted as inputs from objects and used to determine the location and distance of objects around the blind business. The main purpose of this is to provide visually impaired people with access to various obstructions, to find holes and holes in the ground so that they can move freely.

The style stick is designed for people who are visually impaired to pass quickly. In combination with the ultrasonic sensor, the blind rod can sense smoke. Ultrasonic sensors are used in this scheme to track obstacles using ultrasonic waves. The sensor transmits information obtained from the microcontroller by listening to obstacles. The microcontroller analyzes the data and determines whether the obstacle is close enough to the business. The circuit does not do much if the bar is not near the microcontroller. It sends a buzzer signal when the obstacle is close enough to the microcontroller. The system vibrates and provides a warning around the stick and alerts the blind person. it. The system consists of a wireless sensor that connects temporary networks that can be made within the walking stick, which can provide group communication between them, where navigation information and networks can be provided [12]. This is done with a GPS module where we share location and a warning message with the GSM module if someone needs help an emergency contact will be notified of this message. The system also contains an infrared sensor (PIR) that detects human temperature above the sensor range and provides a distance warning [13].

## 2. Method

Here we propose a high-quality blind rod that allows people facing challenges to move easily using advanced technology. The blind rod is combined with an ultrasonic sensor and vibration and buzzer. Our proposed project first uses ultrasonic sensors to detect precursors using ultrasonic waves. At the auditory nerve transmits this data to arduino Uno. Arduino has and then analyzes this data and calculates whether the obstacle is close enough. If the obstacle is not to close the circuit do nothing. If the obstacle is near the arduino Uno sends a warning about the buzzer. It also detects and sounds a different buzzer when it detects an obstacle and warns the blind. The rod inserts a vibrator. When the obstacle is near the arduino uno sends a warning with vibration Module combination of TDMA (Time Division Multiple Access), FDMA (FrequencyDivision Multiple Access) and Frequency hopping. Initially the module uses two 25 MHz frequency bands: 890 to 915 MHz band bands for up-link and 935 to 960 MHz frequency for down-link. Later, two 75 MHz band-assisted roaming bands were added and the PIR sensor detects GPS temperature receivers using a set of satellites and ground stations to calculate position and time almost anywhere in the world. Note the point moving across the globe and the number of visible satellites. With this information and statistics, a ground-based receiver or GPS module can calculate its position and time.

## 2.1 Hardware Requirements

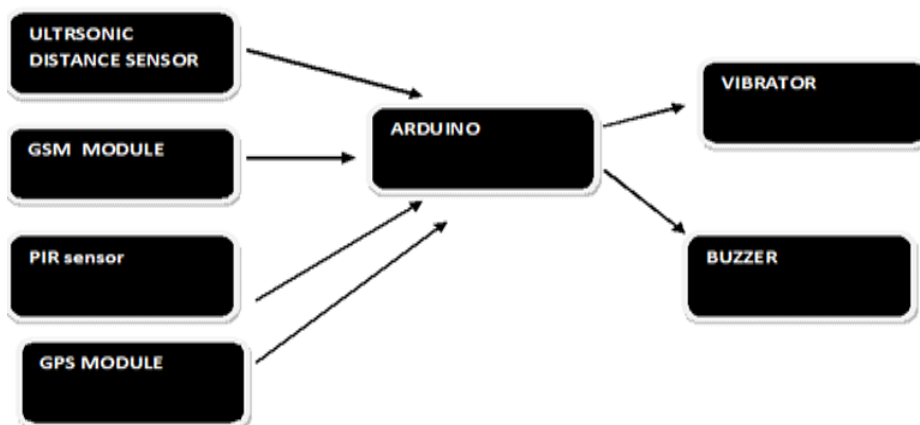


Figure 1. Block diagram of system

Arduino microcontroller is a key feature of this computer. Some of the blocks connected to this device include buzzer, vibrator and ultrasonic sensor screen for barriers (if any) used in this program shown in “Fig”-1. The ultrasonic sensor can provide an inexpensive measuring device. The vibrator and buzzer operate using sensor data.. When a broadcast is found, the buzzer is triggered. Even moving the vibrator to show obstacles. The program has one advantage as well. A blind person may sometimes lose his stone, or he may forget where he was placed. So far, including the GSM and GPS module so that one can track the person in emergency. An PIR module is an electronic device that detects the temperature of a person who passes through the stick due to COVID-19.

## 2.2 Simulation

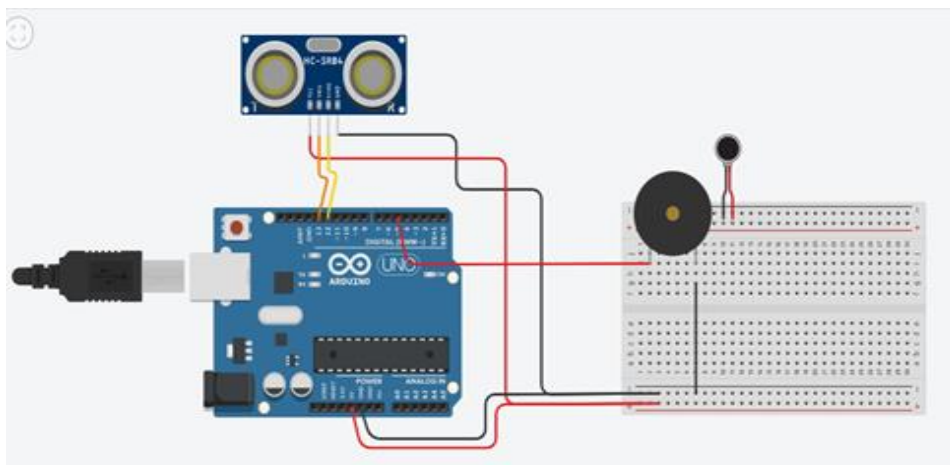


Figure 2 simulation of system on software

Source: live working module on software

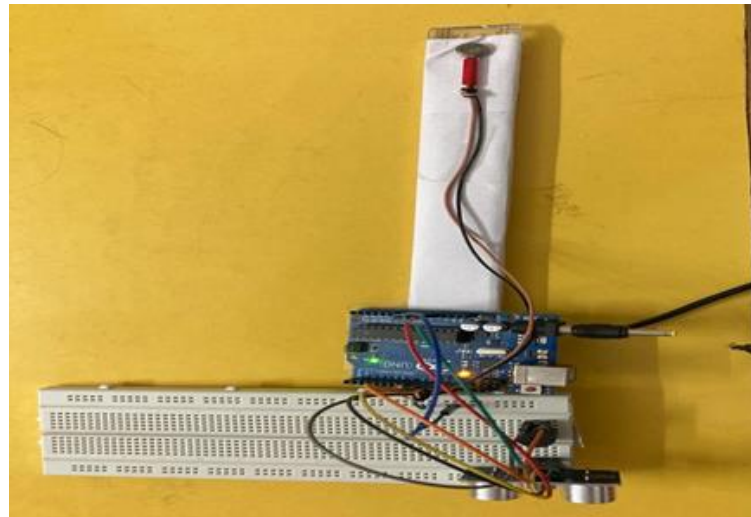


Figure 3. live hands on

### 2.3 GSM Module

A GSM modem or GSM module is a computer hardware unit that provides a data connection to a remote network using GSM mobile communication technology. In "FIG" -4 it's almost the same, from the appearance of the mobile network, to the standard phone, despite the need for a SIM to separate the network itself.



Figure 4 used for sending alert via message

Source : <https://www.elementzonline.com>

### 2.4 GPS Module

To calculate the approximate time and place in nearly every part of the globe, GPS receivers use a cluster of stars and earth stations. A country-based receiver or GPS module can measure its location and time with this information and specific statistics. Shown in figure 5.



Figure 5.Used For Sending Location To Track

Source : <https://sharvielectronics.com/>

## 2.5 Ultrasonic Distance Sensor

The ultrasonic sensor "FIG" -6 system can use sound waves to determine the distance from an object. Terms used to describe stretch waves have a frequency of more than 20 000 Hz and are usually found in solids, liquids, and gases of ultrasound waves or ultrasonic waves. At the velocity (wave velocity) defined by the visual cues and the internal form, the ultrasonic wave moves.



Figure 6. Ultrasonic Distance Sensor to Detect Obstacle

Source : <https://www.amazon.in/>

## 2.6 Buzzer

Piezo buzzer "FIG" -7 produces sound on the basis of the reverse piezoelectric effect. The basic premise is the construction of pressure differences or difficulties with the use of electrical energy over a piezoelectric component. You may also use these buzzers to alert the user to an opposing event signal or sensor input. This is usually found in the warning circuits. No matter how the power difference is applied to it, the buzzer creates the same disturbing signal.



Figure 7. Buzzer For Alert

Source : <https://www.amazon.in/>

## 2.7 Vibration Motor

The "FIG" -8 vibration vehicle is a compact DC-based non-compliant engine used to warn users of vibration, without noise, signal reception. For a variety of applications, including cell phones, mobile phones, pagers, etc., vibration motors are widely used. The main features of a vibrating car are the permanent DC motor motors, which ensure that it will still have magnetic strength. Another important advantage is that the size of the car itself is compact and thus simple.



Figure 8. Vibration With Buzzer Alert

Source : <https://robu.in/>

## 2.8 Arduino UNO

Arduino "FIG" -9 is an open source (prototype) framework that focuses on easy-to-use hardware and software. Contains a built-in circuit board (known as a microcontroller) and a ready-made device called the Arduino IDE (Integrated Programming Environment) used to compose and upload a physical board computer code.



Figure 9. Pin of Arduino Mega

Source : <https://en.wikipedia.org/>

## 2.9 PIR Sensor

Infrared sensor (PIR sensor) "FIG" -10 electronic sensor that detects infrared light (IR) in its field of view. By measuring the infrared radiation (radiant heat) produced or emitted, it works perfectly.



Figure 10. Sensor to Detect Temperature

Source : <https://thinkrobotics.in/>

### 3. Flowchart

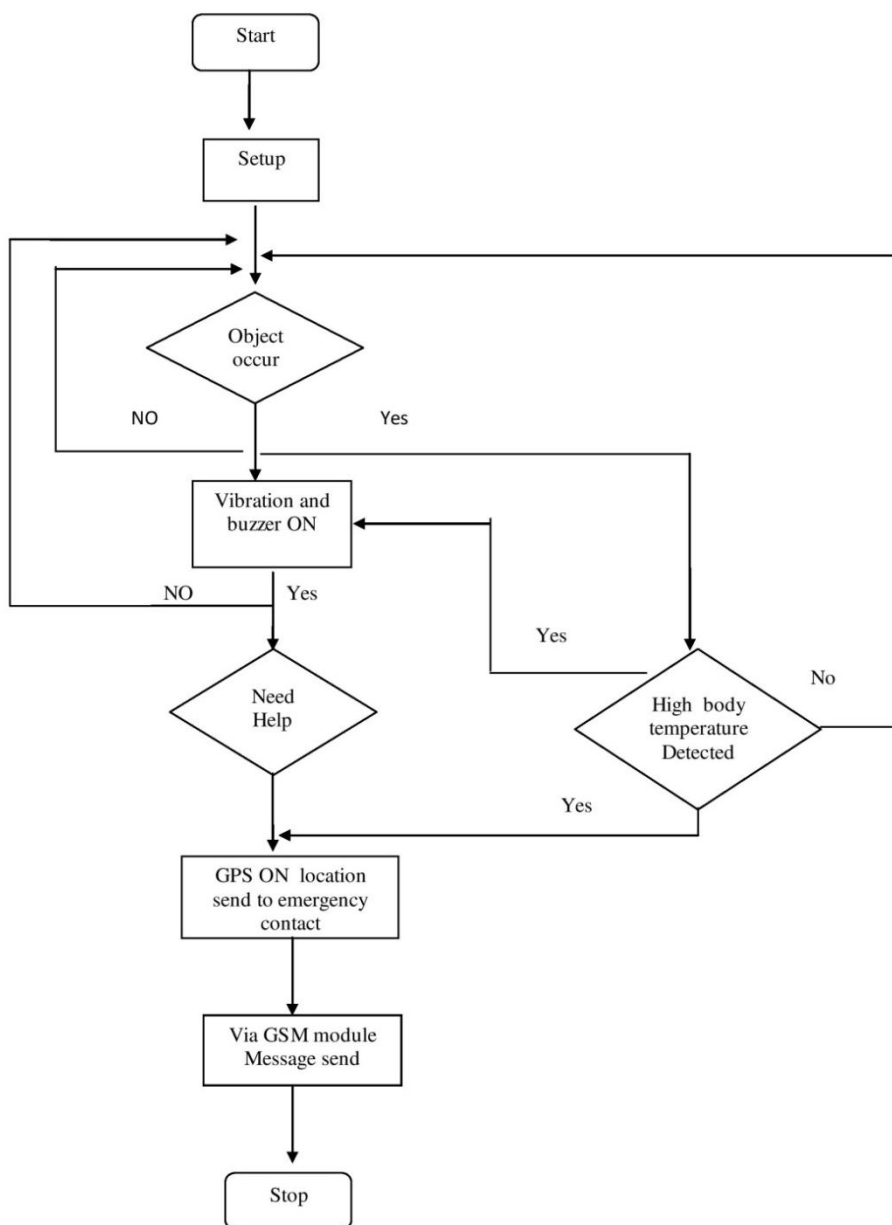


Figure 11 Flowchart

A flowchart for the proposed rod system for each step that blinds travel. It also shows the function of sensory and functional systems and the control system developed by Arduino UNO. Ultrasonic modules are effective means of detecting the presence of objects near their distance. These buzzers can be used to notify the event user of a related action. They were used in the proposed circuit to inform the blind by using sound. At the same time the vibrator module will give a feeling to the person to be alerted. The GPS / GSM module is an emergency option as mentioned earlier. The purpose of the GSM module is to allow the visually impaired to send an SMS message to an emergency contact or management for assistance. On the other hand, the purpose of GPS power is to allow the external location, longitude and latitude, of the blind to be downloaded and sent via SMS for immediate assistance. The GPS / GSM module is manually operated by Arduino microcontroller. The registry switch will cause disruption to the microcontroller to stop all activities and start downloading GPS coordinates and sending you an SMS to help.



#### 4. Results and Discussion

To have a constructive assistant as shown in “FIG”-11 and help the blind and visually impaired, a convenient, inexpensive, adjustable, easy-to-manage electronic device is suggested. The structure has been developed, enforced, tested, and checked. The program's real-time findings are encouraging; 93 percent consistency in receiving grades has been announced. The findings indicate that the device performs well and is exceptional in its ability to identify the source and distance of objects that could be in contact with the blind. It was also popular with those in the trial who participated. The system is very beneficial in situation like COVID -19 as it is capable of detecting temperature of person who passes via the range of the stick . Ultrasonic sensor has been used extensively to improve the movement of blind and sighted people in a safe and independent manner.



Figure 12 virtual view of system

Source : <https://www.semanticscholar.org/>

After looking at the comparison TABLE-1 all the necessary features are embed in this .Our system is 60% more efficient then others .The system detects the obstacle and the stick indicate through vibration and buzzer and if the person is in danger or need help press the button and alert message via GSM module will be send and along with this location of particular person will ne end to the emergency contact to track them.

Table 1. Comparison With Existing Devices

Name	Obstacle detection	Alert via message	Track the location	Temp. Detection (COVID -19)	Vibration and Buzzer
Pratik N K(2019)	✓		✓		✓
<a href="#">Shubham Bele(2020)</a>	✓	✓			✓
<i>Amit Thakur(2020)</i>	✓		✓		✓
<i>Yashvi Khera &amp;Pawan Whig (2021)</i>	✓	✓	✓	✓	✓



## 5. Conclusion

Finally, the blind walking stick has been turned into a device that can be used to direct the blind. A smart, carefully built walking stick can allow the blind without the help of someone to get from one position to another. It can also be used as an unclean way of supplying the blind with hearing. This rod eliminates visually disabled individuals' reliance on other family members, friends, and guide dogs while walking.. The smart stick senses objects or barriers in front of users and sends an alarm back, vibration also offers warnings and location monitoring. The advantages of this devices are that it may be a cost-effective alternative for millions of blind people around the world.

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