Journal of Engineering Sciences

Vol 11, Issue 6,June/ 2020
ISSN NO:0377-9254

SMART STICK FOR BLIND PEOPLE WITH LOCATION TRACKING SYSTEM

Ch. Sri Satya Jyothirmai[1], K.R. Krishna Tulasi[2], K. Jayasri[3], Pavitra Sahu[4] and K. Priyanka[5]

[1]*Assistant Professor, Electronics and Communication Engineering, Vignan's Institute of Engineering for Women, India*

[2]*Student, Electronics and Communication Engineering, Vignan's Institute of Engineering for Women, India*

[3]*Student, Electronics and Communication Engineering, Vignan's Institute of Engineering for Women, India*

[4]*Student, Electronics and Communication Engineering, Vignan's Institute of Engineering for Women, India*

[5]*Student, Electronics and Communication Engineering, Vignan's Institute of Engineering for Women, India*

***Abstract*—This paper represents an approach to overcome major challenges face by blind people. A blind person has a physical limitedness of vision. Therefore, to facilitate their mobility to move, they make use of a normal cane. But the cane could not help them in avoiding obstacles on the sidewalks, technology can further help in providing assistance to the user. This research will develop a smart cane for a blind person using Arduino UNO and it has an Ultrasonic sensor, buzzer and a vibration motor to facilitate the user in detecting the obstacles. To assist in tracking the user's location, this smart cane utilizes GPS to determine the location and send it via SMS. The method used in this paper is the design of hardware and software. The expected results of this paper are to create a smart cane for blind person which can assist their daily activities. A blind person can avoid a collision because this smart cane will alert the user through the buzzer and also the vibration motor alerts when the user is unable to hear the buzzer sound and the smart cane notify their family if they are lost.**

***Index Terms*—Arduino UNO, Ultrasonic sensor, GPS, smart cane, blind people.**

I. INTRODUCTION

Visually impaired people are facing many problems in their everyday life, often have a difficult time to navigate outside the environment. The major disability is the visual impairment. The blind people have to travel individually. They dependably rely upon other individuals for their movements [1]. The global eye defect among the communities is blindness. According to the World Health Organization (WHO), there are a total of 285 million people in the world are experiencing vision problems i.e. as many as 39 million people are blind and 246 million more who have a low vision [2][3]. According to the researcher's, 83% of the information can be acquired by visualizing the things, which is an impossible task for the blind people. Another problem is that the blind people often encountered by the limitation of activity and mobility. They desperately need things to detect obstacles so they could walk anywhere without worry of going to crash into the objects in their path of walk. Therefore, to facilitate their mobility, they usually use a traditional normal cane [3][4]. The smart stick has more facilities for the blind who used to walk. The sticks used will alert the user when an object is exposed to the other end of the stick where the ultrasonic sensor is attached. However, the stick could not provide information to the user if the object is outside the range of the cane, so users could not prepare themselves when faced with objects that are before them. The other feature of the smart stick is that blind's family is able to track the user's location [3][5][6].

Taking this into consideration the smart stick is developed to support the visually impaired people in detecting obstacles as well as sharing their current location via SMS to the respective contact number. The smart stick is way more advanced than the traditional walking stick as the use of sensors makes object detection easier. GPS system provides information

regarding their current location. Electronic oriented technology like Ultrasonic sensor can be used to assist them. In this technology, the sensor detects the obstacles without touching it using ultrasonic waves. On sensing obstacles, the Arduino sends a signal to sound on the buzzer as well as triggers the vibration motor to vibrate with a specified duty cycle.

The GPS receiver has been used for safety purpose to track location of the user. If the blind people need any help then they can trigger a "panic button" which is mounted on the top of the stick then the GSM will send the location information to the predefined contact number within 6 seconds. The whole setup will be mounted on the stick. All effort is being made to make this stick is to be cheaper as well as easy to use.

Now-a-days GPS is one of the technologies that are used in a huge number of applications. One of those applications is tracking or any portable device and keeps regular monitoring on them. This tracking system can inform the location to the respective predefined mobile number. This system enables us to track target in any weather conditions. In addition, to efficiently use the battery power and cost of the tracking system, and later implemented resultant in feasible way and efficiency of battery power and data transmission. Recently, technology is growing in advanced level, because of this the common people are ready to adapt to this technology facilities in their daily life [7].

II. OBJECTIVE

After notifying the problems faced by the blind people to move around the places and new technologies to assist the users to roam freely around their known places. Taking this into consideration the smart stick is developed for the blind person in object detection and its objectives are as follows.

Object detection: Ultrasonic sensor which is called as object detection sensor is used to avoid collision between the objects and the blind person, to make the blind person more convenient to move independently.

Emergency location sharing feature: A panic button has to be implemented to send location via SMS to the predefined number using SIM808 GSM/ GPS/ GPRS module in order to save the blind person from any panic situation.

The entire system is designed to be small and easy to handle hence it should be cost effective.

III. METHODOLOGY

To implement, Ultrasonic sensor, vibration, Arduino UNO board, SIM808 Module are used. Based on the signals received by the Arduino from the sensors and components, Arduino controls, manages and give timely signals. The input string is from the ultrasonic sensor which generates high frequency sound waves and evaluates the echo which is received back by the sensor. Now the sensor calculates the time interval between transmitted signal and the received echo signal so as to determine the distance to an object.

Ultrasonic sensor is able to measure distances in terms of centimetres and inches. It can measure from 0 to 2.5 metres, with a precision of 3 cm. The input received by the Arduino will carry out the remaining work by commanding the buzzer to sound on and vibration motor to vibrate at a certain intensity. This will be done by assigning them a specific duty cycle. Later, when the user is in any emergency situation, they can share their current location to respective contact number by simply pressing the panic button.

IV. PROPOSED SYSTEM

The figure 1 shows the block diagram of the proposed system that consists of various hardware devices which are mounted on the smart stick. The devices are Ultrasonic sensor, Arduino UNO board, SIM808 GSM/ GPS/ GPRS module, vibration motor and a buzzer.

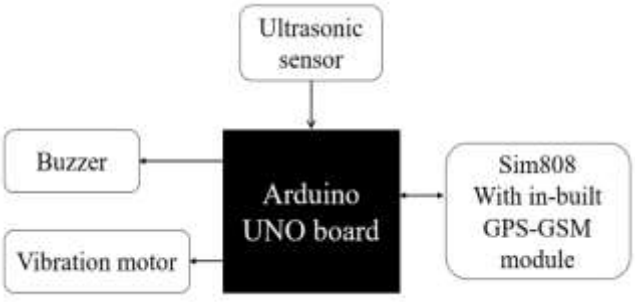

Fig. 1. Block Diagram of the Smart Stick for blind people with Location Tracking System

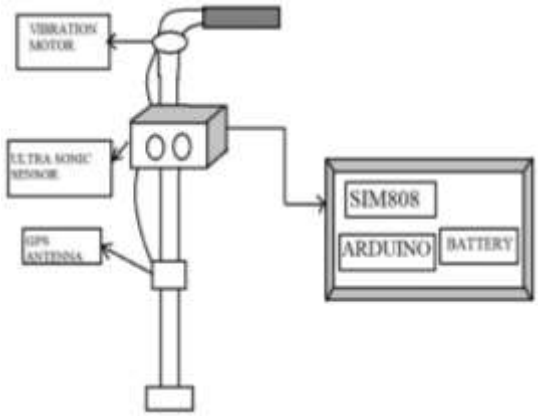

Fig 2: Proposed System of the Smart Stick for blind people with Location Tracking System

The proposed smart stick for blind people with location tracking system is developed to help the visually impaired in avoiding obstacles on the sidewalks and also enable them to share their location via SMS. As shown in the fig. 1, the Arduino UNO ATmega 328 microcontroller is used to interface the remaining hardware components. The ultrasonic sensor is used to detect the obstacles. When an obstacle is detected by the sensor, the Arduino sends commands to the buzzer to sound on and vibrates the vibration motor correspondingly with a certain duty cycle. Using SIM808 GPS/ GSM module location of the user can be tracked easily.

V. HARDWARE DESCRIPTION

A. Ultrasonic Sensor

In order to provide the obstacle detection, Ultrasonic sensor is used. This sensor ranges from 2cm to 400cm non-contact measurement function, the ranging accuracy can reach up to 3mm, it includes ultrasonic transmitters, receiver and control circuit. Ultrasonic sensor uses I/O trigger for at least 10μs high level signals. Sensor automatically sends eight 40 KHz and detects whether there is a pulse signal back. If the signal is reflected back through high level, time high output I/O duration is the time from sending ultrasonic to returning.

Ultrasonic sensor is a device that can measure the distance of an object with the help of ultrasonic waves. It measures distance by sending out waves at a specific frequency and listening for the echo signal that is to be reflected from the target.

Fig. 3. Ultrasonic Distance Sensor

By recording the elapsed time between the transmitted wave and the reflected wave, it is possible to calculate the distance between the sensor and the object. Since it is known that sound travels through air about 344m/sec (1129ft./s), on considering the time taken by the sound wave to return and multiply it by 344 metres (or 1124 feet) to find the round-trip distance of the sound wave. Round-trip means that the sound wave travel two times the distance to the object before it was detected by the sensor, it includes the 'trip' from the sonar sensor to the object and the 'trip' from the object to the ultrasonic sensor (after the sound wave bounced off the object). To find the distance to the object, simply divide the round-trip distance in half. An ultrasonic (well above human being) beat his transmitted from the unit and distance-to-target is determined by measuring the time required for the echo return. Output from the ultrasonic sensor is a variable-width beat that compares the distance to the target.

Ultrasonic Sensor VCC pin	Arduino UNO 5V pin
Ultrasonic Sensor Trigger pin	Arduino UNO D12 pin
Ultrasonic Sensor Echo pin	Arduino UNO D10 pin
Ultrasonic Sensor Ground pin	Arduino UNO GND pin

Table 1: Interfacing of Ultrasonic Sensor with Arduino UNO board

B. *Arduino Microcontroller*

ATmega328 microcontroller manufactured by Atmel belongs to the Mega AVR (Advanced Virtual RISC) series which processes the signals coming from the different components or any sensors. It is a chip mounted on the Arduino board. Arduino is an open source microcontroller from which there is no feedback present in the microcontroller. This Arduino board consists of 12C bus that can be able to transfer the data from Arduino board to the output devices. These Arduino boards are programmed over RS232 serial interface connections with ATMEGA Arduino microcontroller is from 7V and the max of 12V. The DC input current given to the Arduino is in the range of 40mA. It consists of different types of memories such as flash memory, EEPROM.

The length of the Arduino board is nearly about 68.64mm and the width of the microcontroller is about 53.44mm. The weight of the microcontroller is about 20g. We can use various types of microcontroller such as 8-bit AVI Atmel arm microcontroller and 32-bit Atmel arm microprocessor. From these different kinds of processors, we can use those processors for various engineering projects as well as industrial application, some of the examples of using the Arduino in the Arduino in the industrial applications are controlling the actuators and sensors.

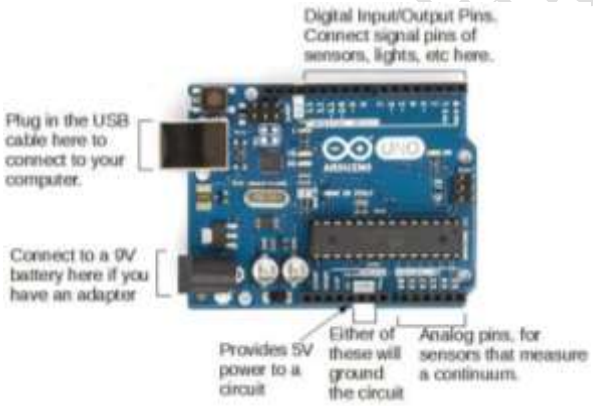

Fig. 4. Arduino UNO Board

C. *Vibration Motor*

A vibration motor is used in the system design, which vibrates with three different intensities depending on the distance from the obstacle. If the obstacle is very near then the intensity of the vibration will be very high. Intensity of the motor decreases as the distances of the obstacle increases.

Fig. 5. Vibration Motor

D. *Buzzer*

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input as a mouse click or keystroke.

Fig. 6. Buzzer

It generates consistent single tone by applying DC voltage. Using a suitably designed resonant system, this type can be used where large sound volumes are needed. At father electronics we stock many of the most common types categorized by type, sound level, frequency, rated voltage, dimensions and packaging type.

E. *SIM808 GPS/ GSM/ GPRS Module*

SIM808 GPS Tracker is an IoT (Internet of Things) Solution based on the ATmega328. It integrates a micro controller ATmega328, GPRS/ GSM/ GPS module. SIM808, which is the upgrade version of SIM900, power management and storage, to make the SIM808 GPS Tracker ready for real project for IoT projects such as smart-home, outdoor monitoring, shared bicycle, etc. SIM808 module is a complete quad-band GPS/ GSM/ GPRS module which combines GPS technology for satellite navigation.

S.no.	Pin	Description
1	VCC	Power supply
2	TXD	UART transmitter
3	RXD	UART receiver
4	GND	Ground

Table 2: Interfacing of SIM808 with Arduino UNO board

Fig. 7. SIM808 GPS/ GSM/ GPRS Module

When the user in any emergency situation, they can share their current location by simply pressing a "panic button" which is mounted on the smart stick. Later, the GSM will send the location information to the predefined contact number within 6 seconds.

VI. SOFTWARE DESCRIPTION

A. Arduino IDE

Arduino Integrated Development Environment (IDE) is an open source electronics platform which is based on easy-to-use hardware and software. Arduino boards are able to read inputs- light on a sensor, a finger on a button, or a twitter message. It is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

B. Algorithm

Step 1: Initially check whether the stick is in active state or not.

Step 2: The process of object detection gets initialized when the user starts their walk.

Step 3: If there is any object detected by the ultrasonic sensor, the distance to the obstacle is calculated according to the time variance between the transmitted and received echo signals.

Step 4: If the detected object's distance is less than 20cm then vibration motor and buzzer vibrate with 100 percent of intensity.

Step 5: If the detected object's distance is less than 50cm then vibration motor and buzzer vibrate with 80 percent of intensity.

Step 6: If the detected object's distance is less than 100cm then vibration motor and buzzer vibrate with 60 percent of intensity.

Step 7: When the user trigger's the "panic button" , then the GPS updates the location information to the Arduino board and later, GSM will send the location via SMS to the predefined contact number.

Later the user's location can easily be tracked down.

C. Flow Chart

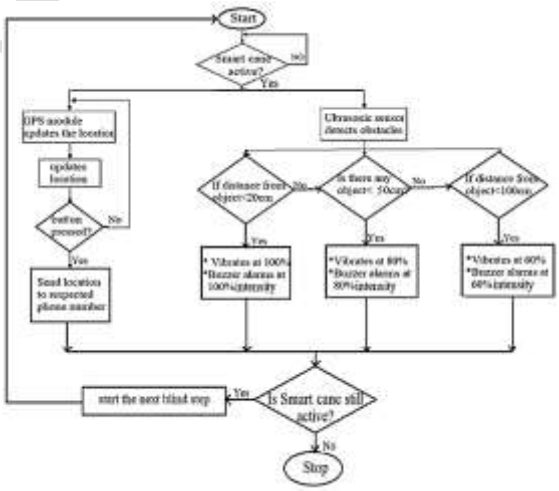

Fig 8: Flowchart of Smart Stick for Blind people with Location Tracking System

VII. TESTING AND VERIFICATION

A. Distance values in Arduino IDE

These are the object detection values which are observed in the "serial monitor" while monitoring.

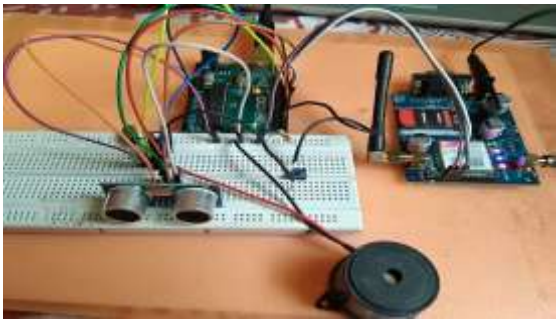

Fig 9: Interfacing the hardware components to the Arduino UNO board

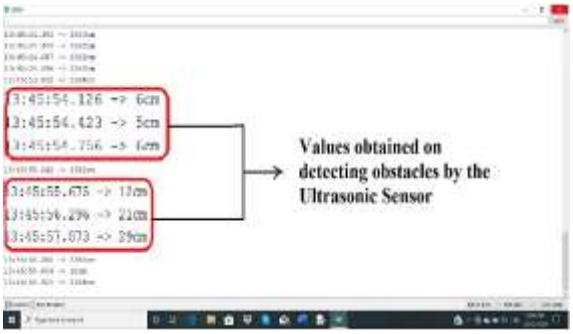

Fig 10: Output of Serial monitor of object detection

On detecting any obstacles by the ultrasonic sensor, the user gets alerted with the help of buzzer and also vibration motor vibrates with a certain intensity based on the distance at which the object is detected.

B. SIM808 GPS/ GSM Module – Sharing Location via SMS

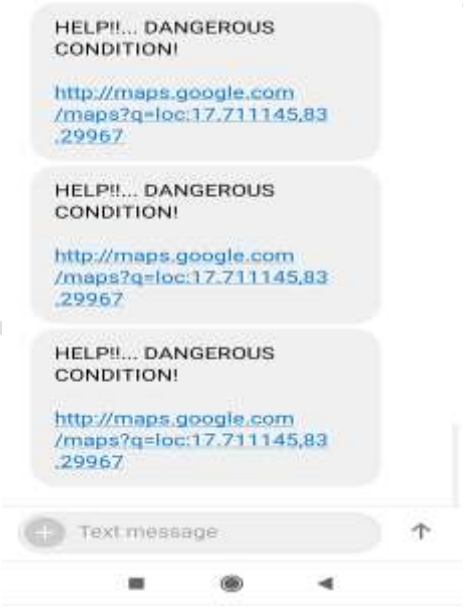

Fig 11: Output of SIM808 GPS/ GSM Module under Emergency situation

C. Combined output of Object detection and sharing Location under Emergency Situation

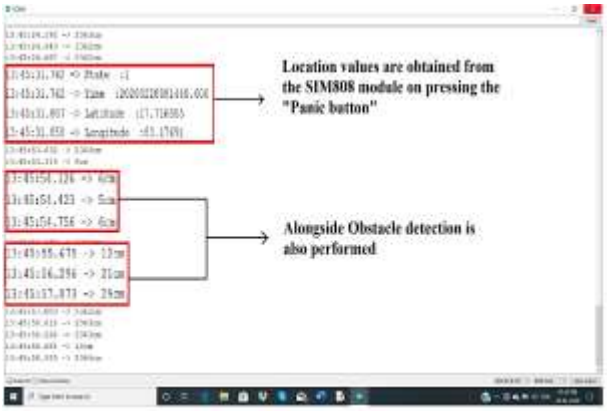

Fig 12: Output of Smart Stick for blind people with Location Tracking System on the Serial Monitor

VIII. CONCLUSION

In this paper, objection detection as well as location sharing feature is provided for the blind people. This smart stick provides safe and secure walk for the blind users. This will obviously help the blind people in avoiding the obstacles that may occur in their pathway. The user can also share their location under emergency situations by simply pressing the panic button, within 6 seconds the location will be successfully shared by SIM808 module to the respective mobile number. These features make the blind people to be independent on others.

IX. REFERENCES

[1] Ambika R, Dr. Sarika Raga Voice Assistive Smart Walking Stick for Blinds using GPS & GSM techniques IJRAR 2018.

[2] Nahar V V, Nikam J L and Deore P K 2016 Smart Blind Walking Stick International Journal of Modern Trends in Engineering and Research 2349 645-652

[3] Junfithrana A P and Ruhiyat U S 2015 Design Tool for Road Base with Blind Arduino Uno J. Engineering Nusaputra 1 1 1-5

[4] Suhaeb S 2016 Stick Design Electronics For Blind And Ultrasonic Sensor Based Microcontroller Atmega8535 J. Sci. pinisi 2 2 131-136

[5] Ahmad F and Tjut A Z Design Tool For The Visually Impaired Ultrasonic Sensor And System Using The Location-Based Mobile 1-11

[6] Sheth R, Rajandekar S, Laddha S and Chaudhari R 2014 Smart White Cane - An Elegant and Economic Walking Aid Am. J. Eng. Res. 3 10 84-89

[7] Mr. Prasad Rajendra Joshi, Mr. Vishal Vasudeo Patil 2017 Device Tracking Using Embedded GPS and ZIGBEE Technology ISSN (Online): 2347 – 4718.