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RAPID RESPONSE SMART BLIND STICK WITH OBSTACLE DETECTION USING ARDUINO

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Abstract- The smart blind stick helps visually impaired people to commute and to do their work easily. The usual blind stick doesn't detect the obstacle in the way of visually impaired person and hence sometimes becomes a cause of fatal road accidents. Because the visually impaired person does not know what type of objects is in front of them, the person cannot recognize the obstacle and how far is he/she from the object which makes the commuting process of the blind person strenuous. This paper presents the blind stick works with the help of ultrasonic sensors and Arduino for visually impaired people. With the help of smart blind stick, the object is detected using an ultrasonic sensor and the person helping the blind person. GPS is integrated with smart blind stick for real-time tracking of the blind person which can be very useful in case of any casualty.
Keywords: Ultrasonic sensor, Visually Impaired Person, Adafruit Ultimate GPS, Arduino ATmega328.

1. INTRODUCTION

Globally the number of people who are visually impaired is estimated to be 285 million, out of which 39 million are blind. Of all the blind people around the world 82% people are 50 or more years old. People with visual infirmity are usually dependent on extrinsic abetment for commuting to their destination [1]. Vision plays a vital role in human life as 83% of information humans get from the environment are with the help of sight. The traditional and bygone peripatetic aids for visually impaired people have many limitations [2,3]. These substantial designs would make the user to be drained. Smart blind stick is a low cost and light weight model designed using various sensors that alerts the blind person about the coming obstacle. The device can detect objects within the distance of 2 metres from the user [4].

2. METHODOLOGY & WORKING:

Fig. 2.1 shows the block diagram of proposed blind stick. Also stick hardware & software requirement is discussed and its incorporation is described as follows:

Fig. 2.1 Block Diagram for smart blind stick

2.1 Arduino UNO

Arduino UNO is microcontroller board and it is used in atmega328p. In Arduino UNO out pins are called as advanced pin and the in pin are called as simple pins. The comport are utilized in AC-DC connector or battery [5, 6]. Fig. 2.2 depicts the Arduino UNO.

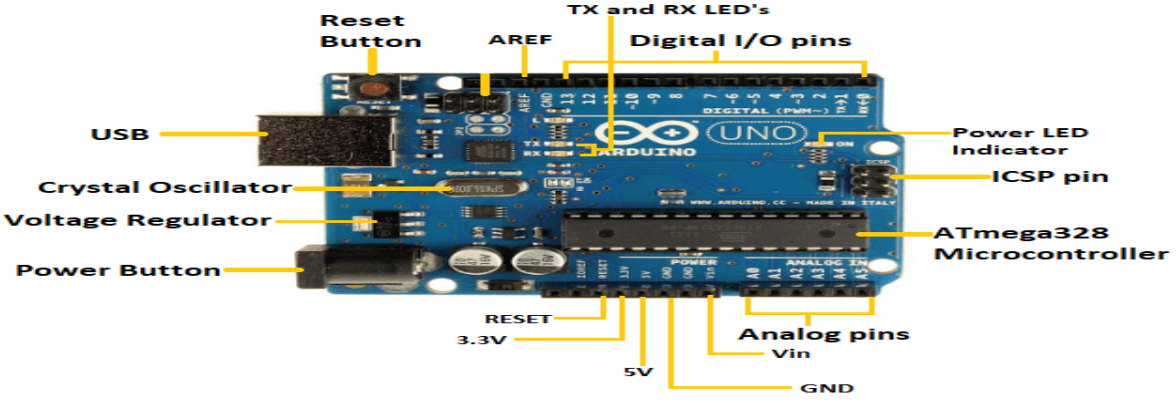

Fig.2.2 Arduino UNO

2.2 Ultrasonic Sensor HC-SR04

HC-SR04 Ultrasonic sensors consist of two transducers, one acts as a transducer converting electrical signal into ultrasonic sound pulses. These sound pulses are listened by the receiver [7]. The ultrasonic sensor consists of 4 pins namely Vcc, trigger, echo and ground. This sensor is mostly used in devices were measuring distance or sensing the obstacle is required. HC-SR04 sensor offers excellent range detection between 2 cm to 400 cm [8, 9]. It operates on 5 volts and is connected with Arduino. Trigger and echo pins of the HC-SR04 sensors and both Input/Output pins and hence they can directly be connected with the I/O pins of the Arduino [10]. Fig. 2.3 shows the sensor. The ultrasonic sensor works on the distance formula as mentioned below:

Distance = Speed x Time

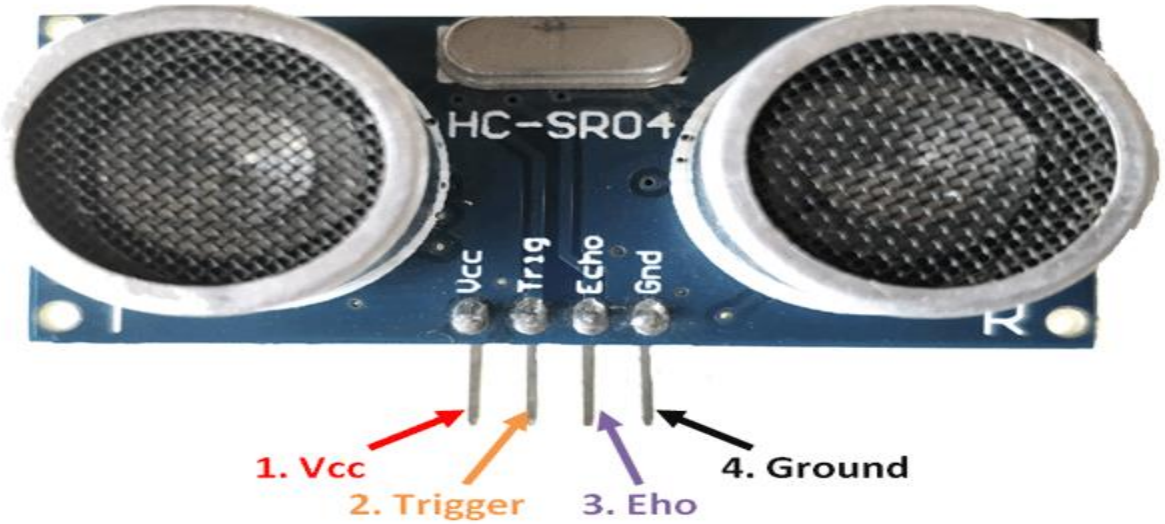

Fig. 2.3 Ultrasonic Sensor HC-SR04

2.3 Adafruit Ultimate GPS

Adafruit's ultimate GPS is used in the smart blind stick for real-time tracking of the visually impaired person [11]. The GPS is a satellite-based navigation system which works across the globe without any setup charges. Each GPS satellite transmits a unique signal that allows GPS device in decoding precise location of the user. A GPS signal contains three different types of information such as pseudorandom code, ephemeris data and almanac data. Pseudorandom code is an I.D code which is used to identify the satellite which is used in transmitting the information. Ephemeris data is needed to discover a satellite's location to have details about the condition of the satellite [12, 13]. Almanac data tells the GPS receiver shows the orbital information about the satellite. To be able to leverage GPS data with the Arduino we need to install Adafruit GPS library in our system. Fig. 2.4 shows how the Arduino is integrated with GPS.

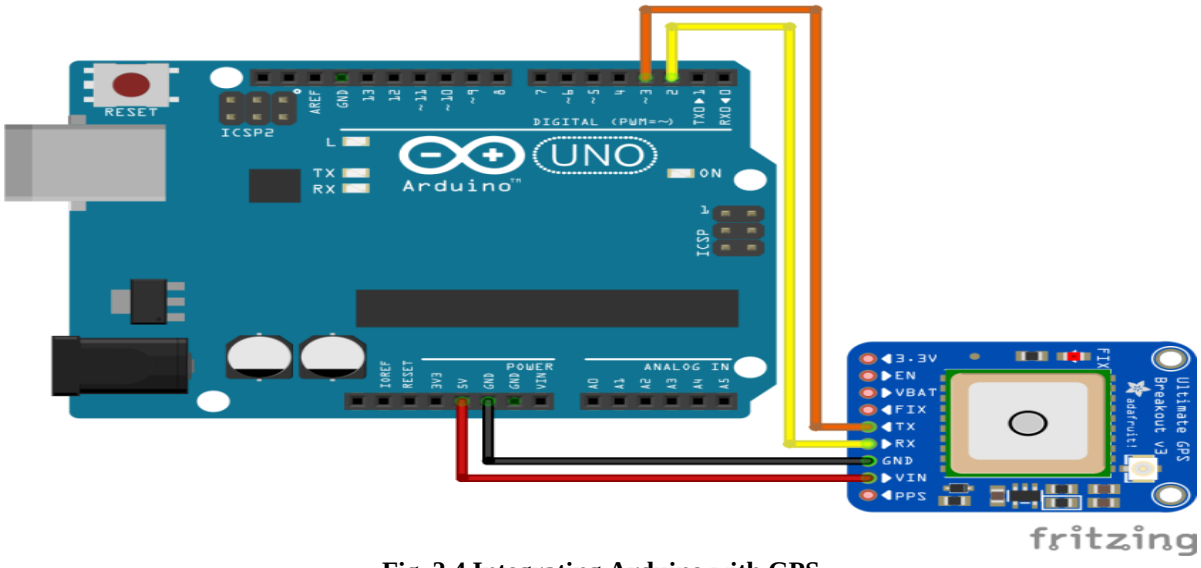

Fig. 2.4 Integrating Arduino with GPS

Integrating the GPS with smart blind stick can help us sending the real time updates of the location of the blind person which can help their family members in keeping a track of them in case of any casualty [14,15]. Once the system receives the information from the GPS we can parse it into our system and get the location of the person. Fig. 2.5 give the code for tracking GPS.

```
Location: 3256.4489S, 15143.1035E
Location (in degrees, works with Google Maps): -32.9408, 151.7184
Speed (knots): 0.19
Angle: 147.58
Altitude: -8.00
Satellites: 9
$PGTOP,11,3*6F
$GPGGA,034052.000,3256.4489,S,15143.1039,E,1,09,0.88,-8.0,M,25.9,M,,*59
$GPRMC,034052.000,A,3256.4489,S,15143.1039,E,0.15,154.07,081216,,,A*76
$PGTOP,11,3*6F
$GPGGA,034053.000,3256.4489,S,15143.1039,E,1,09,0.88,-8.0,M,25.9,M,,*58
$GPRMC,034053.000,A,3256.4489,S,15143.1039,E,0.07,279.89,081216,,,A*7E
```

Fig. 2.5 Location tracked using GPS

2.4 Buzzer

A buzzer is a small component that helps us to include sound into our Smart blind stick as shown in fig. 2.6, [16]. It is very small 2-pin structure that can be easily included among breadboard which makes this a very widely used component in electronic devices.

Fig. 2.6 Buzzer to add alarming sound in the blind stick

2.5 RF Module

A RF module is an electronic device used to transmit and receive signals from one device to another. In an embedded system it is often used to establish communication among two components wirelessly. In blind stick RF module is utilized to detect the misplaced stick [17, 18]. The receiver of RF module is connected to the Arduino and the transmitter acts as a remote and is with the blind person. As the blind person gives command to transmitter using the remote it sends the signal to the receiver and output is given to the buzzer helping the blind person in navigating to the stick [19, 20].

CONCLUSION

The smart blind Stick has been made into model which can be utilized to assist the visually impaired person. Its aim is to provide solution to the complication faced by the visually impaired people in their daily commute from one place to another. In countries with lack of infrastructure for visually impaired person smart blind stick will operate to help them and travelling alone possible for them. In India around 30% fatal road accidents include one or more blind person involved in it. Smart blind stick can be an affordable option in avoiding these fatal accidents and help visually impaired persons live a better life.

REFERENCES

[1] S. Suhaeb, “Implementation of GPS-Based Location Display System on the Train as an Automatic Guide”, in Journal of Scientific Pinisi, Vol. 2, No. 2, page.131-136, 2016.

[2] J. V. Narayanrao, “Safety Stick For Blind People Using Microcontroller”, in International Journal of Engineering Development and Research, Volume 4, Issue 2, 2016.

[3] S. Ullah, S. Ahmed, W. Ahmad and L. Jan, “Sensor Based Smart Stick for Blind Person Navigation”, in International Journal of Scientific & Engineering Research, Volume 9, Issue 12, December-2018.

[4] R. Radhika, P.G. Pai, S. Rakshitha and R. Srinath “Implementation of Smart Stick for Obstacle Detection and Navigation.” International Journal of Latest Research in Engineering and Technology, vol. 2, number 5, pp. 45-50, 2016.

[5] R. Sheth, S. Rajandekar, S. Laddha and R. Chaudhari "Smart White Cane – An Elegant and Economic Walking Aid." American Journal of Engineering Research. Vol. 3, number 10, pp. 84-89, 2014.
[6] Manish Kumar, Sunil Kumar, and Harish Nagar. "Enhanced Text and Image Security Using Combination of DCT Steganography, XOR Embedding and Arnold Transform." Design Engineering, pp. 732-739, 2021.
[7] Himanshu Arora, Manish Kumar, Sanjay Tiwari, "Improve Image security in combination method of LSB stenography and RSA Encryption Algorithm", International Journal of Advanced Science & Technology (IJAST), Vol.8, pp. 6167-6177, April 2020, ISSN: 2005-4238A.
[8] Tekade, M. Sonekar, M. Ninave and P. Dongre, "Ultrasonic Blind Stick with GPS Tracking System", in International Journal of Engineering Science and Computing, March 2018.
[9] R. Dhanuja, F. Farhana and G. Savitha, "Smart Blind Sitck Using Arduino", in International Research Journal of Engineering and Technology (IRJET), Volume: 05 Issue: 03 March 2018.
[10] Maru U., Sujediya G., Saini Y., "Color Image Encryption and Compression Using DCT in Joint Process", Proceedings of International Conference on Communication and Computational Technologies. Algorithms for Intelligent Systems. Springer, 2021.
[11] M. Kumar, F. Kabir and S. Roy, "Low-Cost Smart Stick for Blind and Partially Sighted People", in International Journal of Advanced Engineering and Management, Volume 2, Issue 3, pp. 65-68, 2017.
[12] Mounir Bousbia-Salah, Mohamed Fezari, "An Electronic Travel Aid for Blind People," IMACS'2005.
[13] Jismi Johnson, NikhalRajan P, Nivya M Thomas, Rakendh C S, Sijo T Varghese, "Smart Walking Stick for Blind", International Journal of Engineering Science Invention Research & Development; Vol. III, Issue IX, pp. 557-560, March 2017.
[14] Sung Jae Kang, Young Ho, Kim, Development of An Intelligent Guide-Stick for The Blind IEEE International Conference on Robotics &Automation Seoul, Posted: 2001-05-26.
[15] Manish Kumar, Dr. Sunil Kumar, Dr. Harish Nagar, "Comparative Analysis of Different Steganography Technique for image or Data Security", International Journal of Advanced Science & Technology (IJAST), Vol.29, pp. 11246-11253, April 2020, ISSN: 2005-4238.
[16] Satish Kumar Alaria, SR Dogiwal, "Reducing the Packets Loss Using New MAC Protocol", International Journal on Recent and Innovation Trends in Computing and Communication, Vol. 1, Issue 9, 2013.
[17] J.B.F. van Erp, J.A. Veltman, H.A.H.C. van Veen (2003): A Tactile Cockpit Instrument to support Altitude Control, Proceedings Human Factors and Ergonomic Society 47tn annual meeting 2003.
[18] Jadaun, A., S. K. Alaria, and Y. Saini. "Comparative Study and Design Light Weight Data Security System for Secure Data Transmission in Internet of Things". International Journal on Recent and Innovation Trends in Computing and Communication, Vol. 9, no. 3, pp. 28 -32, Mar. 2021.
[19] Smart Cane Assisted Mobility for the Visually Impaired, World Academy of Science, Engineering and technology International Journal and Information Engineering Vol:6 No:10, 2012.
[20] Dr. Harish Nagar, Dr. Manish Kumar, Dr. Sunil Kumar, "Enhanced Text Data and Image Security Using DCT Technique and Genetic Algorithm", International Journal of TEST engineering and management, Vol. 83, June 2020.