



SMART BLIND STICK

Pratik N K¹, Poornesh V², Shashikant³, Shreedhar Kudva⁴ & Saritha A N⁵

Abstract- Today technology is growing to a greater extent, however there is no cost effective device for visually impaired people. For a visually impaired person it becomes impossible to do his/her day to day activities, therefore Smart Blind stick can help visually impaired people in moving and allowing them to perform their work easily. The smart stick will have sensors embedded with it, thereby it senses the objects/intruder, when any objects or obstacles come in range of an ultrasonic sensor then the person is alerted with a quick response time using a vibrator. The overall system also has a GPS module, so that the person with disability can know the current location with the help of a microphone and a speaker. This system also has a feature where in which the person with disability can contact to a specific person whose number is stored in a microcontroller in case of any emergency. This System also has a water sensor at the bottom of the stick and Infrared sensor for effective obstacle detection. Designing a cost effective and efficient blind stick is the main aim of the project.

Keywords – Smart Belt, RaspberryPI, UltrasonicSensor

1. INTRODUCTION

There are about 253 million people live with vision impairment, 36 million are blind and 217 million have moderate to severe vision impairment. 81% of people who are blind are aged 50 years and above (WHO estimation). The number of visually impaired people are expected to grow in the future due to various reasons. As a result, there is a need for a cost effective system that can be used by blind people in order to walk easily and comfortably. It is necessary that a smart solution is proposed for the blind people so that they can use this in their daily life.

This paper proposes the design and development of a smart stick in order to help the visually impaired people.

2. LITERATURE SURVEY

Paper [1] Title: Smart Stick for the Blind a complete solution to reach the destination. This system uses IR sensor, Ultrasound sensor and water sensor to detect the obstacle. However, this system just gives an alert if any one of the sensor is triggered, it uses a buzzer to alert the blind person. This system does not use any location identifier or location indicator.

Paper [2] Title: Pothole detection for visually impaired which uses a camera that captures image 15 frame per second and based on the concept of image processing the pothole is detected. Problem with this system is use of camera makes it expensive, and also a lot of images captured per second increases overhead and storage requirement.

Paper [3] Title: Smart Walking Stick for Blind describes about a Stick which use Raspberry Pi [10] and an ultrasonic sensor to detect objects and intruder, the system also has a camera embedded with it, and based on the images captured the objects are detected. The objects are analysed based on the set of image datasets that are already stored. This system however, becomes costly due to the use of high-end camera and also because of storage constraints as large volume of datasets are needed to be stored.

This system, sometimes might also be inaccurate because the obstacles are detected based on dataset (large set of images) as different objects vary in their shape and size.

Paper [4]Title: Smart Belt for Blind uses a belt embedded with ultrasound sensor which detects the obstacle. The belt also has a buzzer which vibrates when obstacle is detected. The entire system is developed in such a way that the distance calculated is sent as an audio message for the blind person, where in which he hears the distance calculated using a speaker.

Paper [5] Title: A wearable ultrasonic obstacle sensor for visually impaired. This system uses a couple of ultrasound sensor on either side over the strap of the goggles. This project can detect the intruder in front of the blind person who is wearing the goggles. This system is not robust as the sensor embedded with the goggles makes it heavier and also it cannot detect complex objects such as water, vehicle etc.

¹ UG Students, CSE, B.M.S. College of Engineering, Bangalore, India

² UG Students, CSE, B.M.S. College of Engineering, Bangalore, India

³ UG Students, CSE, B.M.S. College of Engineering, Bangalore, India

⁴ UG Students, CSE, B.M.S. College of Engineering, Bangalore, India

⁵ Assistant Professor, CSE, B.M.S. College of Engineering, Bangalore, India

3. PROPOSED WORK

The stick is embedded with Raspberry Pi, GSM module, GPS module, vibrator, switches and sensors. If any sensor is invoked, the vibrator which is placed over the handle vibrates. If the visually impaired person wants to know their current location they can press the switch assigned for that purpose, an audio regarding the current location is heard by the blind person with the help of a Bluetooth audio device.

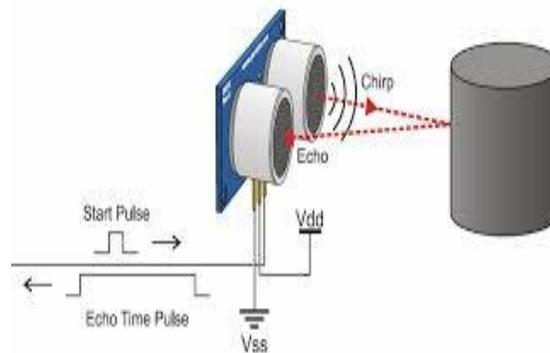
Different kinds of sensors like water sensor, ultrasonic sensor [11], and Infrared sensor [12] are placed at various parts of the stick making it robust.

If the visually impaired person also wants some help during some emergency, a call or a message is sent to a set of mobile numbers stored in a micro controller.

Developing the product at minimal cost becomes the key agenda of the project. If the person wants to know the directions to get to the right location, he/she can actually press a button associated for the purpose, the direction based audio message is heard by them using the Bluetooth based audio device. Infrared which is present at the bottom of the stick can detect presence of holes and steps.

4. WORKING

4.1 Ultrasonicsensor:



This sensor senses the obstacles within few meters of range. There is a pair of eyes, Transmitter and Receiver, Transmitter transmits pulse signals with velocity v and Receiver receives the transmitted signals after time t (this is called Time of Flight). So, the distance will be $(v*t)/2$.

4.2 Infrared sensor:

An IR sensor [12] senses its surrounding by emitting or detecting infrared radiation, infrared sensors can also detect the heat emitted by the object and also can detect motion.

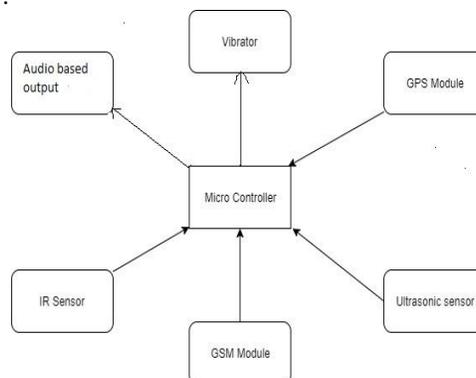
4.3 RaspberryPi:

It is a microcontroller to connect various sensors which is programmable using python. It is single board, low cost computer.

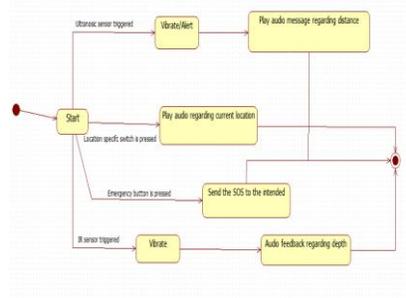
4.4 GPS and GSM Module:

GPS module [12] is used to know the current location where the blind person is present, he can also hear the audio message regarding the direction that is to be followed by the blind person. GSM module is used by the blind person to contact to mobile numbers stored in the microcontroller in case of any emergency.

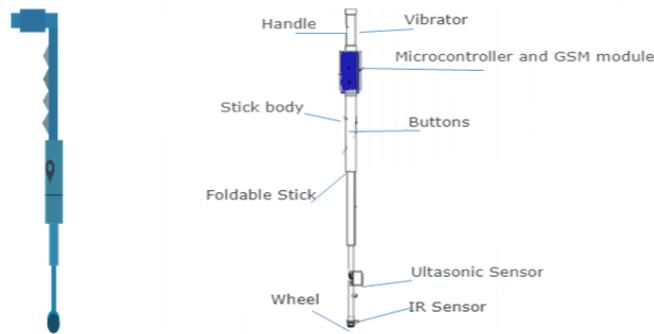
4.5 Parts Connected to Microcontroller:



4.6 State Diagram:



4.7 Model:



5. CONCLUSION

It is necessary that visually impaired people get access to an efficient and comfortable object in order to live their daily life comfortably. In a developing country like India, there is a need for a cost effective solution so that most of the people can have an effective product as proposed in this paper.

6. ACKNOWLEDGEMENT

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7. REFERENCES

- [1] Jismi Johnson, Nikhil Rajan P, Nivya M Thomas, Rakendh C S, Sijo TcVarghese "Smart Stick for Blind" International Journal of Engineering Science Invention Research & Development; Vol. III, Issue IX, March 2017. Department of Computer Science, Jyothi Engineering College, Kerala, India.
- [2] Amy Nordrum, Title: Pothole detection for blind, IEEE, 30 May,2016 <https://spectrum.ieee.org/the-human-os/biomedical/devices/pothole-detection-for-the-visually-impaired>
- [3] G. Prashanthi, PTejaswitha "Sensor assisted Stick for Blind People" Transactions on Engineering and Sciences, Vol 3, Issue January 2016.
- [4] Ayush Wattal, Ashuthosh Ojha, Manoj Kumar "Obstacle Detection Belt for Visually Impaired Using Raspberry Pi and Ultrasonic Sensors" Department of Information Technology JSSATE, Noida, India. National Conference on Product Design (NCPD 2016), July 2016
- [5] V. Diana Earshia, S.M Kalaivanan, K.Bala Subramanian "A Wearable Ultrasonic Obstacle Sensor for Aiding Visually Impaired and Blind Individuals."International Journal of Computer Applications, National Conference on Growth of Technologies in Electronics January 2016
- [6] Ezra Ali Hassan, Tong Boon Tang, Smart Glasses for Visually Impaired, ICCHP 2016: Computers Helping People with Special Needs pp 579-582
- [7] Sonda Ammar Bouhamed, Imene Khanfir Kallel, Dorra Sellami, Title: New electronic white cane for stair case detection and recognition using ultrasonic sensor, (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 4, No. 6, 2013 <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.310.4332&rep=rep1&type=pdf>
- [8] The Amazon way on IoT by John Ross man, volume 2, 20th July,2016
- [9] Designing the Internet of Things' by Adrian McEwen, Wiley Publication, Edition 1 2013.
- [10] Programming in python' by Cody Jackson, 3rd Edition, 2011
- [11] https://en.wikipedia.org/wiki/Raspberry_Pi
- [12] education.rec.ri.cmu.edu/content/electronics/boe/ultrasonic_sensor/1.html
- [13] <https://www.azosensors.com/article.aspx?ArticleID=339>
- [14] Smart Blind Stick, Gangan Deep Singh, 2013 <https://www.slideshare.net/gagandeepsingh942/sensor-based-blind-stick-65362526>