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Design of Intelligent Stick Based on Microcontroller with GPS Using Speech IC

Naseer Muhammad*, Engr.Qazi Waqar Ali**
Departement of Electrical Engineering, Sarhad University of Science and IT Peshawar Pakistan.
engr_naseermuhd@hotmail.com*, engr_qazi@yahoo.com**

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ABSTRACT

For visually impaired persons the endeavors and researchers have spent the decades to develop an intelligent and smart stick to protect and alert them from obstacles. This paper proposes a new thought developing an intelligent stick equipped with GPS navigation system, which detect the obstacles in path and gives information about their location using GPS coordinates. The combination of ultrasonic sensors and GPS will detect the obstacles and determine the position and will gives information about location through Bluetooth.

Corresponding Author:

Mr. Naseer Muhammad
Departement of Electrical Engineering, Sarhad University of Science & IT, Peshawar Pakistan.
E-mail **:** engr_naseermuhd@hotmail.com
Contact no.+923018811740

1. INTRODUCTION

Visual impairment means vision loss not totally blind at which the person needs a support and is caused by disease like trauma, degenerative conditions or innate has no remedy to cure by medicine or surgery. In a stable exchange of energy, in sequence with environment and substances human body is an open biosystem it is extract from the significance of sensorial and communication functions. The human being receives information from the environment: 1% by taste, 1.5% by tactile sense, 3.5% by smell, 11% by hear and 83% by sight, [1].

For the happy life and a proficient reintegration of the visually impaired in the family and society, it is strongly needful to put back the totally lost functions or to support their diminished functions like low vision. Thus, a new branch of technology and engineering is developing Assistive Technology, meaning any product, instrument, equipment or technical system used by a disabled person, especially produced or generally available, preventing, compensating, relieving or neutralizing the impairment, disability or handicap, [2], [3].

To support and help the visually impaired persons in their daily life activities such as movement from one place to another is not unexpected for engineers. Navigation in unfamiliar spaces is a problem for the visually impaired [4], use tactile and sense, they can't move freely in new environment. So applications that support navigation in unfamiliar places are very helpful for the visually impaired [5]. The embedded system accommodates the design of a navigation system to help the low visions to navigate easily is the integration of current technology such as position identification, obstacle or hazards recognition. There are some important drawbacks of these usual and oldest mobility aids (White cane, guide dogs, Geotact, Tom Pouce, Teletact II) are training phase, motion range, necessary skills, and information conveyed in a very diminutive amount**.**

Figure 1. Tom Pouce

This paper presents the design and implementation of an intelligent stick and Global Positioning System (GPS) integrated navigation system for the visually impaired peoples, which will detect the obstacle and hurdle in the path and also determine the position and location through GPS coordinates and the person will be inform about the place by the audio message through Bluetooth. It will provide location on the spot everything is embedded in a light weight circuit. This system helps the visually impaired people solve many problems such as the person can leave home by themselves in a safe and convenient way, participate in more social functions and other activities to provide more convenient means and improve their quality of life.

2. PROBLEM STATEMENT

Visually impaired persons have difficulty to interact and feel their environment. They have little contact with surrounding. Physical movement is a challenge for visually impaired persons, because it can become tricky to distinguish where he is, and how to get where he wants to go from one place to another. To navigate unknown places he will bring a sighted family member or his friend for support. Over half of the legally blind people in the world are unemployed. Because limited on the types of jobs they can do. They have a less percentage of employment. They are relying on their families for mobility and financial support. Their mobility opposes them from interacting with people and social activities. In the past different systems are designed with limitations without a solid understanding of the non-visual perception. Some of the systems are only for indoor navigations, and has no hurdle detection and determining location feature in outdoor environment. There is no one system available to navigate indoor, outdoor and also determine location and position to easily facilitate the visually impaired persons. The available systems are very costly; some of the systems are very heavy cause physical fatigue and required training to use**.**

3. RELATED WORK

Over the last decades, research has been conducted for new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at danger places. There are some systems which has some deficiencies.

Shoval et. al [6] developed a Navbelt, an obstacle avoidance wearable portable computer which is only for indoor navigation. Navbelt was equipped with two modes, in the first one the system information was translated to audio in different sounds. One sound for free for travel direction and other for blocked, it was difficult for the person to differentiate the sounds. Other problem was the system would not know the user momentary position**.**

S. Innet and N. Ritnoom [7] have introduced a stick for distance measurement using infrared sensors, which is a complex and time wasting process. The stick has different vibration modes for different range which is difficult for a blind to differentiate, it needs time for training. The stick informs the person clearly at dangerous stage which conveys less information and safety. The stick has no location and positioning features.

J.Na [8] proposed an interactive guide system for indoor positioning, which can't detect the obstacles and hurdles. The system is not suitable for the outdoor activities.

Benjamin et al. [9] introduce a laser cane with three photo diodes and three laser diodes function as receiver making an optical triangulation. The laser cane detects the obstacle in three different directions. One is 45^o to the ground for overhanging obstacles, the second one is parallel to the ground and third one is for sharp deepness. The laser cane has no system for determining location and position.

4. RESEARCH METHOD

Our project is an innovative idea of intelligent stick which has basically two features the first one is "Obstacle detection" and the second one is "Providing accurate location and position through GPS". It will provide safety and support to visually impaired Persons. The ultrasonic sensors in the stick will sense surrounding and will detect the obstacles and give feedback to buzzer and vibrator to change the path way**.**

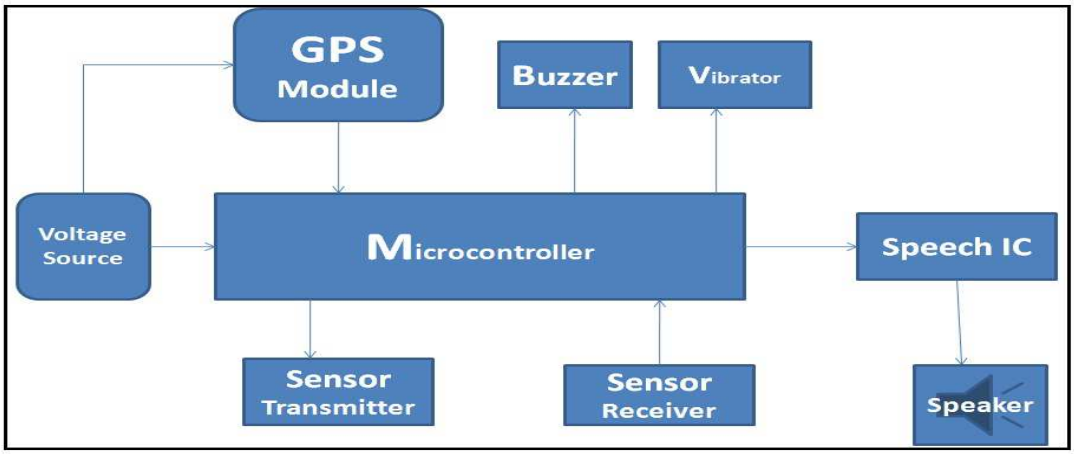

Figure 2. Block Diagram

- The voltage source activates the circuit.
- The "sensor transmitter" transmits the 40 kHz frequency, which reflects from the obstacle.
- The "Sensor receiver" receives the reflected frequency and gives it to microcontroller.
- The microcontroller processes it and gives signal to the buzzer and vibrator.
- Buzzer gives a beef sound and vibrator start vibration to inform the person that the obstacle is detected.
- The GPS module receives the coordinates continuously and gives it to the microcontroller.
- Microcontroller matches it with predefined coordinates.
- If the coordinates matches then it gives to Speech IC.
- Names is given to these predefined coordinates are places names in audio form which is already save in speech IC.
- The IC play the name of place and the person receives these names through Bluetooth hands free.

The vibration is a good feature for high listening persons in case of not listening to the beep sound. This stick will provide the accurate location and position to the blind person through GPS receiver. A specific area will be programmed for these persons which they use in daily life. The important feature of our project is that a person can change the GPS coordinates in the programming and places names in speech IC anywhere in the world.

5. CONCLUSION

The ultrasonic sensors in the stick sense surrounding and detect the obstacles. The person was informed through vibrator and a beep sound of buzzer. The specific area was programed for determining position. It provided location on the spot. In our hardware representation everything is embedded in a light weight ircuit. The stick is relatively low cost easily affordable and portable, Light weight, and provide safety, support and location. No training is required. Our proposed methodology given a new opening for and expand the area of operation for the visually impaired person by taking outside world as functional area. Before this the blind person was bound to his building premises only. Our idea removes this restriction on him.

REFRENCES

[1] Maties, V., Mandru, D., Balan, R., Tatar, O., Rusu, C. – Tehnologie si educatie mecatronica, Editura Todesco,2001.
[2] Bronzino, J.D. (editor), Biomedical Engineering Handbook, CRC Press & IEEE Press, Hartford, 1997.
[3] Mandru, D., Ingineria protezarii si reabilitarii, Editura Casa Cartii de Stiinta, Cluj-Napoca, 2001.
[4] D. Baldwin, "Wayfinding technology: A road map to the future," Journal of Visual Impairment & Blindness, vol. 97, no. 10, pp. 612-620, 2003.
[5] D. Parry, H. Jennings, J. Symonds, K. Ravi, M. Wright, "Supporting the visually impaired using RFID technology", Proceedings of Health Informatics New Zealand Annual Conference and Exhibition, Oct 2008.
[6] S. Shoval, J. Borenstein, Y. Koren, "Mobile robot obstacle avoidance in a computerized travel aid for the blind," Proceedings of the IEEE International Conference on Robotics and Automation, May 1994.
[7] S. Innet 1, N. Ritnoom 2" An Application of Infrared Sensors for Electronic White Stick" 2008 International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS2008) Swissôtel Le Concorde, Bangkok, Thailand
[8] J. Na, "The blind interactive guide system using RFID-based indoor positioning system," Lecture Notes in Computer Science, Springer Publications, vol. 4061, pp. 1298-1305, 2006.
[9] J. M, Benjamin, N. A. Ali, and A. F. Schepis, "A laser cane for the blind," Proceedings of San Diego Medical Symposium, 1973.