ISSN 2395-1621

Ultrasonic based Cane for Blind and Positioning System

[#1]Prof S. K. Bhatia, [#2]Shete Prasad Ramdas, [#3]Shinde Roshan Shukraji,

[2]roshanshinde73@gmail.com

[#1]Prof. Department of Electronics and Telecommunication
[#23]Department of Electronics and Telecommunication

JSPM's Imperial College of Engineering & Reasearch, Wagholi.

ABSTRACT

The purpose of this project is to develop the Electronic Travel Aid for the blind people. It will involve the ultrasonic technology to be more useful and reliable compare to the classical cane in order to provide fully automatic obstacle avoidance with audible notification. Developments in embedded systems have opened up a vast area of research and development for affordable and portable assistive devices for the physically challenged. Besides, it is design to consume less power, portable in size and has an acceptable accurate performance in object distance.This project aimed at the design and implementation of a detachable unit which acts to augment the functionality of the existing white cane, to allow knee-above obstacle detection. However, due to its inherent limitation, the classical method does not provide the protection for the body. Consequently, there is no guarantee that's the presence of obstacle, can be detected by the blind to avoid a collision. The cane developed helps a blind person find way without any difficulty in terms of improving the social life for the blind pedestrian. The system is also designed to locate the current position of the blind person in case of an emergency.

ARTICLE INFO

Article History

Received :16th March 2016

Received in revised form :

18th March 2016

Accepted : 20th March 2016

Published online :

23rd March 2016

Keywords : **Pic Micro Controller, Moisture sensors, GPS,GSM.**

I. INTRODUCTION

Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The 2014 statistics by the World Health Organization (WHO) estimates that there are 285 billion people in world with visual impairment, 39 billion of which are blind and 246 with low vision. The traditional and oldest mobility aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs. The most important drawbacks of these aids are necessary skills and training phase, range of motion and very little information conveyed.

The simplest and most widely used travelling aid used by all blinds is the white cane. It has provided those people with a better way to reach destination and detect obstacles on ground, but it cannot give them a high guarantee to protect themselves and being away from all level of obstacles. With the recent advances in assistive technology, it is possible to extend the support provided to blind people taking into consideration the concept of the white cane.

Historically, there are various types of assistive technologies that are currently available to blind or visually impaired people. One example is the smart phone, which addresses some of the concerns that the blind and partially sighted people needed in their daily life. The smart phones allow those people to listen to voice mails and even write and send emails. Another example refers to the electronic oriented aids, is the laser or ultrasonic. In this technology, energy waves are emitted ahead, then it is reflected from obstacles in the path of the user and detected by a matching sensor. Thus, the distance to the obstacle is calculated according to the time variance between the two signals.

With the rapid advances of modern technology, both in hardware and software front had brought potential to provide intelligent navigation capabilities.

Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind navigate independently and safely. Also high-end technological solutions have been introduced recently to help blind persons navigate independently .Many blind guidance systems use ultrasound because of its immunity to the environmental noise.

Another reason why ultrasonic is popular is that the technology is relatively inexpensive, and also ultrasound emitters and detectors are small enough to be carried without the need for complex circuit.

The scope of this paper is to develop a low-cost intelligent system capable of assisting the blind and visually impaired without the help of sighted person. The system is a GSM-GPS based so that it takes the advantages of the GSM network such as the popularity and cost-effectiveness.

Additionally, GSM-GPS module have been used in different areas of human activity, such as the navigation of vehicles and navigation aids to guide visually impaired pedestrian and let them to avoid obstacles and reach their destination.

Aim of the Project:

The main objective of this project is to provide artificial guidance to the visually impaired people with the help of a PIC Microcontroller, Ultrasonic Sensors, a speaker physically mounted on a stick.

II. LITERATURE SURVEY

This research intends to bring "intelligence" into the long cane by providing Overhanging obstacle detection capabilities to the cane users. For this purpose, a self-contained, miniaturized ultrasonic ranging module with microelectronics will be designed, prototyped, and integrated into the shaft of a long cane. Upon obstacle detection, a human voice signal, describing in key words the distance and height of the obstacle, will be displayed to provide orientation assistance. Compared to electronic travel aids (ETAs) developed in the past, the "smart" long cane will be ergonomic in design, easy to use, easy to maintain, less expensive, and much more compatible with daily travel situations. It will provide a useful tool to the blind community in terms of increased mobility, which is a prerequisite for employment and an independent, substantial social life.

10% of people considered legally blind also have mobility impairment, leading to reliance on others for mobility. Although there are limited specialty options available for blind people with mobility impairments, people have been successful using the current obstacle detection options like ultrasonic or infrared sensor.

In the paper “Smart cane: Assistive Cane For Visually Impaired People” Mohd Helmy Abd Wahab et.al proposed a study that helps visually-impaired people to walk more confidently. The study hypothesizes that a smart cane that alerts visually-impaired people over obstacles in front could help them in walking with less accident. The aim of the paper is to address the development work of a cane that could communicate with the users through voice alert and vibration, which is named Smart Cane. The development work involves coding and physical installation. A series of tests have been carried out on the smart cane and the results are discussed. This study found that the Smart Cane functions well as intended, in alerting users about the obstacles in front.

In the paper “Design of Microcontroller Based Virtual Eye for the Blind” Pooja Sharma et.al proposed a simple, cheap, friendly user, virtual eye will be designed and implemented to improve the mobility of both blind and visually impaired people in a specific area. The proposed work includes a wearable equipment consists of head hat, mini hand stick and foot shoes to help the blind person to navigate alone safely and to avoid any obstacles that may be encountered, whether fixed or mobile, to prevent any possible accident.

In the paper “Automated Mobility And Orientation System For Blind or Partially Sighted people” Abdel Ilah Nour Alshbatat proposed new intelligent system for guiding individuals who are blind or partially sighted. The system is used to enable blind people to move with the same ease and confidence as a sighted people. The system is linked with a GSM-GPS module to pin-point the location of the blind person and to establish a two way communication path in a wireless fashion. Moreover, it provides the direction information as well as information to avoid obstacles based on ultrasonic sensors. A beeper, an accelerometer sensor and vibrator are also added to the system. The whole system is designed to be small, light and is used in conjunction with the white cane. The results have shown that the blinds that used this system could move independently and safely.

III. PROPOSED SYSTEM

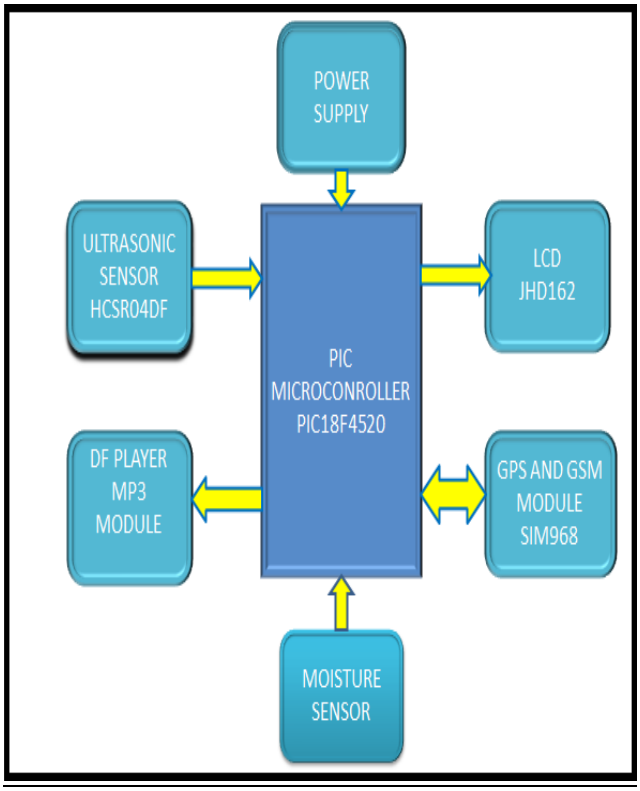

Fig 1. Block Diagram

The blind stick is integrated with ultrasonic sensor along with light and water sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller.

The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it detects water and alerts the blind. One more feature is that it allows the blind to detect if there is light or darkness in the room.

The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept

it. A wireless RF based remote is used for this purpose. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled people.

GPS module used to detect the location of person and accordingly it will send the message through GSM modem to their home. LCD display is used to display location and what microcontroller is processing.

IV. ADVANTAGES AND APPLICATION

ADVANTAGES

I. The system can be used both indoor and outdoor navigation.
II. Blind person's location can be tracked whenever needed which will ensure additional safety.
III. Detects obstacles and alerts the blind person through vibration alert and speech output.
IV. It is battery operated. Hence power consumption is less.
V. Use of additional GPS system allows to locate the blind person easily.

APPLICATIONS

I. This system can be used as a guidance system for humans with no or relatively low eye sight capability.
II. It can also be used for the elderly peoples.

V. CONCLUSION

With the proposed architecture, if constructed with at most accuracy, the blind people will able to move from one place to another without others help. If such a system is developed, it will act as a basic platform for the generation of more such devices for the visually impaired in the future which will be cost effective. And as far as the localization is concerned it will be able to provide accurate details of the location of the blind if in case they lost with help from the GPS. It will be real boon for the blind. The developed prototype gives good results in detecting obstacles paced at distance in front of the user.

The solution developed is a moderate budget navigational aid for the visually impaired. However minimizing cost leads to compromises in performance. It is advised that the design be improved before commercial production. Some improvements that could be made are as follows:

- Increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles.
- Synchronization with external memory to increase the number of routes stored.
- Synchronization with various navigation software applications available on the internet so that new, un-programmed destinations can also be chosen.
- Provision for voice control using speech recognition.

REFERENCE

[1] Mohd Helmy Abd Wahab, Amirul A. Talib, Herdawatie A.Kadir, Ayob Johari, A.Noraziah, Roslina M. Sidek, Ariffin A. "Smart cane: assistive cane for visually impaired people", IJCSI, Vol.8 Issue 4, July 2011.

[2] Yuan, D.; Manduchi, R.; "Dynamic environment exploration using a virtual white cane", in Computer Vision and Pattern Recognition, 2005.CVPR 2005. IEEE Computer Society Conference.

[3] F. van der Heijden, P.P.L. Regtien, "Wearable navigation assistance a tool for the blind" Measurement Science Review, Volume 5, Section 2, 2005.

[4] Abhishek Choubey, Dattatray Patil, "RFID Based Cognition Device for Assistance to Blind and Visually Challenged Persons for Indoor Use", International Journal of Engineering and Innovative Technology (IJEIT) Volume 1, Issue 6, June 2012.

[5] João José, Miguel Farrajota, João M.F. Rodrigues, J.M. Hans du Buf, "The Smart Vision Local Navigation Aid G.Gayathri, IJECS Volume 3. Issue 3 March, 2014 Page No.4057-4061 Page 4061 for Blind and Visually Impaired Persons" International Journal of Digital Content Technology and its Applications Vol.5 No.5, May 2011.

