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Review on Blind People Navigation Using Wireless Sensors.

Sunaina V[1], Vyshnavi R[2], and Ravi T[3]*.

[1,2]BE Electronics and Communication Engineering, Sathyabama University, Chennai, Tamil Nadu, India.
[3]Assistant Professor, Department of ECE, Sathyabama University, Chennai, Tamil Nadu, India.

ABSTRACT

This paper is mainly focused on survey of navigation for blind people. When the blind people fall in any critical position, it becomes difficult to navigate them so in such situation the production of the electronic devices has been implemented. The sensors which will be used will detect the obstacles in the environment. Then the signals will be send to the Computer for processing and hence the information required will be obtained and send to the mobile application. The information which will be received by the mobile application will be converted into voice, and hence it can be used for navigation. Hence proper guidance via voice and hence it helps for navigation. The application generates request from the system which will be receiving the data from different kinds of sensors. Thus, the visually impaired user can make an independent travel.

Keywords: Wireless Sensors, GPS, GSM, Navigation.

Corresponding author

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INTRODUCTION

Based on the World Health Organisation, visually impaired people are around 285 million in number, with 39 million completely blind. It is necessary for independent travel in this busy world[9]. So, it becomes challenging for them to access unfamiliar environments. Though there are many researches taking place from 1960's for navigation which were build using electronic devices. They considered three different categories, namely (i) vision enhancement, (ii) vision replacement, and (iii) vision substitution [4].Independent travel for an individual is very important in the present world, because the world does not have time. As this is a huge problem, the visually impaired find it very difficultfor individual transportation. Even if they find a way to help themselves out, it becomes very difficult for them to afford the price. Hence, it becomes difficult for the blind people to navigate themselves. In order to provide them with feasible navigation, many people have introduced many concepts in order to help the blind people for easy navigation. It is necessary for the blind people to be aware about the outside environment (both indoor as well as the outdoor). Much electronic equipment has been introduced into the world but then only a few have been proven in the real time.

In this survey, there are the usages of much outrageous equipment for the blind people. The basic is to find the location of the person, for that the basic source used is GPS (Global Positioning System). GPS determines the exact location of the exact location of the person with latitude and longitude. Secondly, if the person wants to walk to some location he or she needs to know the directions to reach the desired destination. So, for those different kinds of sensor are been used in order to identify any obstacle like car or a person crossing or a man hole Etc. So, by those the obstacle can be identified and hence the direction can be known by the person using voice technique. Thirdly, when the visually impaired person needs to access the public transportation he or she needs to know where is the location of the bus taking and even the bus number. So, for those again different kinds of sensors like ultrasonic sensor Etc. can be used which can detect the bus and hence converts it to voice which in turn helps the blind person to access the public transport [11].

So, like the above mentioned there are many papers that has done research on these and still doing research to help the blind people for easy access. There are different papers published based up on the navigation for blind people using various electronic and other software equipment's.This survey mainly discusses about different methods used by different authors which have also been tested under many different circumstances. The paper description is as follows, Section 2 consists about the literature survey and the survey concludes itself at section 3.

LITERATURE REVIEW

Samleo L. Joseph et al.(2015) described about the navigation system using two different kinds of sensors namely wearable sensors and social sensors which would help the blind for navigation. They use different method in which the navigation becomes easier. Here they use event summarization algorithm and even Internet of things. The data will be streamed and then the summarization around the world will be taken place. The algorithm will be feasible enough for the output to be obtained. Thus, the navigation will be supported by the output obtained. And when this comes out in the real time it helps the blind people for navigation and hence it becomes easier for their independent travel [9].

Figure 1 shows the navigation using wearable sensors and social sensors. The wearable sensors will be used to find the location of the person standing or located, position of the object, pose of the user Etc., while the social sensors will be used to obtain the information using mobile computing devices. Hence, the mentioned output of the user, such as the location and the other concepts will be obtained, which makes the user to move freely in the environment without any difficulties [9]. The main disadvantage of the usage of the mentioned is that they use only two different kinds of sensors. This might create a problem for the navigation purpose because the whole of the information may not be provided [9]. In this it mainly concentrate on the different types of sensors which are been used and hence developing them without any errors and also providing more different kinds of sensors. The desired output which will be obtained will be used by the user [9].

Pelinangin et al. (2011) explained mainly about the extensible navigation system for the visually impaired. The proposed system mentioned in the paper is easy to use, portable, high quality and can be accommodated by the user easily. Here the GPS is used in order to obtain the location of the user and hence

the position of the user can be obtained so that it becomes easy for the user in order to locate him/her. But the main disadvantage of using the GPS is if the signal is lost due to some obstacles like buildings and other functionalities, then it becomes difficult to locate the person. So, in this project they use more advanced equipment's for developing easy navigation for the visually impaired people [6].

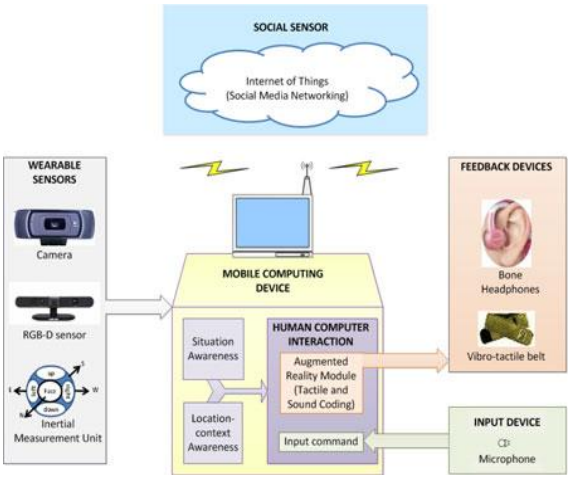

Fig 1. System Architecture

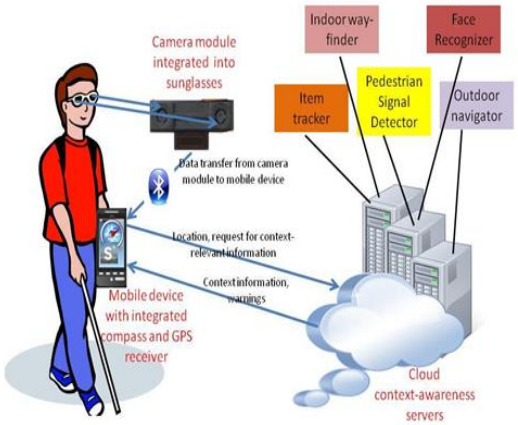

Fig 2. Broad view of the architecture

Figure 2 describes about the navigation system for the blind person. The sensor senses the object which is in in-front of it and hence it send through Bluetooth device to the tracker via cloud. And hence the required output is been received via voice in which the blind person can hear it and then proceed further. So, in such a way the navigation process will help the blind people [6]. This concept is a usage of the combination of the ubiquitous mobile phones and different electronic devices.

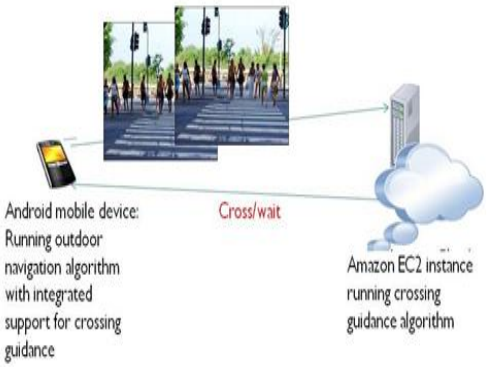

Fig 3. Pedestrian Signal Detector

Fig 4. voice "Seeing with sound" system

Different kinds of sensors and even cloud computing technique have been used here [6]. In this paper they have mentioned that the future work will be using different kinds of obstacles and also usage of well infrastructure-independent indoor route planning as shown in figure 3.

Dimitrios Dakopoulos et al. (2010) described about the navigation for visually impaired people both indoor as well as outdoor environments. Here he uses three different categories of systems, Electronic travel aids (ETA's), Electronic orientation aids (EOAs), and Position locator devices (PLDs). The main concept in this paper depicts about the survey on wearable or portable obstacle avoidance systems. This system is based on the survey that it is done in different categories giving qualitative and quantitative measurements [4]. Figure 4 depicts about the usage of the voice. The glasses used there having the sensors and hence it can detect the object and then the information is obtained via voice to the user [4].

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Fig 5. Virtual acoustic space prototype

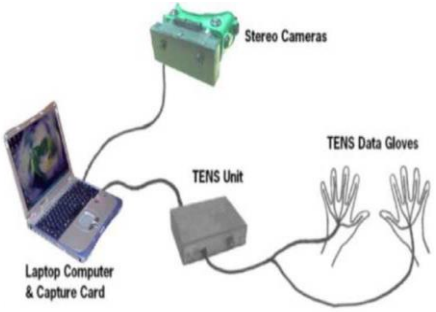

Fig 6. ENVS and its components

Figure 5 depicts the same voice, but then the voice is already stored in the portable voice recorder and hence the voice can help the user for navigation. The processor used here is HRTF which creates the map for distance, sound and Etc. [4]. In Figure 6 they use a stereo camera is used and hence the captured image will be send to the laptop which in turn gets the information and hence using a microcontroller can send the image to the gloves which will be placed. Hence, in such a way the obstacle can be avoided [4].

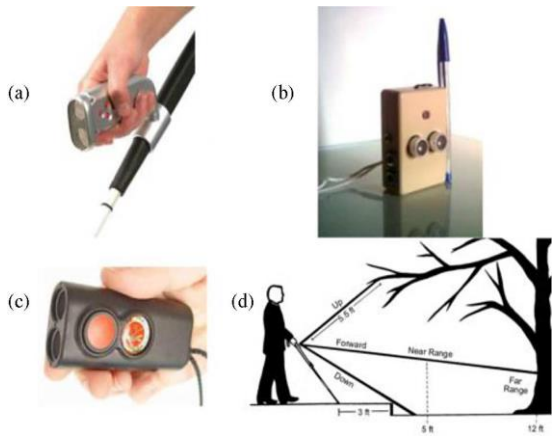

Fig 7. Commercial products (a) K-Sonar Cane
(b) Mini-radar (c) Miniguide and (d) Laser Cane

Fig 8. ETA assistance for blind

Figure 7 depicts about the usage of the portable material which will sense the obstacle and hence determines the distance between the user and the respective object. Hence, in such a way that will be converted into voice message and the user can be aware of the surroundings for the easy travel. The above all which are mentioned can be used in real time environment but then the future work would be, using free hands, free ears, wearable and more simple than the present ones [4].

Bruno Andò, et al. (2011) described about the methodologies for easy communication between the user and the sensors which would help the blind people for easy navigation. The study is based up on the depicting the aids required for the visually impaired [1]. In order to implement the performances for both on environment and the user, the sensor network has been installed and the small signal processing has been used. The applications used are in different fields namely robotics, in living environment, human machine interactions, and for visually impaired people. The main advantage of this project is that it easy to use and the interaction between the user and the environment becomes easy [1].

The system which is mentioned here is easy enough to implement and even the architecture is easy for the user. The outcomes of those are of high possibility and also of updated version and hence they can be used far more easily than the other systems. There is a lot of flexibility and the methodologies used are far easier and used in several applications. Hence as an example it has been used for the visually blind people and even deaf people. Further, the author wants to extend the project using different targets and even using

various paths. The activities which are under this are used to extend the system capabilities especially in terms of the environment perception and also smart paradigms which will be adapted by the user and it is also strongly recommended[1].

V.S.M.Madulika, et al. (2013) described about the object detection using Global Positioning System (GPS). The author mainly focuses about the development about the Electronic Travelling Aid (ETA) kit which would help the blind people for navigation. Here the author mentions about the usage of the stick in which the required equipment is used to connect and hence it becomes easy for the user for navigation [11]. The different kinds of sensors attached to the ultrasonic sensors, sonar sensors, and GPS module and also a vibratory circuit. There are also speakers or head phones and hence all these in turn help the blind person for navigation [11]. This paper mainly concentrated about the smart electronic aid for the blind people who will be used for the object detection using different kinds of sensors and also for the positioning which is done using GPS. When is object is detected the stick alerts the person and also conveys to the blind person with the help of headphones (fig 8). The location of the person is found using Global System for Mobile Communications (GSM) and also Global Positioning System (GPS) [11].

The design and the architecture of the ETA system had a lot of advantages (fig 9). It is of low cost and also it is very helpful for the blind people navigation. The proposed system in this has various working units which can be used in the real-time environment as it is more safe and secure. The main concept for the system is to provide overall object detection and real-time assistance using GPS. The system uses different kinds of sensors like ultrasonic sensors, sonar sensors, and other equipment's which would help the blind for navigation. Hence, the location can be traced and the navigation for the visually impaired person becomes easier [11].

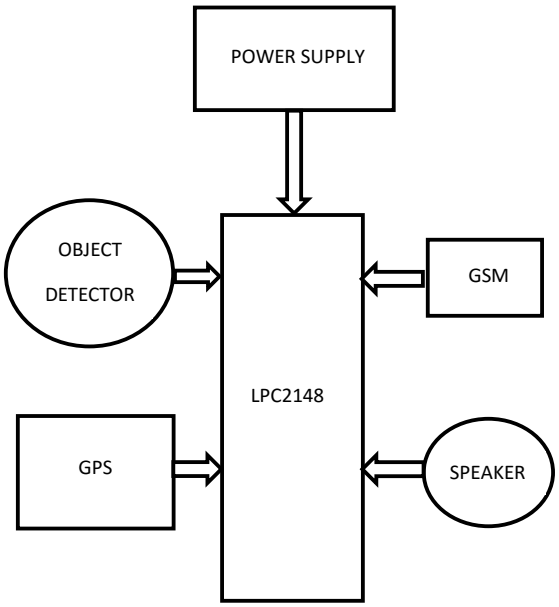

Fig 9.Hardware Architecture

CONCLUSION

The survey described about being aware of the outside situation in which it becomes difficult for a normal to navigate himself, so how the situation would have been for visually impaired persons. So, a survey has been made in order to help the visually impaired person to navigate themselves easily who is very much required in the present world. All the papers and Journals which are been mentioned and explained the different techniques that would help the blind person to navigate themselves. There are varieties of electronic gadgets which would help the blind person in order to find their location and also sense the obstacles which are present in their surroundings. The study has been made and more extension and addition sensors can be taken for more convince.From the complete survey they described about the navigation for blind people, which would help them to move easily in the present world.

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