

Tactile Based Walking Stick For Visually Challenged People

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Abstract—This paper reviews the existing electronic existence for visually challenged people. Blind people often rely on a conventional cane as a support for directing them when they move from one place to another. Visual Impairment is a major reason that hugely diminishes the movement of the people. Nowadays the most widely used mean for the visually challenged are the white cane, but it has its own drawbacks. With the latest technology it has become easier to enhance the support given to the people during their mobility. In this paper an idea is given about a system named voice aided electronics stick, whose objective is to give the users the confidence to move around in unfamiliar environment. This system uses GSM, GPS and ultrasonic technology.

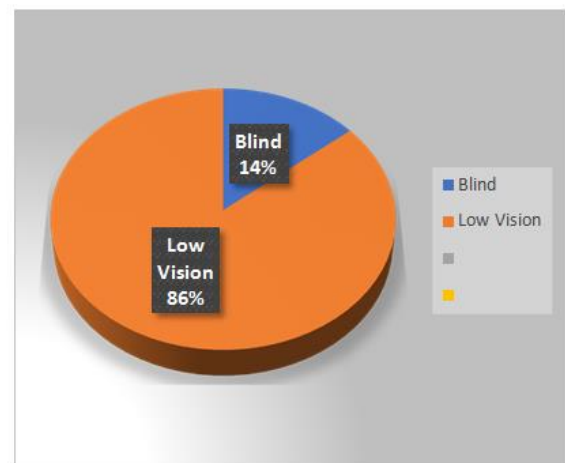
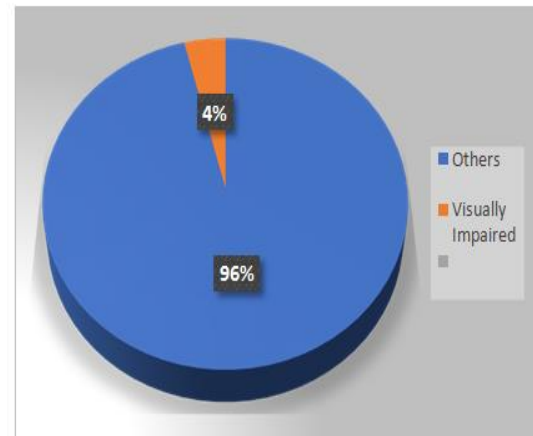
Keywords— *Visually Impaired, White Stick, Navigation System.*

I. INTRODUCTION

According to the latest research most of the information that a human receives is through sight. It accounts to approximately 83%. In accordance to World Health Organization till 2017, total population that was visually challenged in the world is 285 million, in which 39 million are blind and 246 million are light sighted. Everyone is having rights to move freely and securely in their surroundings.

The blinds are deficient to the capacity of freely walking around without a bonus support. Thus the electronic travelling aid (ETA) [1] was found to give the essential aid to the visually challenged individuals. Few ways such as guarding dogs, normal individuals, and different equipment are most commonly used as a support for the blind people. Due to advancement of new technologies, much more civilized equipment based on electronic is taking over the regular methods.

There are various things like browsing the internet, writing a document and sending and receiving emails which a person with vision loss can do. Some devices like Braille, Special talking and Screen Recording Software give access to individuals with no vision to use different tools like computers and cell phones



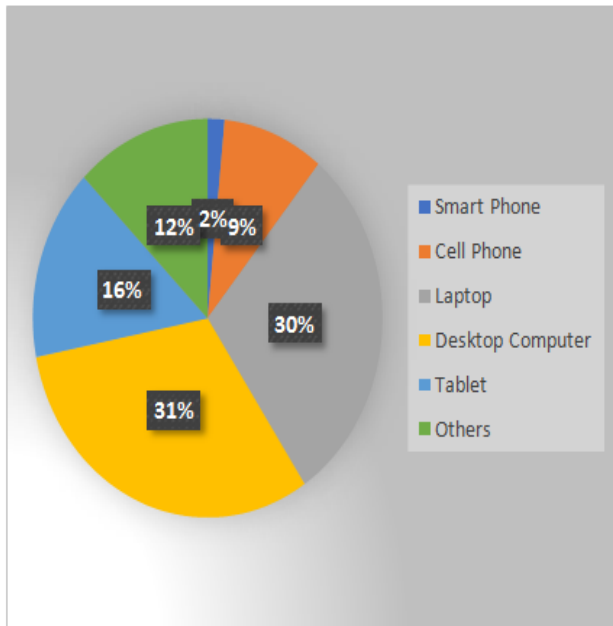
An overview of technology for visually impaired:

- Zoom Text- it magnifies the text and graphical programs. It magnifies the full screen, single line at a time or a portion of a time. It incorporates the window soundcard to utilize the speech functions.
- In LARGE: It is a software package of screen magnification for low vision. It also invert the screen's color, utilizes a tracking, hotkeys, scanning and more advance option.
- Lunar: It is the world's leading magnification program of screen for visually impaired uses of computers. It

contains many advance features to manage the enlargement of screen more efficiently.

- **Intelli-Talk:** It is a word processing program of talking .It allows hearing the letter word or phrase as it is entered into the computer.

Types of Technologies Preferred By Blind Users:



Various identification methods were worked on to find out the obstructions. Sometimes inaudible beams are used to identify the obstruction:

Touch Feedback In [4], electrodes in the data gloves were used in transforming the obstacle information to the pulses that would stimulate the nervous system of the skin. Lately [5] has made a product of thirty six electrodes which transfers the impulses to the tongue as to identify and correct the body language and flexibility for the balance of blind people.

One of the means is the Smartphones, that states few of the major concerns that the virtually disabled and low vision people in their life [6] . Lately numerous electronic travel aids has been outlined for the secured and free travel to the blind. To find out the exact address of the blind, all the major outcomes are dependent on GPS. Whereas, on the other side, various projects were brought into use using different methods like Radio- Frequency identification [RFID], GPS, ULTRASONIC, Laser and GSM for the betterment of the blind people[7, 8,9].

Currently the much more concern is given to the creation of new support for the betterment of visually challenged. There are various systems that relate to the volatility and provide support to them. In [8] the developer takes into use of the location details provided by the GPS by building maps and details to deliver guidance to visually impair within a closed surrounding. Whereas, on the basis of RFID system the support to the blind in the normal daily works [10].The use of on board

sensors in a cane assisted blind people to avoid the obstacle. [11]

For example, “*Navbelt*” was proposed by Borenstien et al that provided a supervision system in Michigan University with the use of sensors [12] . Stereo vision cameras and complex image processing techniques have been used to identify obstacles [13]. A well-equipped audio supervising system with sensors was introduced in [14]. To travel to a local area the user has the system that works on different GPS address details. Using inaudible sensor the distance of the obstruction is calculated on the basis of the echo produced and the signal generated [15]. The “*NAVIT*” system meant to support visually impaired for the detection of obstacles during travel [16].

II. LITERATURE REVIEW

- R. Sowmiya (2014) described a method for encouraging visual impaired people with the help of well-equipped sensor. The distance of object was calculated and measured with the help of inaudible sensors and their distance was calculated using feet measurement. The result was acknowledged by audible representation. Then the earpiece would receive the audio. However this audio guidance system gave importance only to the detection of obstruction and hence was not helping in emergency purposes.
- M.P. Menikdiwela (2013) gave a new idea of a travel support working electronically with tactile overview for the blinds. It consists of inaudible sensors, a motor with vibrations, a regulator and a power supply in it. The difference in power of vibration gave an idea of the distance of obstacle. It does not provide any mental support as it only finds the obstacle in the way. There was also no linkage to direction.
- The Central University of Michigan in 2009, introduced an electronically equipped device (cane) for visually disabled which would provide them with details about the surrounding of the user. They took help of store fronts, similar locations and RFID chips which were implanted into the street signs and the cane collects the details and returns it[17]. It also has facility to detect the obstruction which would come at the head of the device. The Cane, consisting of an inaudible sensor on the top of it, is accompanied by a bag that holds a message, which has a speaker on its strap that alerts on the detection of the obstacle, worn across the shoulder.
- Miguel Farrajota, Joao Jose, Rodrigues, Joao M.F. in 2011 introduced a blue print of a stick. Its size was compact, inexpensive and readily portable travel support. The function of this aid is to address the overall way finding by providing guidance to the user to reach destination and gives local navigation for path’s negotiation, side-walks and corridors and even avoiding the static as well as moving obstacles, a handy computer in a pouch worn on shoulder and just one speaker. The system does not give any hindrance while walking with cane and even does not prevent normal sounds in the surrounding.

- MA., Torres-Gil, Casanova-Gonzalez, Gonzalez- Mora, O., J.L. in 2010 described in detail the development and usage of an artificial reality simulator for blinds. It creates an audio-visual representation of the virtual atmosphere; contribute to the artificial atmosphere completely by hearing. The main purposes of the simulator were :

3D sensor emulation for environment recognition and hardware integration, validation of auditory representation techniques, training of visually impaired users with these new acoustic portrayal, and audio-visual perception experiment that is directed to the improvement of the auditory provision.

- Brian F.G. Katz , Olivier Gutierrez, Malika Auvray, Simon Thorpe(2012) gave an idea about a project NAVIG, which lead towards enhancing the personal rights by a artificially sustained reality system. It included geographic information for improving route selection and guidance. Guidance is provided to the user about his final station through distributed logical audio supply, always stabilized in a reference frame. The objects detected by real time embedded vision algorithms.
- S. Chew in 2012 gave the advance white stick, called Blind Spot that joins GPS, networking and well-equipped sensors that provide help to visually disabled to move public places. The obstruction's location is found by the GPS which alerts the blind preventing to hit it using sensors. However, it is not efficient enough in exactly locating the obstacle as sensors only show the obstacles' distance. [18].
- Shruti Dambhare and A. Sakhare(2011) gave their contribution on virtual perception and identification of object with a real world association via GPS that enables a inexpensive and effective travel support to impaired people that provides an idea of virtual perception by giving details about the closed framework of moving and non-moving objects around their surroundings[19].
- Thanh-Huong Nguyen, Van-Nam Hoang, Nicolas Vuillerme in 2016 brought a convenient system for blind people on the basis of product of electrodes and volatile kinetics. In one of the two components, mobile kinetics was used to capture the environment and analyse to detect the obstructions for blind people whereas the second component aimed at representation of obstacle's details in the form of electrode matrix.

III. PROBLEM IDENTIFICATION

After going through several research paper, we analysed, in certain areas enhancement can be done for having a trustworthy and well-organized stick for blind with advance safety precautions. Some issues that were found in the earlier modules are: RFID can be used for the detection of obstacle prevailing at small distance. It could not be used in larger area and external surrounding due to its higher cost where it needed to be tagged. Hence, leading to lot of chaos due to different

tags. Except to this, usage of tactile included technology will detect the obstruction above the waist and also trigger an emergency will not function pouring a question on safety measures. It will lead to difficulty for impaired people in travelling.

In comparison to other system, the diagnosis of range is not up to the mark as it is shorter while using the audio guidance system. It may lead to fatal collisions when they come across vehicles having high speed.

GPS provides various features. For instance, it is used for travelling purposes and finding the address. But normal aids having GPS does not bring out much difference with advance GPS system used for navigation only if extra facilities could be provided like location detection with the help of trigger button. Getting the distance of the obstacle in terms of the change in the intensity of vibration is not very supportive. It won't be able to provide psychological support making it difficult for the blind people to gain consciousness after finding any obstacle.

IV. SUGESTED IDEA

When we examined thoroughly the previous studies, we found certain disadvantages, on the basis of which, we suggested an advance support electronically efficient stick for visually challenged people consisting some advancement that provides welfare to visually impaired. We took help of GSM and GPS and also well-equipped sensors accompanied by an earpiece working on bluetooth in designing the stick. The soul objective is to show a combination of the mentioned devices which work together for their safety and security.

The extra bonus for them is the combination of GPS and GSM technologies. In case of emergency, the trigger button needs to be pressed by the blind to activate the GPS and GSM. The identification of location of blind is done by GPS and GSM receives it in the form of GSM. The receiver consisting of their family member, a friend and a government organization which works for the blind will get an alert message consisting the location of them.

In addition, sensors that have voice recognition facility is used in detection of obstruction. It provides details about the distance at which obstacle is found. And in consideration to security, thumb print scanner is used which can be activated only by the blind by using their thumb prints. Hence preventing it from misuse by defaulters.

And also the range of detection which is shorter and not good enough to be used in the audio guidance system will be increased for betterment. It will prevent the blind people from fatal accidents when there are vehicles that would come across them with high speed.

Here when GPS and GSM system is used, it has one of its soul purposes . It does not create a chaos while performing different tasks at a time like a normal GPS tracking system. The trigger used here with the help of GPS system will prevent any unwanted obstruction or psychological barrier for the blind people.

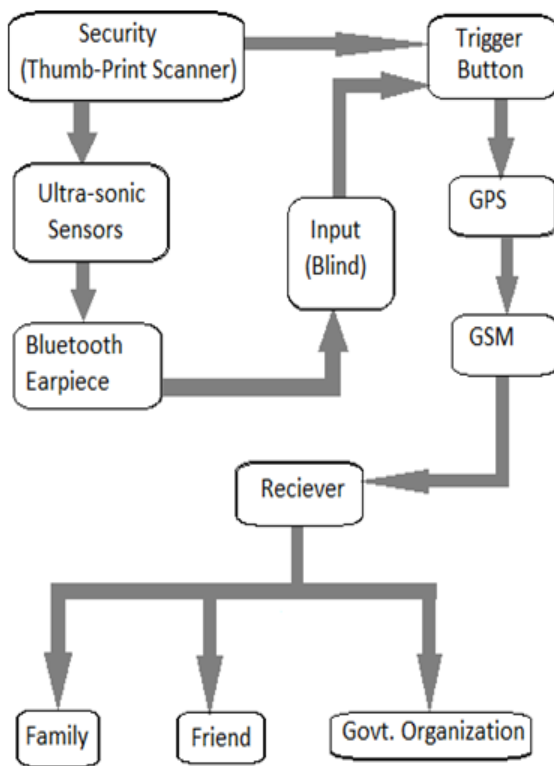


Figure 1: Block Diagram of proposed system.

V. CONCLUSION

This study investigated the different type of difficulties and technical help that blind people experience while interacting with the environment. In addition to this paper investigated the previous electronic support for visually challenged and do not state any execution able output. On the basis of limitation in prevailing work, the use of modern technology like GSM, GPS, Bio-Medical verification aid and ultrasonic sensors for the blind people is advised. Its main aim is to develop emergency trigger system along with the design.

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