Recent Approaches on Navigation Gadget For Visually Impaired People

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Abstract : In modern countries, few young people are blind. Blindness is caused by diseases and malnutrition of old people, like cataracts and trachoma. The World Health Organization (WHO) estimates that 80 percentage of visual impairment is either preventable or curable with treatment. Sometimes people are born blind. Blind people use things such as alphabet in braille and guide dogs to do everyday life activities. They use audible cues like traffic noise to determine when they think it is safe to cross the traffic and then signals their dog to move forward. If a car is coming, the dog will refuse to obey the command. In this paper several techniques are discussed in order to help the visually impaired to detect obstacles and provide path information to their required destination.

IndexTerms **- Navigation gadget, Headset, Walking stick, Ultrasonic sensors, Raspberry pi, Discrete Cosine Transform**

I. INTRODUCTION

Blindness is the circumstance of lacking of visual belief. This could be due to neurological factors or physiological factors numerous scales had been developed to describe and define blindness. Total blindness is the complete lack visual light belief. About 37 million people across the whole world are blind in which, over 15 million are from India. Most blind human beings presently rely upon different humans or dogs, while nowadays most of the disabled people prefer to do things by themselves rather than depending on others.

There are several gadgets accessible to give the guidance to the impaired people to go to a remote location, yet these gadgets are either costly or they make utilization of Braille interface. In early circumstances the visually impaired people used dogs or walking stick to help them in detecting obstacles. The stick cannot scan the entire platform as such and it simply go as a device to help individuals from risk while street crossing and in movement zones. Face appearances provide a vital measure for the investigation of feeling. Hence automatic facial feeling detection systems can successfully be utilized to understand the feeling activity of a person. The feeling identification can help the visually impaired people to collect the exact feeling of stranger talking to them.

Electronic Travel Aids (ETAs) is one gadget that warns the user with the assistance of specific signals either the sound waves or by the physical interaction with people such as vibratory patterns. Some navigation system has proposed solutions for visually impaired in their route by utilizing RGB sensors and ultrasonic sensors for identification of objects. Comparative work with GSM and RFID to recover area information for the blinds, and one more proposed solution uses RFID, ZigBee and FM transmitter and receiver for the data transfer [1]. There are numerous systems designed to help in the navigation of the visually impaired.

The facial appearances not just express our feelings, yet in addition provide essential conversational clues in the social communications, such as our level of passion, our eagerness to make speech and a nonstop feedback signaling about the understanding of the information conveyed. It is considered that facial appearance has a great effect on a listening interrogator; the facial expression of a speaker accounts for about 55 percent of the effect of the communicated message, 38 percent of the latter is conveyed by voice intonation and 7 percent by the spoken words. In this paper, a Navigation System is proposed to guide the visually impaired along with emotion detection with facial features, to extract the emotion on the person in front. Psychological theory states that human emotions can be classified into six archetypal types: anger, happiness, surprise, fear, disgust and sadness.

The related work is explained in the Section II. Section II A discusses the papers related with object detection and navigation. The papers related to emotion is discussed in Section II B.

II. LITERATURE SURVEY

In an uttering computing world, information about location and position is necessary to find blind people because they may get lost. Numerous applications have been developed for finding the location. From the survey of World Health Organization, in the year of among 7 billion human populations 285 million people are blind and which 19 million are children who are below 15 years. Current statics enforce that India ranks one among the blind people population. There are many IOT products that help them to find objects ahead them. Most of them are related with RFID technology and ultrasonic sensors. Emotion detection techniques are also addressed in the literature survey along with the navigation technologies to identify the emotion of persons talking to the visually impaired.

A. ***Object Detection and Navigation***

Sathya Mala et al. [1] developed a gadget that is, a walking stick and a Bluetooth headset. It guides the blind people to find their way in this busy world. This gadget helps them to reach their destination by commanding through voice recognition system. The stick is appended with an ultrasonic sensor. The recognized obstructions are told to the user with help of certain physical vibration. The quality of the vibration is relative to the intensity of the reflected wave. If the object is closer then, the quality of the vibration is more when compared when the object is placed at a distance more than 10m. The range of object recognized closer to the user is informed to them with help of vibration signals. Stronger the vibration more closely the object and smaller the vibration farer is the object. The GPS on the walking stick helps the visually impaired individuals to distinguish their present location. The headset and the walking stick are matched using Bluetooth Stick. The GPS-GR 87 distinguishes the present area and furthermore recognize the way to the address got through the Bluetooth. Route to their destination is conveyed to them through voice recognition system available in navigation system. Here an ultrasonic sensor is also used for object detection.

Chaitali Kishor Lakde et al. [2] proposed a method developing a shoes model and portable audio playing device, for guiding the blind person to move on different surface and in various paths. This is done by making a combination with the visual detecting technologies, object finding technology and the voice guidance technology. The system comprises of designing and building up a shoe having numerous depth, obstacle detection and RGB sensor and furthermore control board to detect numerous level of barriers on the floor. It likewise builds up a sound recording and playing module for voice assistance purpose. The system is designed by utilizing an IR sensor, RGB sensor, Processing System and a Response system. Visually impaired person are alerted from obstacles in their way by the IR sensors. These IR sensors are associated on font, left and right side of a shoes to accurately identify the position of obstacle. RGB sensor is used to identify obstacles relying on its red, green and blue color intensities of obstacles. The discovery is done by the red, green, blue color level from reflected light at the boundary of obstacle .The disadvantage of the system is that it can be only used in known environment.

Arjun Sharma et al. [3], proposed a navigation system having four IR sensors and one ultrasonic sensor. The IR sensors gives the information regarding to the obstacle that comes in route. IR sensors identifies the obstacle and corresponding audio information are send by earphone. The Left side, Right side or the bottom side obstacle are detected by the sensor and audio information are conveyed by earphone. The ultrasonic sensor provides the information about the object in straight, or whether the object is movable or not and corresponding message is conveyed by earphone. The ultrasonic sensor gives the message that depicts the distance of the object from the user. The principle functions of the system are to provide clear way sign and environment recognition. The visual information obtained by the ultrasonic sensors is converted into sound related data. The user can identify the environmental information by the binaural sound created by the system. Ultrasonic sensor transmit waves continuously with high frequency. When an obstacle comes in the way of signal then, it will reradiate the signal. Subsequently ultrasonic recipient receives low frequency signal as compare to transmitted waves. The range of US sensor is three centimeter to three meter and frequency range is 100 KHz to 50MHz. Frequency transmitted by IR is of 30 KHz. The disadvantage of the system is it is difficult to identify one's location globally.

Jin Fukasawa et al. [4], the system is composed of colored navigation lines, RFID tags and an intelligent white cane. The intelligent white cane incorporates a RGB color sensor, a transceiver for the RFID tags, a vibrator and a voice processor. These gadgets are appended to the white cane. This system has some colored tapes that are determined to the floor along the walking routes. Each color is allotted for every direction destination. This system can the detect user's direction. At a point when a user diverts opposite direction from destination, the white cane leads the user to his/her right route. When there are numerous destinations, different color is assigned for each route. On each route a RFID tag indicating area code is set on the navigation path. A color sensor introduced on the tip of a white cane detects the color of a navigation line. When sensor identify the target color, the impaired person will be advised by the white cane that he/she is walking along the correct navigation line by providing vibration. The disadvantage of the system, it can be used only in known environment.

The Deepika et al. [5] plans and built up a visually impaired stick for the convenient navigation in public areas. The stick is incorporated with an ultrasonic sensor accompanied with the light and water sensors. The ultrasonic sensor recognizes the obstacles using the ultrasonic waves. The microcontroller then process the detected data and generate a buzzer sound when the object is near. It also generate a different sound on the sensing water. The system also helps the user to identify weather the room is in dark or light. Information's regarding the environment is provided by the light sensor. The light sensor informs the user weather it is a day or night or weather he is in a dark or bright room. The moisture sensor is utilized to identify water pits on the floor. These signals obtained is then sent to the microcontroller, which in turn is sent to the buzzer to generate an alert to the user. There is one more advantage, sometimes when the blind loose there sticks or forgot where they have put it, they can find it by using the wireless remote. Since this is developed in low cost, it reduces the performance of the system.

Kanchan et al. [6] is a framework which is designed for the visually impaired people or blind people, to enable them to discover the way from the current area to the deserved area. The system also provide the information about the obstacle placed in a way or in a liable bound. The VIAS comprises of a convenient and low power cane mounted RFID reader for retrieving the tag information and sending it remotely to the server database. For communication there are two ZigBee transceiver modules. These modules are then merged with the reader circuit and the database server PC for data transmission. The got tag ID is searched in the database and it's relating content data is retrieved. The text data is received by the user in an audible form through server ZigBee. The disadvantage is delay in communication on using ZigBee.

Mohsin Murad et al. [7] introduced an RFID based solution for visually impaired to identify obstacles in a house or a class room. It consists of a compact and a low power RFID reader for extracting tag information. These information are transmitted wirelessly to the

database server. Here two ZigBee transceiver modules are used, one is integrated with the reader circuit and other with the personal computer for data transmission. The reader, reads the information stored on the tag and transmits it to a nearby server using the ZigBee module. On the server side, the obtained tag ID is searched in the database. Corresponding to that particular tag ID, an audio file is extracted and transmitted through FM band. The blind person is handed with a low power FM receiver headset tuned with the transmitter frequency. The FM transmitter module reduces the broadcast/reception of the message to unknown targets. The problem of the system is that can be used only in areas where the RFID tags are placed.

Amit Kumar [8] introduced an embedded e Box 2300. It is a small (4.5 x 4.5) low-cost X86 processor based embedded computer system. Here to detect the objects in the way of the blind person ultrasonic sensors are used. The ultrasonic sensors are integrated with the sensor circuit. Sensor unit consists of three subunits. They are transmitter, receiver and processing units. 40 kHz ultrasonic signal is generated by the transmitter unit. The reflected echo signal is received by the receiver unit. Finally, the time difference between the transmitting and receiving pulses are computed by the processing unit. The sensor unit provide a pulse count as its output. The pulse count is the raw distance data. These counts are processed in e Box 2300 to the compute actual distance. This distance data is then given through a RS-232 serial cable to e Box 2300. The e Box 2300 is connected with an USB webcam for capturing the line of sight of the blind person. A human being is located based on this line of sight. The e Box 2300 is also connected with a headphone to get the audio feedback of the obstacle distance and presence of human being. Here the obstacles in the way of the blind person is noted using ultra sonic sensor. The system detects the obstacles only up to 300 cm.

Kassim et al. [9] proposed an assistive navigation device. The device is described and constructed for visually impaired or the blind people. The device will allow the impaired to travel comfortably from one place to another by providing verbal guidance. The assistive navigation device can be developed by redesigning the traditional white cane. It is a device consisting of RFID Tag Reader and a sound control system implanted in the device. A special solid surface has been designed, where RFID Tag is placed beneath the walkway to give data regarding the area and surrounding environment. The RFID Tag stores the current area and direction to advise the impaired to move inside the walkway in the true direction.

B. Emotion Recognition

Chavan et al. [10] proposes the development of a robust actual time implementation of a facial recognition system. It detects the facial expressions, detect human face and code the expression dynamics. It can also detect the frontal image from the fetched image and arrange them to the 7 dimensions in actual time, which include anger, neutral, disgust, fear, joy, sadness and surprise. Here the RGB images are converted to the binary image. From the obtained binary image the eye and lip portions are extracted, since more emotions are concentrated there. For eyes detection RGB image is converted to binary image and then scan image from W/4. The rest of the width is used to identify the middle position of the eyes. For left eye search ranges from W/8 to middle position between eyes of the image. For right eye from mid of the image to W-W/8 of the total width. Next, we determine upper position of the two eyebrows. Bezier curve is then calculated for the extracted lip and eye areas. Bezier Curve include interpolation, approximation, curve fitting, and object representation. These Bezier curve value are then compared with the data base values to extract the exact emotion. If the input doesn't match with the values in the database, then average height for each emotion in the database is calculated. The decision regarding the emotion depends on the average height.

Fatma Guney [11] is a facial emotion recognition system. Here, from the input image, the face and eye areas are detected. The detection is based on modified census transform (MCT). For face representation a local appearance-based approach is used. The face is divided into non-overlapping blocks and feature extraction is performed on these blocks. When there is a change in appearance of face due to occlusion, local blocks provides advantage because only the related region of block or blocks are affected. For feature extraction on the local regions, discrete cosine transform (DCT) is used. DCT is used for the facial image analysis because it provides frequency information in a compact representation. Lip is another area that carry more information regarding emotions. To determine the lip portion the distance between forehead and eyes are considered. Sum of these obtained dimension is the upper height of lip box. The lower height of box is the lower end of the face. This distance is then added to the lower point of eye. After detection process, alignment based on eye coordinates is applied to scale and translate face and also to reduce variances in feature space. This aligned face image is then divided into local blocks and then discrete cosine transform is performed on these local blocks. Then on concatenating the features of each block, an overall feature vector is obtained. These feature vector are classified using the Support Vector Machine (SVM) classifier.

Table 1 Comparison Table

Author	Topic Name	Advantage	Disadvantage
Argun Sharma [3]	Blind Audio Guidance System	Reduce training time	Difficulty to identify one's location globally
Jin Fukasawa[4]	Navigation System For Visually Impaired An Intelligent White Cane	Simple	Used in known environment only
Deepika. S [5]	Ultrasonic Blind Walking Stick	Developed in less cost	Reduce performance of system
Kanchan M. Varpe [6]	Visually Impaired	Low cost	Delay in communication

	Assistive System		
Amit Kumar [8]	Electronic Travel Aid for Navigation of Visually Impaired Persons	Small light sized device, affordable	Limited memory
Mohsin Murad [7]	An RFID Based Navigation and Object Recognition Assistant for Visually Impaired People	Easy and simple	Covers only limited environment

III. CONCLUSION

Visually impaired people prefer to use electronic aids, canes or guide dogs for obstacle detection. The reasons for this include the relatively high costs and poor levels of user satisfaction associated with existing electronic systems. There are many techniques discussed in this paper to help in the navigation of the visually impaired. Some of the navigation systems are designed to help the visually impaired people to discover their paths. These systems can help in both navigation and also object detection. It can also be used by the visually impaired people to identify the emotions of the persons talking to them. Most of the systems are developed in a low cost and in a user friendly manner with greatest possible level of accuracy.

REFERENCES

[1] N. Sathya Mala, S. Sushmi Thushara, Sankari Subbiah, "Navigation Gadget for Visually Impaired Based on IoT", Second International Conference on Computing and Communications Technologies (ICCCT17), 2017.

[2] Chaitali Kishor Lakde," Navigation System for Visually Impaired People", International conference on computation of power, energy, information and communication, 2015.

[3] Arjun Sharma, Rahul Patidar, Shubham Mandovara, Ishwar Rathod, "Blind Audio Guidance System", International Journal of Emerging Technology and Advanced Engineering, Volume 3, Special Issue 2, January 2013.

[4] A. Jin Fukasawa and Kazusihge Magatani, "A navigation system for the visually impaired an intelligent white cane", 34th Annual International Conference of the IEEE EMBS San Diego, California USA, 28 August - 1 September, 2012.

[5] Deepika S, Divya B.E, Harshitha K, Komala B.K, Shruthi P C, "Ultrasonic Blind Walking Stick", International Journal of Advance Electrical and Electronics Engineering (IJAEEE), 2015.

[6] Kanchan M. Varpe and M.P. Wankhade, "Visually Impaired Assistive System", International Journal of Computer Applications (0975 8887), Volume 77 No.16, September 2013.

[7] Mohsin Murad, Abdullah Rehman, Arif Ali Shah, "An RFID Based Navigation and Object Recognition Assistant for Visually Impaired People", 978-1-4577-0768- 1/11/26.00 2011 IEEE.

[8] Amit Kumar,"An Electronic Travel Aid for Navigation of Visually Impaired Persons", DOI: 10.1109/COMSNETS.2011.5716517

[9] A.M Kassim, H. I Jaafar, M.A. Azam, N. Abas, "Design and Development of Navigation System by using RFID Technology", 2013 IEEE 3rd International Conference on System Engineering and Technology, 19 - 20 Aug. 2013, Shah Alam, Malaysia.

[10] P. M. Chavan, Manan C .Jadhav, Jinal B. Mashruwala, Aditi K. Nehete, Pooja A. Panjari, "Real Time Emotion Recognition through Facial Expressions for Desktop Devices", International Journal of Emerging Science and Engineering (IJESE) ISSN: 23196378, Volume-1, Issue-7, May 2013.

[11] Fatma Guney, "Emotion Recognition using Face Images", guneyftm@gmail.com