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Survey on Smart Assistance for Visually Impaired Person

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Abstract - In this era where the technology is playing a vital role in human life to manage their day to day activities. It helps the normal human beings, but when it comes to visually impaired persons they find it difficult to adjust to the new technologies. Most common problem which they are facing is in terms of navigation. Blinds depend on an ordinary stick for finding obstacle but it is still risky in some of the environments. In order to overcome this problem most of the prototypes have been proposed which helps them to adjust to the newly changing environment. This paper gives the overall view about the prototypes which are helpful in assisting the visually impaired person.

Key Words: Blinds, prototypes.

1. INTRODUCTION

As per the World Health Organization statistics there are 39 million people who are blind. Different people are facing different types of blindness such as night blindness, color blindness etc. The ones who are partially blind are somehow managing their lives but when it comes to a person who lost his sight completely it becomes very much difficult for him to sustain in this modern era. In order to help these visually impaired persons few systems are designed. This paper gives information about the devices which are specially designed to assist visually impaired people.

2. LITERATURE REVIEW

2.1 Devices designed for detection, navigation and to alert blind

[1] Proposed a technique for detecting the obstacles, darkness and to track the visually impaired person. GPS module is used for tracking the user. Camera is used for capturing the images with the help of these images user will come to know what the obstacle is whenever the Infrared Sensor detects the obstacle. Darkness is found out with the help of Light Dependent Resistor. These alerts will be given to the blind through headphones. This device is portable and moreover it works even without connecting to the internet.

[2] This system is specially designed to track the visually impaired person. It facilitates in communicating the panic messages to the respective caretakers along with the current location. This enables the visually impaired person to walk independently through map directions.

[3] Here obstacle detection is done through the ultrasonic sensor which detects the obstacle as well as hole. Water detection is done with the help of moisture sensor. To get back the stick whenever it gets misplaced radio frequency transmission is used. All these modules are controlled by arduino. It uses GPS for tracking and GSM for sending alert messages in critical conditions.

[4] This approach uses ultrasonic sensor to detect obstacles such as pits, pebbles etc. Water sensor detects the water spreads. Alert is given to the user whenever the detection is found, buzzer starts buzzing when obstacles are detected. Radio frequency transmission is used to find the misplaced stick. GPS tracks the blind person and GSM sends the alert message to the concerned users.

[5] Here haptic feedback is used which supports Bluetooth as well as USB communication. Two separate controllers for USB and Bluetooth communication are used. Computer communication network transmission protocol is used for acknowledgment in order to prevent message drops. It uses kinect sensor which gives depth data by IR projector which emits different patterns. Kinect sensor detects humans. For example if human weaves his hand it is informed to the user through headphones by which blind comes to know a human is present in front of him.

[6] Multi sensor probe is used in this device which performs task of human detection whenever the user is walking in the crowd. PIR sensor uses infrared radiation to detect the movement of the person. Sonar module provides the target distance and the velocity which helps in calculating the actual distance.

[7] Here obstacle detection is done through ultrasonic sensor and infrared sensor. Buzzer alert is given in different duration for different distances. Buttons are placed for the

user navigation. Whenever the button gets pressed the user is informed about the directions from Google maps through voice assistance. Messages are sent to the registered numbers by Bluetooth module with the exact location which is provided by GPS.

[8] Android application which has the ability to detect color, light, object and banknotes. Light detection is done by embedded light sensor and the beep sound is given for different light intensity. Color detection uses RGB values. Bank notes which are detected are identified with previously stored database. These detections are informed through text to speech.

[9] Here, two ultrasonic sensors detect obstacles and moisture sensor is used to find water spreads. User is alerted about the detection with voice output. Data is uploaded to the cloud by using Thinkspeak.

[10] Obstacle detection is done with directions as front, upper and side with the help of ultrasonic sensor. Vibration alert is given to the user when the obstacle is detected. User location is tracked by GPS module.

[11] Robot technique which has video processing module where the video is recorded. Images will be captured from the video and face detection is done with the help of face detection library present in it. Laser sensor detects the depth map and camera is used to detect the obstacles. Decision module guides the robot with the detection output.

[12] Smart glass and walking stick are used. Obstacle detection is done by the smart glass and walking stick reminds the blind about the obstacle. In case of collision, information will be sent to the caretakers through online platform.

[13] Two sensor arrays are used one for receiving and other for transmitting the signal. Receivers will detect the signal of the emitter. This helps in finding the distance range. The device detects the actual target distance. From this, expected distance and actual distance are measured and it is matched.

[14] Obstacle detection is done in three directions namely right, left and front by using ultrasonic sensor. Buzzer will alert the blind when the obstacle gets detected.

[15] Device uses RADAR architecture in order to detect obstacles. It is based on transmitter and receiver sections of the RADAR. The advantage of the device is miniaturization and portability.

[16] Here tutor uses the touchscreen keyboard to teach the blind students where the information will be passed to the microcontroller. Students in the receiver end will receive the data in tactile display. By using this technique multiple blind students can be trained with the help of single tutor.

[17] An application with text to speech technology. The users who want to assist the blind should type the message which will be converted to speech. Blind person will have earphone to hear the voice message.

[20] Based on the construction of the building by determining the direction and the distance of movement, location of blind will be tracked. Data is captured and processed in different stages and a map is generated for the blind to help his navigation. It helps for the indoor navigation of the blind.

[22] It works on echolation and image processing. Images are captured by image sensor. These captured images are used to identify the static and dynamic objects. Ultrasonic sensor detects the obstacle and the distance will be calculated. GPS module helps for the navigation of blind.

[23] It is designed for outdoor navigation. It has buttons to perform different actions. SETUP procedure, navigation, help, emergency and vision system are performed upon pressing the relevant buttons. This prototype is still in initial phase and can be improved better.

[24] Here, blinds were asked to take photographs and the results were quite inaccurate. As per the testing results blind were able shoot videos easily than capturing images. It has the future work where blind can register the images on their own.

[26] They have tested with multi-floor buildings as well as underground passageway. They have estimated and calculated the error between estimated and actual locations. This prototype is helpful for navigation in huge building complexes.

[29] Ultrasonic sensor detects obstacle. Level crossing guidance is given through Reflective Infrared Sensor. Wifi module helps to upload current position of data to the cloud. Navigation assistance is given through headphones. Vibration alert is given to the user which helps him in the noisy places where it is difficult to hear.

[30] This technique is to detect oncoming buses. Road area detection and static obstacle detection are the two main aims. RGB format is used for the road detection. Static

obstacles are identified by using gray scale segmentation, vertical projection and consideration of the vertical projected signal.

[32] Device is a wheel chair which has ultrasonic sensor for obstacle detection. It uses infrared sensor for tracking line so that wheel chair moves in a accurate path. User must move in a path where he is asked to move. This device makes the blind independent to travel.

[33] This paper is based on RAMPE research project. RAMPE is of two parts one is fixed at the bus stops and the other is carried by the user. Base station generates vocal messages and sends to the user's device which is Personal Digital Assistant. To communicate with the base stations text to speech is used.

[35] This prototype detects the obstacle and calculates the actual distances. Smartphone is connected via Bluetooth module and the information will be retrieved through this.

[36] Detection is done by using Convolutional Neural Network. Testing is done by using different entities such as mug, ball and human. As per the testing results its accuracy is 80%. It is more accurate and efficient.

[37] It helps the blind to find the nearby pedestrian signal which helps him to cross the road. Kinect sensor is used to get the depth and color image. Soon as the image is detected GPS guides the blind to the exact location of the pedestrian crossing.

[39] Robot is used to assist the visually impaired person. It guides the user about the obstacle which is present ahead of him. In case of climbing it informs the user whether he needs to use stairs or to take elevator.

[40] Electromagnetic sensor is used for detecting the obstacle in front of the user. To detect obstacles at different heights radar is used. This device is cost effective and can be used to assist the visually impaired person.

[41] This paper helps the blind to read texts present in the image. It consists of laptop, camera and voice synthesizer. Camera has zooming option to capture the texts. Based on the FDR method texts are detected. It is still in initial phase and not yet suitable for practical use.

[42] RGB-D camera detects the obstacle along with their size, velocity and positions. It provides navigation assistance with fuzzy integral-based gaze control in dynamic indoor environment. Notification about the obstacle is given with the help of vibrotactile vest.

[43] This technique helps the blind in shopping areas. Web cam takes the snap and the images will be stored. When the user walks barefooted his foot position, size will be measured through Gait detector with the help of pressure sensor. Height of the person is measured through laser range finder device. Assistance to the user will be given through microphone.

[44] Here, products expiry date will be known to the blind with the help of barcodes. This prototype helps the blind to scan the barcode with the help of voice feedback which will be giving him the directions. In case of multiple products the product with highest priority will be considered.

2.2 Devices assisting with smartphones

[18] It is based on signal frequencies where receivers are placed inside the room or place. Smartphone will be carried by the user. Acoustic signal which is emitted by the smartphone is received by the receivers. Here path estimation is based on receiver positions. Error approximation is calculated between estimated path and the actual path.

[19] QR codes are placed in the floor sections and an android phone will be carried by the blind. This QR codes when they gets scanned helps the user to move in a shortest path. It also informs about the deviation when he gets deviated from the actual path.

[21] Obstacle detection is done by ultrasonic sensor. Bluetooth is used for the connectivity with smartphone. Vibration alert is given when the obstacle is detected. This device has buttons for location, speed dial, time and power off. Data will be uploaded to the cloud and controlled by the authorized users.

[31] Smartphone is used to record and process images. It detects both static and dynamic objects. Images will be captured in a sequence and are converted into video of five minutes duration. Video consists of different moving objects which helps the user to detect the moving objects.

[45] Mobile application through which the users are interacted and the images are generated. Blind is assisted through voice feedbacks. Through computational software most of the mathematical equations were worked by using an algorithm. By this application visually impaired students will be trained mathematics.

2.3 Devices using RFID technique

[25] This technique uses RFID reader. RFID tags are placed on all the objects. RFID reader reads the tag and informs the user about the thing through the audio source which helps the blind person for indoor navigation.

[27] Text in the book is converted into voice as well as braille which help the blind to understand through hearing. It used RFID for obstacle detection. It also identifies the person and currency which is informed to the blind through audio. This device is multi-functional and helps the blind in many ways.

[28] Here RFID technique is used along with GPS. RFID tags will be placed in the places where the blind will move. Soon as the RFID tags are read the system informs the user about the location based on the previously stored data.

[34] It is an Indoor Anti Collision system which uses RFID. RFID tags are placed on the user clothes and the signals are tracked. Fingerprints are used to determine the distance between the obstacle and the user. As most of the devices use video monitors which destroys blind's privacy, this system gives them privacy and has high accuracy.

[38] This technique helps the blind to shop the things independently in malls. RFID is used to guide the visually impaired person about the nearby stores inside the mall. It informs about the opening and closing time of the store which helps him to purchase with ease.

3. CONCLUSION

In this article, I have surveyed the systems which are designed to assist the visually impaired person. This paper gives an overall view of the prototypes which have been implemented and yet to implement. Survey of all the assistive devices which helps the visually impaired person has been done. It consists of problems which the visually impaired people are facing in their day to day life and solution to these problems has been given. Based on the survey the systems are advanced to help the blind in various fields so that they can be independent and do their work on their own.

REFERENCES

[1] Joe Louis Paul I, Sasirekha S etal "Smart Eye for Visually Impaired-An aid to help the blind people" Second International Conference on Computational Intelligence in Data Science (ICCIDS-2019).

[2] Priscilla Ebenezer.R, Vishnu priya.M, and Nivetha.B, "GPS Navigation with Voice Assistance and Live Tracking for Visually Impaired Travelers" IEEE 6th International Conference on smart structures and systems ICSSS 2019.

[3] Mrs. S. Divya, Jawahar Akash etal "Smart Assistance Navigational System for Visually Impaired Individuals".

[4] Mukesh Prasad Agrawal and Atma Ram Gupta "Smart Stick for the Blind and Visually Impaired People" Proceedings of the 2nd International Conference on Inventive Communication and Computational Technologies (ICICCT 2018).

[5] Danish Ali, M. Faisal Riaz etal "Bionic Kinect Device to Assist Visually Impaired People by Haptic and Voice Feedback".

[6] B. Andò,"A Smart Multisensor Approach to Assist Blind People in Specific Urban Navigation Tasks" IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING, VOL. 16, NO. 6, DECEMBER 2008

[7] Akshay Salil Arora and Vishakha Gaikwad "Blind Aid Stick:Hurdle Recognition,Simulated Perception,Android Integrated Voice Based Cooperation via GPS Along With Panic Alert System" 2017 International Conference on Nascent Technologies in the Engineering Field (ICNTE-2017)

[8] Milios Awad, Jad El Haddad etal "Intelligent Eye: A Mobile Application for Assisting Blind People" 2018 IEEE Middle East and North Africa Communications Conference (MENACOMM).

[9] Kabalan Chaccour and Georges Badr "Novel indoor navigation system for Visually Impaired and blind people".

[10] Kabalan Chaccour and Georges Badr "Computer vision guidance system for indoor navigation of visually impaired people" 2016 IEEE 8th International Conference on Intelligent Systems.

[11] Gaurao Chaudhari and Asmita Deshpande,"Robotic Assistant for visually impaired using Sensor Fusion".

[12] Liang-Bi Chen, Jian-Ping Su "An Implementation of an Intelligent Assistance System for Visually Impaired/Blind People".

[13] Bruno Andb, Salvatore Graziani etal "Development of a Smart Clear Path Indicator" IMTC 2004- Insuumentaiion and Measurement Technology Conference C O ~ O .It aly. IX-20M ~2Y00 4

[14] Naiwrita Dey, Ankita Paul, etal "Ultrasonic Sensor Based Smart Blind Stick" Proceeding of 2018 IEEE International Conference on Current Trends toward Converging Technologies, Coimbatore, India.

[15] Valentina Di Mattia, Giovanni Manfredi, etal "A Feasibility Study of a Compact Radar System for Autonomous Walking of Blind People" 2016 IEEE 2nd International Forum on Research and Technologies for Society and Industry Leveraging a better tomorrow (RTSI)

[16] Shreya Gandhi, Bhaskar Thakker and Shreelal Jha "Braille Cell Actuator Based Teaching System for Visually Impaired Students" IEEE International Conference On Recent Trends In Electronics Information Communication Technology, May 20-21, 2016, India

[17] Robiah Hamzah and Mohammad Izzat Mohamad Fadzil "Voice4Blind: The Talking Braille Keyboard to Assist the Visual Impaired Users in Text Messaging" 2016 4th International Conference on User Science and Engineering (i-USEr)

[18] Fabian Höflinger, Joan Bordoy etal "Indoor-Localization System for Smart Phones".

[19] Affan Idrees, Zahid Iqbal and Maria Ishfaq, "AN EFFICIENT INDOOR NAVIGATION TECHNIQUE TO FIND OPTIMAL ROUTE FOR BLINDS USING QR CODES".

[20] J.A.D.C.Anuradha Jayakody and Iain Murray "The Construction of an Indoor Floor Plan Using a "Smartphone for Future Usage of Blind Indoor Navigation".

[21] Sujith B Kallara, Mitu Raj etal "Indriya - A Smart Guidance System for the Visually Impaired" Proceedings of the International Conference on Inventive Computing and Informatics (ICICI 2017).

[22] Akhilesh Krishnan, Deepakraj G etal "Autonomous Walking Stick For The Blind Using Echolocation And Image Processing".

[23] T. Valls Matar´o, F. Masulli etal "An Assistive Mobile System Supporting Blind and Visual Impaired People when Are Outdoor"

[24] Noboru Takagi and Yuichiro Mori "High Speed Image Retrieval Method Executable on Smartphones: Toward Vision Assistance for Blind People". 2018 IEEE International Conference on Systems, Man and Cybernetics.

[25] Mohsin Murad, Abdullah Rehman etal "RFAIDE – An RFID Based Navigation and Object Recognition Assistant for Visually Impaired People"

[26] Masayuki Murata, Dragan Ahmetovic etal "Smartphone-based Indoor Localization for Blind Navigation across Building Complexes".2018 IEEE International Conference on Pervasive Computing and Communications (PerCom).

[27] Pooja Nawandar and Dr. Mrs. Vinaya V. Gohokar "Design and Development of Multisensory Smart Assistive Technology for Blind Persons"

[28] Rachid Sammouda and Ahmad AlRjoub "Mobile Blind Navigation System Using RFID".

[29] SathyaNarayanan E, Gokul Deepan D etal "IoT Based Smart Walking Cane For Typhlotic with Voice Assistance" 2016 Online International Conference on Green Engineering and Technologies (IC-GET).

[30] Watcharin Tangsuksant and Chikamune Wada "Static Obstacle Detection along the Road with a Combined Method". The 2018 Biomedical Engineering International Conference.(BMEiCON-2018)

[31] Ruxandra Tapu, Bogdan Mocanu etal. "A Smartphone-Based Obstacle Detection and Classification System for Assisting Visually Impaired People" 2013 IEEE International Conference on Computer Vision Workshops.

[32] Mohammad saleh khaje hosseini, Mehrdad mokhtari etal "The intelligent electronic system especially for quadriplegics wheelchair and blinds bicycle (New method in Paralympics)".

[33] Olivier Venard, Olivier Venard etal "Field Experimentation of the RAMPE Interactive Auditive Information System for the Mobility of Blind People in Public Transport : Final Evaluation"

[34] Fu Xiao, Qianwen Miao etal. "Indoor Anti-Collision Alarm System Based on Wearable Internet of Things for Smart Healthcare."

[35] David Zhou, Yonggao Yang etal "A smart "virtual eye"mobile system for the visually impaired".

[36] Samkit Shah, Jayraj Bandariya etal "CNN based Auto-Assistance System as a Boon for Directing Visually Impaired Person" Proceedings of the Third International Conference on Trends in Electronics and Informatics (ICOEI 2019)

[37] Saleh Alghamdi, Ron van Schyndel etal "Safe Trajectory Estimation at a Pedestrian Crossing to Assist Visually Impaired People" 34th Annual International Conference of the IEEE EMBS San Diego, California USA, 28 August - 1 September,2012.

[38] Saleh Alghamdi "Shopping and tourism for blind people using RFID as an application of IoT"

[39] Shiri Azenkot, Catherine Feng etal "Enabling Building Service Robots to Guide Blind People".

[40] E. Cardillo, V. Di Mattia etal "An Electromagnetic Sensor Prototype to Assist Visually Impaired and Blind People in Autonomous Walking"

[41] Nobuo Ezaki, Kimiyasu Kiyota etal. "Improved Text-Detection Methods for a Camera-based Text Reading System for Blind Persons".

[42] Seung-Beom Han, Deok-Hwa Kim etal "Fuzzy Gaze Control-based Navigational Assistance System for Visually Impaired People in a Dynamic Indoor Environment".

[43] Farzana Jabeen, Aslam Muhammad etal. "Feed Forward Neural Network Training Based Interactive Shopping for Blind. 2015 12th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE), Mexico, City. Mexico.

[44] En Peng, Patrick Peursum etal "Product Barcode and Expiry Date Detection for the Visually Impaired using a Smartphone".

[45] Luiz Oscar Topin, Profa. Dra. Regina Barwaldt etal "Towards Machine Learning for Enhanced Maths Teaching to the Blind".