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TECHNOLOGY: A HELPING HAND FOR BLIND PEOPLE

Author

N. VISAKAMURTHY

ABSTRACT

More than a quarter of a billion people are visually impaired, including at least 285 million people who are blind. 39 million people are completely blind, whereas 246 million people have some degree of poor vision. As a result, even the most basic of tasks are difficult for these individuals to do. As a result, several tools for making their life easier have to be created. Advances in technology and study around the world could lead to the development of such systems. RFID, GSM, GPS, voice assistance, and image processing are just a few of the innovations that have made these discoveries possible.

Keywords: Blind, Technology, RFID, GPS

INTRODUCTION

The Great Tamil poet Avvaiyar has sung way back in the Sangam age about the rarities of life. Avvaiyar has stressed the fact that it is blessed and rare to be born as a human being and it is more blessed and rare for the human to be born without any disabilities.

A person is only whole if he or she is able to use all five of his or her senses. This is a blessing that isn't shared by everyone in the globe. Vision is a crucial sense since it helps us make vital life decisions. Certain chronic conditions like retinopathy and exposure to toxic chemicals might cause this sensation of vision to develop, while others are born without it. A person who is blind or visually impaired suffers from low self-esteem since they are unable to execute simple tasks. It has an impact on both their physical and psychological well-being. However, they can only count on a few weeks' worth of assistance. To help these people, we

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decided to develop a smart stick that would make their life a lot easier. Various sensors collect data from the environment, which the controller then processes. Images, ultrasonic sensors, infrared sensors and motion sensors are all included in this set of sensors. RFID has been proven to be a useful tool for tracing the path of tagged things. When using the tagging approach to identify items, this is the method of choice. An audio feedback is also used to help visually impaired people find their way around. An accurate real-time location can be determined by using GPS, a satellite-based radio navigation system. A concerned person receives this location information in the event of an emergency. The same can be said for a GSM module. It's possible to communicate with the device through other modules such as Bluetooth, Wi-Fi, and the like. Microcontrollers are the most common type of processor utilised in these devices. The PIC18F2520, MC68HC11E2, PIC16F887, and LPC2148 are just a few examples of microcontrollers of this type.

Figure 1: Modern Aids for visually challenged

HISTORIC PERCEPTION

Blindness is a condition in which a person is unable to see. There are several reasons why a person may be blind, such as a congenital defect or a long-term medical condition such as diabetes or age-related vascular degeneration. Human beings have devised their own methods for making the life of the visually handicapped simpler over the years. Dogs were trained to guide their blind owners. In order to make it easier for blind individuals to learn, Braille was created. White canes have been used by the blind for a long time. Observers have been able to see the blind person, but they have also been able to see impediments to some level. New technologies have led to the creation of numerous assistive devices. Various wearable alternatives for the White canes were also proposed. In the literature review, several of them have been mentioned.

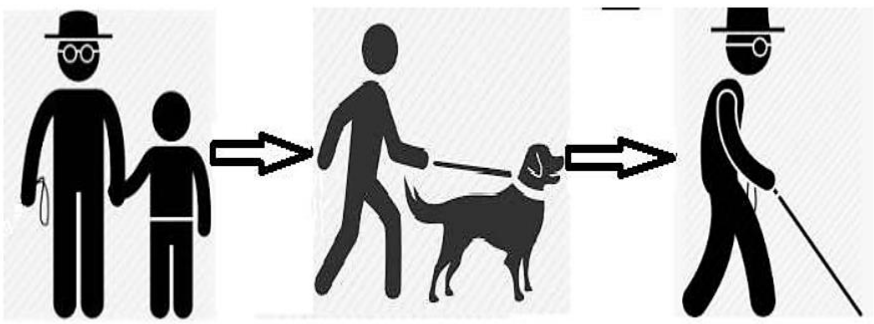

Figure 2: Conventional assisting methods for visually challenged people

LITERATURE REVIEW

B. Ando and others (2015) For visually impaired people, the article presents an electronic travel aid that utilises haptic feedback. It can detect, identify, and deliver data on a variety of different types of barriers. For the same purpose, a circuitry is incorporated into the cane. An eccentric mass motor put in the cane acts as an actuator and generates vibrations when it encounters an obstruction in its route, simulating the object's real-world sensation. Ultrasonic sensors (disc-shaped) and detection-simulation algorithms are used to detect obstacles. Smart processing architecture, no cross-interference between actuators and cane, and no cane-floor contact are some of the features of this system. Despite the fact that this system helps with navigation, it is unable to adapt to new environments because its database is not stored.

A light-weight Guide cane, which is utilised to avoid obstacles, is pushed by Iwan Ulrich et al. (2001). This is accomplished by the embedded computer determining the proper direction of motion to steer both guiding cane and user around an obstruction that is detected using an ultrasonic sensor The steering is clearly visible from the handle, making it simple for the user to follow along. There is no need for extensive training in this case. The guide cane is easy to use and allows users to go at an average speed of one metre per second. Small abnormalities in the ground may be misinterpreted as impediments by sonars since they are closer to it. It is only in indoor conditions where the obstacle avoidance performance is adequate that it is considered adequate.

In this proposed method, the smart stick helps visually handicapped over any barriers, pits, or water, as demonstrated by G.Gayathri et al. (2011). As a result, visually impaired people are able to lead more confident lives. In the suggested walking stick, a GPS device is pre-programmed to determine the most efficient path to take. Sensors such as ultrasonic and ultrasonic-like ones can be employed. A speech synthesiser, keypad, vibrator, level converter, speaker, and headphone jacks are all included. Using a PIC controller, two pieces of the proposed system are included: a sensor unit and a GPS receiver. Other obstacles can be detected by using an ultrasonic sensor instead of infrared sensors. Electrodes are placed at the bottom of the device to detect water and offer a visual indication to someone who is sight impaired. The blind person is alerted by the voice response when they arrive at their location through GPS. Because it can only be used for a limited number of routes, it may not be of much value when trying to find a new way to go.

In this research, Olakanmi et al. (2014) describe the design and implementation of a visually impaired walking assistance that uses a network of ultrasonic sensors to identify impediments. Adding an alert light and a voice guidance signal to a mini-headset further enhances the performance and functionality. The user is alerted to the presence and direction of the impediment by the recording of a voice. When an impediment is detected within a range of 0-1 metres on either the left, right, or in front of the stick, a verbal alert will sound. The multidimensional impediment is too far away for the walking stick we've devised to measure.

Piyush Patil and other members of the team (2017) Using a belt and a smart cane, the Proposed system aims to replicate the experience of touch in the user. Haptic feedback is used to do this. Ultrasonic sensor-based obstacle detection is just one of several solutions this system offers (using PIR sensor). A Smartphone app is used to deliver voice assistance. The captured object is compared to a database of known objects to identify it. Google Maps and a smart phone are used to provide directions to the user's destination once the user provides information about the location. Using three pairs of ultrasonic sensors, the robot is able to detect the object in both the right and left orientations. Detection may be muddled in situations where obstacles are present in all directions. It's also possible that the results of a smartphone app may not always be correct.

"Assistor" is the name of the smart walking stick proposed in this reference by Akhilesh Krishnan et al." It is based on the echolocation principle, which employs an ultrasonic sensor to identify objects by bouncing back sound waves. The runtime objects are captured using an image sensor, and a smart phone application is utilised to navigate. The assistor is equipped with these two sensors, which transmit data wirelessly to a smart app. The stick's motion is supported by servo motors in the system. Google Maps is used to calibrate the motors so that they travel in the same direction that the user intends. A new search algorithm called "Deep Depth First" has been implemented in order to improve navigation. This paper's main flaw is the inaccuracy of the Smartphone app. It also doesn't offer a way to figure out how far the impediment is from the user.

Visual replacement is proposed by Hanen Jabnoun and his colleagues in Hanen Jabnoun and his colleagues' publication in 2017. To identify and find items in the image, it uses a robust algorithm. The image is captured by a single camera. The sort of image that was taken determines the features that can be extracted. Color or binary pictures could be used for the images. This approach is called Scale Invariant Feature Transformation (SIFT) or Speed up Robust Feature Transformation (SRF) (SURF). The SIFT technique uses the Euclidean distance between feature vectors and key points to compare the target image to a reference image stored in the database. Obstacle detection and 3D object reconstruction are both possible uses for the SURF technique in computer vision. The SURF algorithm is based on Haar-wavelets, which are reactions to Haar-wavelets. Two frames are employed in the proposed system. Each consecutive frame is compared to the previous frame while the first frame is checked against the database. Voice output is delivered to the user when an object is recognised. In this case, object recognition relies heavily on the precision of the recognition and the processing of time.

According to Ashwini et al. (2016), the proposed system aids blind people in independently navigating and avoiding any stationary or movable impediments. RFID technology is used to provide the user with speech output direction from the gadget. Occurrence detection, signal information, the position of blind sticks and power generation are all included in this system. Vibrations alert the user when an obstacle is spotted using infrared sensors. The blind stick has two IR receivers that help determine the user's distance from the object. There are IR receivers mounted on traffic poles that activate when the traffic light turns green, which results in an audible alert. This allows the user to cross the street on their own, without the aid of others. When using the bus route information system, the destination of the bus is read out loud to the blind individual. When the bus is within RF range, a voice message informs the user that it is on its way. Providing a switch with an RF transmitter that activates when pressed and emits a beep sound at the receiver end can reveal the location of the blind stick. Power can be generated from the stick's wheels by converting mechanical energy into electrical energy. Because the IR sensors are attached to the user's belt, it may be difficult to wear it all the time.

In this reference, Akshay Salil et al. (2017) use IR sensors and ultrasonic range finders to detect obstacles. Voice aid is offered and location information is sent to the concerned person via SMS utilising a Bluetooth module and an Android app for the visually impaired. For determining the distance to an obstacle and providing a way, the user is guided through a variety of buzzer ringing and vibration durations. This is a low-cost, low-power, and simple method. Unreliable navigation will be the outcome if there is any malfunction that changes the duration of vibration or ringing. Due to its dependence on internet access, Google Maps on Android is not always dependable.

This paper by Zeeshan Saquib et al. (2017) developed a BlinDar electronic travel aid. GPS and the ESP8266 Wi-Fi module are used to communicate location data on the cloud. In the event of a fire, a gas sensor is utilised to detect the blaze. Misplaced sticks can be tracked by using an RF Transmitter/Receiver module. Ultrasonic sensors, which can detect obstructions and potholes up to a distance of 2 metres, are the primary detecting devices. The Arduino Mega2560 is the primary computational engine in this project. BlinDar is a visually impaired person's best friend since it responds quickly, uses little power, is lightweight, and is inexpensive. Because GPS indoors isn't as trustworthy as it is outdoors, getting around can be challenging at times.

CONCLUSION

The extinction of vision has hampered human progress. Blindfolded for a day is terrible enough, but think what it's like for those who are sight impaired. However, they do not give up on their lives and continue to strive for a better future. Various electronic devices and systems have been developed to help make this easier to manage. Many studies have shown that the aid designed should not only match design requirements but also be affordable, simple to use, and devoid of complications.

REFERENCES

- B. Andò , S. Baglio , V. Marletta , A. Valastro, A Haptic Solution to Assist Visually Impaired in Mobility Tasks IEEE Transactions on Human-Machine Systems (Volume: 45 , Issue: 5 , Oct. 2015)
- Ulrich, J. Borenstein,The GuideCane-applying mobile robot technologies to assist the visually impairedIEEE Transactions on Systems, Man, and Cybernetics - Part A:Systems and Humans (Volume: 31 , Issue: 2 , Mar 2001)
- G.Gayathri,M.Vishnupriya,R.Nandhini,Ms.M.Banupriya, SMART WALKING STICK FOR VISUALLYIMPAIREDhttp://www.ijecs.in/index.php/ijecs/article/view/151
- Olakanmi O. Oladayo, A Multidimensional Walking Aid for Visually Impaired Using Ultrasonic Sensors Network with Voice Guidance,, I.J. Intelligent Systems and Applications, 2014, 08, 53-59 Published Online July 2014 in MECS (http://www.mecs-press.org/) DOI: 10.5815/ijisa.2014.08.06
- Piyush Patil, Akshay Sonawane, "Environment sniffing smart portable assistive device for visually impaired individuals", Trends in Electronics and Informatics (ICEI) 2017 International Conference on, pp. 317-321, 2017.

- Akhilesh Krishnan, G Deepakraj,N Nishanth, K. M. Anandkumar,Autonomous walking stick for the blind using echolocation and image processing, 2016 2nd International Conference on Contemporary Computing and Informatics (IC3I)
- Hanen Jabnoun, FaouziBenzarti,Hamid Amiri, Object recognition for blind people based on features extraction, International Image Processing, Applications and Systems Conference, INSPEC Accession Number: 14947267, DOI: 10.1109/IPAS.2014.7043293, Publisher: IEEE
- AshwiniBYadav,LeenaBindal,V.UNamhakumar,K Namitha, H Harsha, Design and development of smart assistive device for visually impaired people, 2016 IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT)
- Akshay Salil Arora, 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 Engineering (ICNTE)INSPEC Accession Number: 16963603 DOI: 10.1109/ICNTE.2017.7947957 Publisher: IEEE
- Zeeshan Saquib, Vishakha Murari, Suhas N Bhargav, BlinDar: An invisible eye for the blind people making life easy for the blind with Internet of Things (IoT), 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT)