International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 12 Dec. 2022, pp: 116-120 www.ijaem.net ISSN: 2395-5252

Third Eye for Visually Challenged Using Echolocation Technology

DR. Amol Potgantwar[1], Aditya Zinjurde[2], Sudarshan Sahane[3], Girish Barhate[4], Roshan shelke[5]

[1,2,3,4,5]*Computer Engineering Department, Sandip Institute of Technology and Research Centre Nashik, India*

Date of Submission: 02-12-2022 Date of Acceptance: 12-12-2022

ABSTRACT
The millions of people in the world whose vision is not perfect and they wear glasses. But for those hundreds or thousands who are blind, existing methods that merely assist them are not just enough. What they need are alternative methods by which they can navigate with greater comfort, speed, and confidence. By taking these into consideration, a wearable prototype is designed using Echolocation Technology which can resolve the problems of the existing methods. Sensors like Ultrasonic Sensors and IR sensors are used for obstacle detection and water detection. All the sensors are interfaced with Arduino UNO for processing purposes. Thus, there is hope for the visually challenged people to traverse without a stick. They can simply wear the designed prototype as a headset or a cap which can work very accurately and the only thing required is some training to use it.

Keywords— CNN, Machine learning, Deep learning, Embedded System, Object Detection Echolocation, Ultrasonic sensor, IR sensor, Detection

I. INTRODUCTION

Vision is a significant part of life. Individuals get a large portion of the data or information about nature by sight. The Visually Challenged individuals, without this perspective, face difficulties consistently for protected and free versatility. As indicated by the insights given by the World Health Organization (WHO), worldwide at least 2.2 billion individuals are blind or facing a vision impairment The Internet of Things (IoT) is a system of interconnected computing devices, mechanical and digital machines, objects and people that are provided with unique identifiers, unique roles and the ability to transfer data over a network without requiring human-to human or human-to-computer interaction. The IoT brings the power of the internet, data processing and analytics to the real world of physical objects. For consumers, this means interacting with the global information network without the intermediary of a keyboard and screen; many of their everyday objects and appliances can take instructions from that network with minimal human intervention. These devices gather useful data with the help of various existing technologies and share that data between other devices. IoT (Internet of Things) technology is now being used for multiple operations including remote. operations such as irrigation systems, military purposes, forests, etc.

where human interference needs to be minimized. In practice, Internet of Things is an amalgamation of multiple technologies such as cloud technology, which leads to real time analytics, machine learning, commodity sensors, and embedded systems. Sensors, actuators, and other ICs are embedded with electronics, Internet connectivity, and other forms of hardware like LED lights and LED displays. These hardware components such as sensors and actuators interact with others over the Internet and provide the information collectively and can be monitored and controlled remotely with the help of cloud technology

Motivation- The motivation behind this proposed work is to help the blind people by making their navigation easy with the help of object detection system. As with the growing technology, it is our responsibility to use it for the betterment of people especially those who are facing certain disabilities and are dependent on others to fulfil their daily tasks. By properly utilizing the advanced technology, we can help disabled people by making them independent persons of the society. The aim of this proposed work is particularly, to help the blind people or those who are suffering from a lack of vision. Such persons have to encounter many obstacles while walking indoors or outdoors**.**

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 12 Dec. 2022, pp: 116-120 www.ijaem.net ISSN: 2395-5252

.

Objective- To develop a machine learning and computer vision-based low-cost system that helps blind people to walk freely, comfortably, and with confidence. To improve the accuracy of existing object detection systems using deep learning techniques. To develop a system that is simple to use and maintain for blind people while also being cost-effective

II. LITERATURE SURVEY

The researchers have proposed several techniques for developing assistive devices for Visually impaired persons. Vision-based sensors (camera), non-vision-based sensors (e.g., IR, ultrasonic, inertial, and magnetic sensing, etc.), and other technologies such as low-energy Bluetooth beacons, GPS, GPRS, and so on have all been used in existing devices. Because of their importance to our proposed system, vision-based sensing devices receive special attention in this section.

- The object detection devices use sensors (laser scanners, ultrasonic devices) and cameras to collect information from the surrounding environment, process it, and provide feedback to the users. The basic working principle of such devices is that they detect the object around the user and give instructions about the object/obstacle and its distance using vibrations or sound waves. Saputra et al. [6] have presented an obstacle avoidance system with the help of a Kinect depth camera for VIPs. It helps detect the obstacle and calculate its distance using the auto-adaptive threshold. The device is tested on ten blind people aged 20-40 years to evaluate the system's performance. The result of the proposed system is promising as it detects the obstacle without any collision from any direction. Yi and Dong [7] have presented a blind-guide crutch using multiple sensors. The triplet ultrasonic module detects the obstacle from the front, left, and right sides. It identifies the object using voice and vibration waves. Department of Computer Engineering, SITRC 2022-23 5 Third Eye for Visually Challenged using Echolocation Technology.

- Kumar et al. [8] have presented an ultrasonic cane that provides information related to the environment and enables the user to move safely. The ultra-Cane consists of a narrow beam ultrasound system that provides 100% obstacle detection. It detects objects which are 2- 4 meters away. The proposed device is tested on ten people (ages 20-26 years). The volunteers effectively detected the hurdles within the proposed range.

- Hanen Jabnoun, Faouzi Benzarti and Hamid Amiri, in paper —Object recognition for blind people based on features extraction‖ provided an overview of various visual substitution systems developed in the recent years. This method is based on video analysis , interpretation and feature extraction .They give the results of comparison of SIFT and SURF in which they concluded that SURF is faster than SIFT ,however SIFT is robust when the matches findings, scale variations are considered. They used video to Audio transformation to provide the object information [3].

- Ricardo Chincha and YingLi Tian in paper entitled —Finding Objects for Blind People Based on SURF Features‖ has proposed an object recognition method to help blind people find missing items using Speeded-Up Robust Features (SURF). The Proposed recognition process begins by matching individual features of the user queried object to a database of features with different personal items which are saved in advance. From the experiments the total number of objects detected were 84 out of 100,this shows that their work needs better performance hence to enhance the object recognition SIFT can be used instead of SURF[4].

- Hanen Jabnoun, Faouzi Benzarti and Hamid Amiri, in their paper —Object Detection and Identification for Blind People in Video Scene‖ has proposed system that restores a central function of the visual system which is the identification of surrounding objects. This method is based on the local features extraction concept. The simulation results using SIFT algorithm and key points matching showed good accuracy for detecting objects. They have worked for the key point detection in fast video using affine transformation in SIFT which is

PROBLEM STATEMENT

Impaired vision People suffering from this severe condition are unable to move on their own. In today's fast -paced world, these people are frequently overlooked. Few methods have been used to assist them and provide some mobility comfort. Traditional methods, such as trained dogs

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 12 Dec. 2022, pp: 116-120 www.ijaem.net ISSN: 2395-5252

or a cane, do not provide enough information about potential obstacles. Furthermore, training and managing dogs are difficult tasks. RFID technology is used in some navigation systems. This technology, however, cannot be used in an open area outside.

OBJECTIVE

- To develop a machine learning and computer vision-based low-cost system that helps blind people to walk freely, comfortably, and with confidence
- To improve the accuracy of existing object detection systems using deep learning techniques.
- To develop a system that is simple to use and maintain for blind people while also being cost-effective.

III. PROPOSED SYSTEM

Impaired vision People suffering from this severe condition are unable to move on their own. In today's fast-paced world, these people are frequently overlooked. Few methods have been used to assist them and provide some mobility comfort. Traditional methods, such as trained dogs or a cane, do not provide enough information about potential obstacles. Furthermore, training and managing dogs are difficult tasks. RFID technology is used in some navigation systems. This technology, however, cannot be used in an open area outside

This is the Software Requirements Specification (SRS) for 'Third Eye: Third Eye for Visually Challenged using

Echolocation Technology.'. The purpose of this document is to give information about the end user's requirements, both functional and non-functional to the reader.

1. System should be wearable and easy to use for blind person.
2. System should detect object in front of blind person using ultrasonic sensor.
3. Hands Free Feature - all task should be done without any manual work.
4. System should work in real-world.

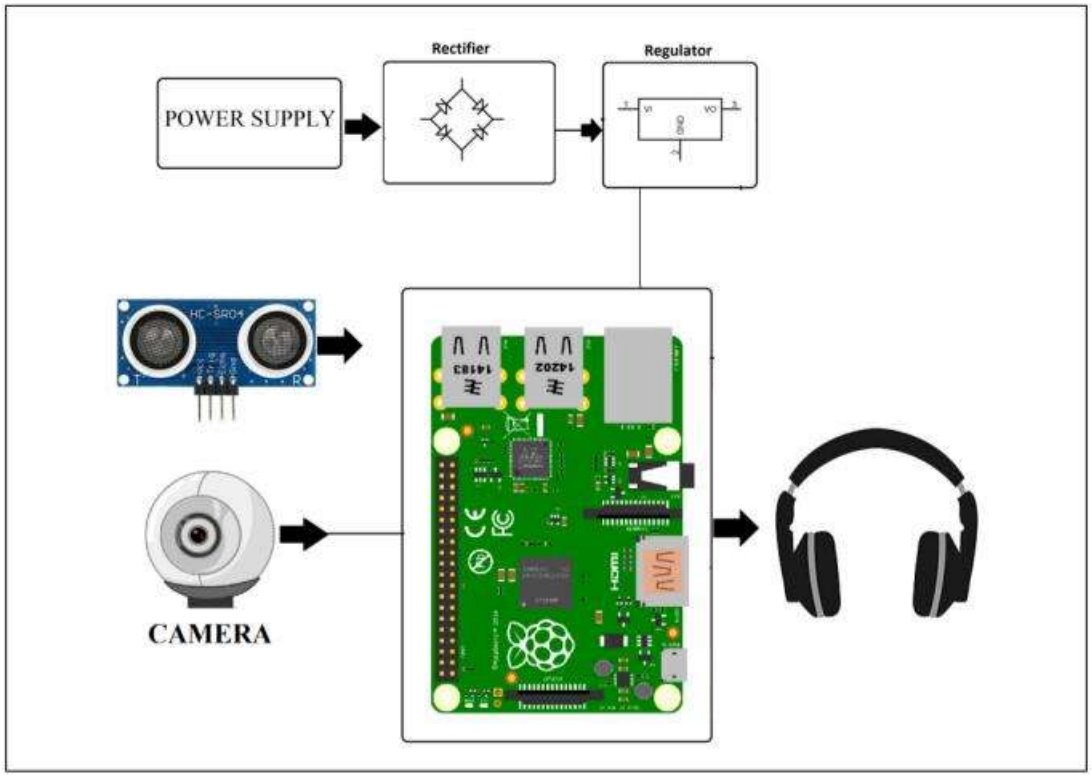

Figure 1.1 System Architecture

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 12 Dec. 2022, pp: 116-120 www.ijaem.net ISSN: 2395-5252

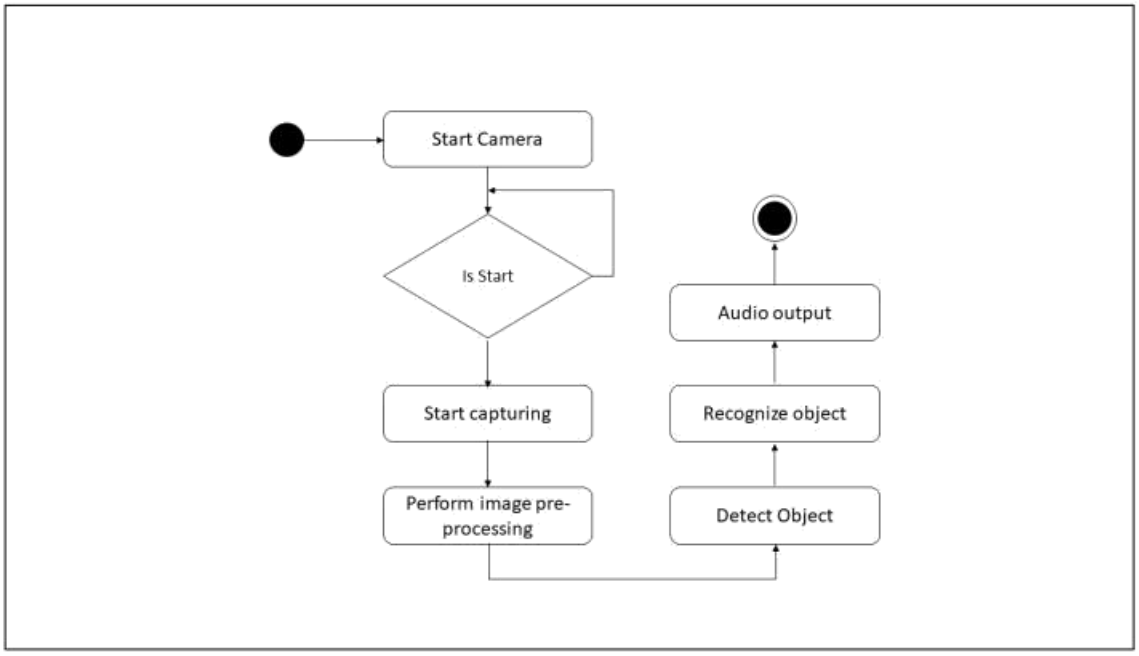

Figure 1.2: Activity Diagram

OUTCOMES

The aim of this proposed work is particularly, to help the blind people or those who are suffering from a lack of vision.
Such persons have to encounter many obstacles while walking indoors or outdoors.

As with the growing technology, it is our responsibility to use it for the betterment of people especially those who are facing certain disabilities and are dependent on others to fulfil their daily tasks. By properly utilizing the advanced technology, we can help disabled people by making them independent persons of the society.

IV. CONCLUSION

This work presented a smart and intelligent system for visually impaired people to help them move around and stay safe. The proposed system is based on the needs of visually impaired individuals in their daily lives. It helps them visualize the environment and gives them a sense of their surroundings. Using CNN-based low-power Mobile-Net architecture, they can recognize objects around them and sense their surroundings.

FUTURE SCOPE

- In future we will use Jetson Nano for better performance.
- We also use Lidar Sensor to detect obstacle/Object in Dark Environment.

REFERENNCE

[1] W. Elmannai and K. Elleithy, "Sensor-based assistive devices for visuall people: Current status, challenges, and future directions," Sensors, vol. 17, no. 3, p. 565, 2017.
[2] R. Vel´azquez, "Wearable assistive devices for the blind," in Wearable and Autonomous Biomedical Devices and Systems for Smart Environment. Berlin, Germany: Springer, 2010.
[3] L. B. Neto, F. Grijalva, V. R. M. L. Maike, L. C. Martini, D. Florencio, M. C. C. Baranauskas, A. Rocha, and S. Goldenstein, "A Kinect-based wearable face recognition system to aid visually impaired users," IEEE Trans. HumanMach. Syst., vol. 47, no. 1, pp. 52–64, Feb. 2017.
[4] C. Shah, M. Bouzit, M. Youssef, and L. Vasquez, "Evaluation of RU-netratactile feedback navigation system for the visually impaired," in Proc. Int. Workshop Virtual Rehabil., 2006, pp. 72–77
[5] M. R. U. Saputra, Widyawan, and P. I. Santosa, "Obstacle avoidance for visually impaired using auto-adaptive thresholding on Kinect's depth image," in Proc. IEEE 11th Int. Conf. Ubiquitous Intell. Comput., IEEE 11th Int. Conf. Auton. Trusted Comput., IEEE 14th Int. Conf. Scalable

Comput. Commun. Associated Workshops, Dec. 2014, pp. 337–342.

[6] K. Kumar, B. Champaty, K. Uvanesh, R. Chachan, K. Pal, and A. Anis, 'Development of an ultrasonic cane as a navigation aid for the blind people," in Proc. Int. Conf. Control, Instrum., Commun. Comput. Technol. (ICCICCT).

[7] C. T. Patel, V. J. Mistry, L. S. Desai, and Y. K. Meghrajani, "Multisensor– based object detection in indoor environment for visually impaired people," in Proc. 2nd Int. Conf. Intell. Comput. Control Syst. (ICICCS), Jun. 2018, pp.

[8] T. H. Nguyen, T. L. Le, T. T. H. Tran, N. Vuillerme, and T. P. Vuong, "Antenna design for tongue electrotactile assistive device for the blind and visually impaired," in Proc. 7th Eur. Conf. Antennas Propag. (EuCAP), 2013, pp. 1183–1186.

[9] P. Salavati and H. M. Mohammadi, "Obstacle detection using GoogleNet," in Proc. 8th Int. Conf. Comput. Knowl. Eng. (ICCKE), Oct. 2018, pp. 326–332.

[10] S.-H. Chae, M.-C. Kang, J.-Y. Sun, B.-S. Kim, and S.-J. Ko, "Collision detection method using image segmentation for the visually impaired," IEEE Trans. Consum. Electron., vol. 63, no. 4, pp. 392–400, Nov. 2017.

[11] M. Poggi and S. Mattoccia, "A wearable mobility aid for the visually impaired based on embedded 3D vision and deep learning," in Proc. IEEE Symp. Comput. Commun. (ISCC), Jun. 2016, pp. 208–213.

[12] P. Salavati and H. M. Mohammadi, "Obstacle detection using GoogleNet," in Proc. 8th Int. Conf. Comput. Knowl. Eng. (ICCKE), Oct. 2018, pp. 326–332.

[13] L.-B. Chen, J.-P. Su, M.-C. Chen, W.-J. Chang, C.-H. Yang, and C.-Y. Sie, "An implementation of an intelligent assistance system for visually impaired/blind people," in Proc. IEEE Int. Conf. Consum. Electron. (ICCE), Jan. 2019, pp. 1–2.

[14] K. Kumar, B. Champaty, K. Uvanesh, R. Chachan, K. Pal, and A. Anis, "Development of an ultrasonic cane as a navigation aid for the blind people," in Proc. Int. Conf. Control, Instrum., Commun. Comput. Technol. (ICCICCT), Jul. 2014, pp. 475–479.

[15] C. T. Patel, V. J. Mistry, L. S. Desai, and Y. K. Meghrajani, "Multisensor– based object detection in indoor environment for visually impaired people," in Proc. 2nd Int. Conf. Intell. Comput. Control Syst. (ICICCS), Jun. 2018, pp. 1–4.

[16] L. B. Neto, F. Grijalva, V. R. M. L. Maike, L. C. Martini, D. Florencio, M. C. C. Baranauskas, A. Rocha, and S. Goldenstein, "A Kinect-based wearable face recognition system to aid visually impaired users," IEEE Trans. HumanMach. Syst., vol. 47, no. 1, pp. 52–64, Feb. 2017.