Migration Letters

Volume: 20, No: S13(2023), pp. 361-365

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)
www.migrationletters.com

Reading Assistant for Visually Challenged Peoples with Advance Image Capturing Technique Using Machine Learning

Dr.R. Sudhakar[1], Dr.S. Elango[2], Arya Surendran[3] and Gopika Venu[4]

Abstract

Since blindness prevents a person from learning about their surroundings, it is difficult for them to independently navigate, recognise items, avoid hazards, and read. In this essay, we provide a ground-breaking system for visually impaired people who use assistive technology. The concept incorporates a camera, sensors, and effective image processing algorithms that use Raspberry Pi for object detection and obstacle avoidance. Ultrasonic sensors and the camera both measure the user's distance from the obstruction. The system consists of integrated reading help that first generates an audio response before converting images to text. The complete apparatus is small and light, and it can be easily and inexpensively mounted on a regular pair of eyeglasses. The entire system is affordable, easy to use, and can be attached to a regular pair of eyeglasses. It is also portable and lightweight. Ten people who are completely blind will be used to compare the performance of the suggested device to the traditional white cane. The evaluations are conducted in controlled environments intended to mimic day-to-day activities for blind persons. The findings show that the proposed device provides more accessibility, comfort, and simplicity of navigation for the blind when compared to the white cane.

Keywords: *Blind People, Surrounding Environment, Reading Assistance, Raspberry Pi, Machine Learning.*

Introduction

Visual impairment or vision misfortune is perhaps of the most widely recognized handicap on the planet. Whether welcomed on by mishaps or normal causes, visual deficiency has become more normal throughout the course of recent many years. To some extent blind individuals experience exclusive focus, cloudy vision, shadow-just vision, unfortunate night vision, and other visual weaknesses [1]. An individual who is totally visually impaired, then again, has no vision by any means. The quantity of individuals who are visually impaired or outwardly debilitated is assessed to be tied in with, as per ongoing evaluations from the World Wellbeing Association. The white stick is a typical device utilized by the oblivious in regards to assist them with exploring their current circumstance, but it is deficient for recognizing far off moving items. White sticks likewise can't see raised deterrents that are higher than knee level. Expertly prepared guide canines are one more choice for helping the blind [4]. In any case, prepared canines are costly and challenging to track down. Various wearable or versatile electronic travel extras (ETAs) have been

[1] Associate Professor, Computer Science and Engineering, Madanapalle Institute of Technology & Science, Madanapalle, Andhra Pradesh, India. sudhavk1983@gmail.com
[2] Assistant Professor, Computer Science and Engineering, Madanapalle Institute of Technology & Science, Madanapalle, Andhra Pradesh, India. elangoniran111@gmail.com
[3] Assistant Professor, Computer Science and Engineering, Madanapalle Institute of Technology & Science, Madanapalle, Andhra Pradesh, India. aryasu005@gmail.com
[4] Assistant Professor, Computer Science & Technology, Madanapalle Institute of Technology & Science, Madanapalle, Andhra Pradesh, India. gopivenu96@gmail.com

proposed in late studies [16]. A few of these gadgets consolidate different sensors to plan the climate and deal discourse or sound-based Earphone admonitions. The precision of these gadgets is affected by the Ongoing hear-able sign conveyance standard. As of now accessible ETAs regularly miss the mark on continuous understanding help, have below average UIs, cost unreasonable measures of cash, have versatility issues, and don't have sans hands access. Along these lines, the visually impaired don't much of the time use these devices, they actually should be worked on regarding configuration, use, and reliability for utilize both inside and outside.

Literature Survey

In "Virtual-blind-street following based wearable route gadget for blind individuals," J. Bai et al. make sense of the best visual guide that is presently accessible however has a couple of minor drawbacks. [2][6]. This contraption just communicates with the Arduino Uno, which has an ATmega 328p, 8-digit microcontroller connected to the motherboard of the computer chip, and just catches RGB pictures from the fisheye profundity camera. It likewise interacts with a ultrasonic sensor. [12][13]. This paper's essential blemishes were its exorbitant cost and unnecessarily thick fringe interface. Investigation of picture catch, which is hard to deal with, calls for additional investment to look at its outcomes. The Arduino Uno is cheap, yet the simulated intelligence can't peruse photographs from a camera [5]. Hence, the pictures including an item name will be perused by the outer fringe of the PC computer processor connected with the motherboard [14][15]. The technique' essential blemish was that it would require a long time to stack the caught photographs and afterward perceive the information again in light of the fact that the microcontroller's working pace for a 8-cycle regulator was only 16 MHz [19].

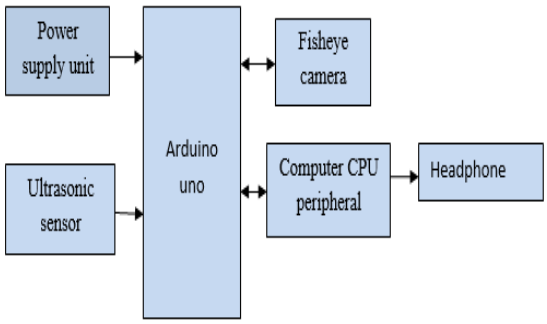

Figure 1: Existing System block diagram

It will require somewhere around 50 seconds for the image stacking pre-handling to distinguish the information; really at that time will the picture information be sent on to the words, which will then be converted into a sound document for earphones.

Proposed Work

In this exposition, we propose a cutting-edge visual guide for totally blind individuals. The accompanying distinctive qualities characterize the proposed plan's innovation. An incorporated perusing help that can be mounted on a couple of glasses and is without hands, versatile, low-power, and lightweight for utilize both inside and outside. Utilizing a low-end setup, muddled calculations are handled. Continuous, camera-based distance estimation that is precise and requires less sensors implies a less complex plan and lower cost. Right now, the recommended system might give the visually impaired aural contribution while at the same time distinguishing both fixed and moving articles. The gadget likewise incorporates a coordinated perusing right hand that can peruse text from any archive. The accompanying issues are canvassed in this article, which is coordinated as follows: plan, development, and execution assessment of the recommended visual guide framework, as well as an examination of the ongoing framework on blind directing instruments, featuring the two its advantages and disadvantages.

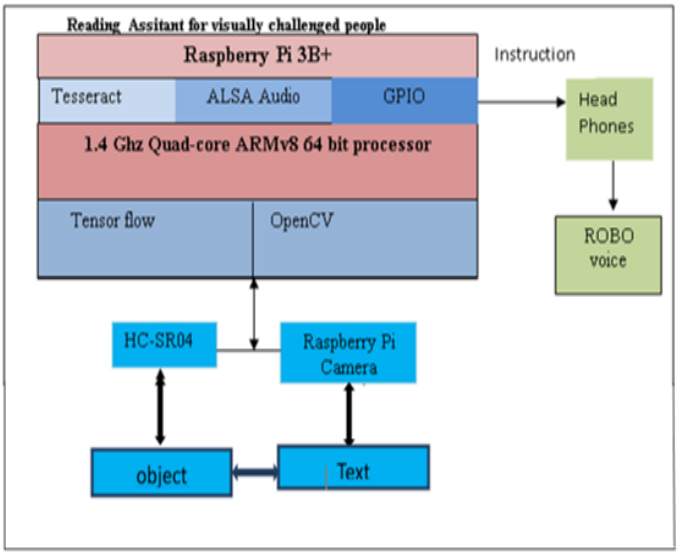

Figure 2: Hardware design of reading assistant for visually challenged People

Figure 3: Image of the actual suggested gadget

For the individuals who are totally visually impaired, we suggest a visual guide with a coordinated understanding help. The gadget, which is connected to a couple of eyeglasses, can furnish clients with quick sound info. The client utilizing earphones can be heard. The distance between the client and the hindrance is estimated utilizing sensors and cameras [20]. The equipment for a perusing help for outwardly hindered individuals is displayed in Figure 2. Individuals, An image of the genuine suggested contraption is displayed in Fig. 3. Perusing's visual partner snapped a photo as the distance beneath was being perused by a ultrasonic sensor.5 meters later, the caught picture is provided to the Raspberry Pi's feedback. When the cycle is in progress, it examinations the gave input picture and afterward creates the comparing hear-able criticism for earphones with a robot voice. These circuits are controlled by a battery-produced, directed 5 volt supply. It had a 5 volt battery-powered battery with a reserve season of very nearly 4 hours.This perusing visual guide is lightweight and minuscule, making it agreeable for everybody to wear while likewise being completely configurable. The five separate plans that make up the proposed framework's equipment plan with man-made reasoning are coordinated as follows: information obtaining, include extraction, framework work process, object recognition, and understanding collaborator. Free OCR programming for an assortment of operating system frameworks is called Tesseract. This is utilized to extricate text from pictures. Moreover, sound criticism for object kind and client object distance is given utilizing eSpeak, a conservative open-source text-to-discourse synthesizer [8]. transition of tensors. Tensorflow is based on the diagram object, which comprises of an organization of hubs [11]. To store the organization, the ProtoBuf library might make Charted objects. The proposed idea requires a preparation. The equipment interface accumulates information from the climate. The product interfaces process the information and result a reaction through the sound point of interaction [17]. SSD [9] models regularly utilize the one-stage

object identification procedure, which immediately estimates object bouncing boxes for an image. To restrict the things, it very well may have the option to reuse the calculation that was at that point finished during the classification step. This is finished by utilizing convolutional highlight maps from an organization's later layers, on which convolutional channels can be applied, to figure class scores and bouncing box balances simultaneously. The SSD finder [18] utilize many layers to acquire better accuracy on objects of fluctuating scales. As the layers are stripped back, the bigger articles become more noticeable. The fast speed of the SSD permits the ongoing video to construe data. For the SSD layers, MobileNetv2 [16], the reason for SSDLite, highlights profundity wise divisible convolutions. The SSDLite models are utilized to make forecasts utilizing a fixed-sized framework. As a result, every cell in this framework produces two tensors that each contain bouncing box expectations for different classes. Every cell in this lattice is liable for perceiving objects in a specific region from the first info picture. The few framework sizes presented by SSDLite range from 19 by 19 to 1 by 1 cells. Tesseract can perceive various dialects and result designs, like plain-text and HTML, PDF, TSV, and PDF with just undetectable text. It additionally upholds Unicode (UTF-8) and supports recognizing a few dialects. An organization called LSTM (long transient memory) [7] is utilized by the essential motor. The text from the text record is then spoken resoundingly utilizing the text-to-voice [10] motor Talk. Since it is delicate to these components, the Tesseract OCR motor performs best in settings with splendid lighting and against white sceneries [9].

Result and Discussion

Because of understanding help, the camera will begin recording all live video when we notice the item name before the camera. In spite of the way that the framework has been educated, certain mistakes might have been limited in the live catch. Pre-handling time is likewise expected to stack the picture with the item name. The robo voice will make reference to the entire name of the item in the earphones. The product and equipment parts of the proposed blind associate have been widely examined. Ten individuals who are totally visually impaired have tried the gadget's exhibition in controlled indoor settings that repeat certifiable circumstances.

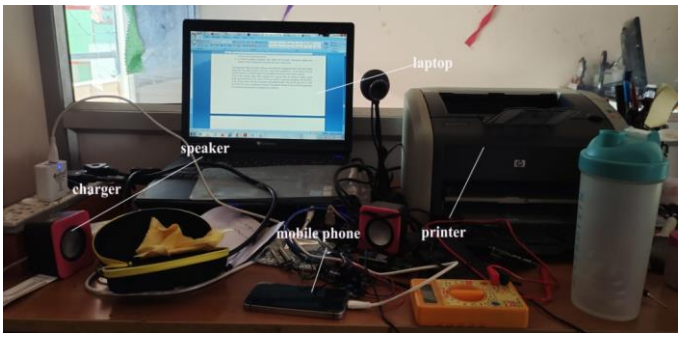

Figure 4: Result of reading assistant visual aided gadget

Conclusion and Future Work

For the people who are totally visually impaired, this exploration paper concentrate on offers another arrangement of glasses as a visual guide. A portion of the essential highlights of the suggested contraption incorporate the ones recorded underneath. The wearable, little, economical, low-power, sans hands plan for both inside and outside route. Handling successful calculations with the Raspberry Pi 3 Model B+'s handling limit. the utilization of a camera and ultrasonic sensors to simultaneously decide distance and understand objects. The visually impaired can peruse compositions from sources with any composed work thanks to an incorporated perusing help that gives text-to-picture transformation. Because of the powerful AI calculations and a superior UI, the framework may likewise be created and tried in a more mind-boggling external climate.

References

Blindness and vision impairment, World Health Organization, Geneva, Switzerland, Oct. 2019.

J. Bai, S. Lian, Z. Liu,K.Wang, andD. Liu, "Virtual-blind-road following based wearable navigation device for blind people," IEEE Trans. Consum. Electron., vol. 64, no. 1, pp. 136–143, Feb. 2018.

B. Li et al., "Vision-based mobile indoor assistive navigation aid for blind people," IEEE Trans. Mobile Comput., vol. 18, no. 3, pp. 702–714, Mar. 2019.

J. Xiao, S. L. Joseph, X. Zhang, B. Li, X. Li, and J. Zhang, "An assistive navigation framework for the visually impaired," IEEE Trans. Human- Mach. Syst., vol. 45, no. 5, pp. 635–640, Oct. 2015.

A. Karmel, A. Sharma, M. Pandya, and D. Garg, "IoT based assistive device for deaf, dumb and blind people," Procedia Comput. Sci., vol. 165, pp. 259–269, Nov. 2019.

J. Bai, S. Lian, Z. Liu, K. Wang, and D. Liu, "Smart guiding glasses for visually impaired people in indoor environment," IEEE Trans. Consum. Electron., vol. 63, no. 3, pp. 258–266, Aug. 2017.

D. Dakopoulos and N. G. Bourbakis, "Wearable obstacle avoidance electronic travel aids for blind: A survey," IEEE Trans. Syst. Man, Cybern. Part C Appl. Rev., vol. 40, no. 1, pp. 25–35, 2010.

E. E. Pissaloux, R. Velazquez, and F. Maingreaud, "A new framework for cognitive mobility of visually impaired users in using tactile device," IEEE Trans. Human-Mach. Syst., vol. 47, no. 6, pp. 1040–1051, Dec. 2017.

F. Lan, G. Zhai, and W. Lin, "Lightweight smart glass system with audio aid for visually impaired people," in Proc. IEEE Region 10 Conf., Macao, China, 2015, pp. 1–4.

M. M. Islam, M. S. Sadi, K. Z. Zamli, and M. M. Ahmed, "Developing walking assistants for visually impaired people: A review," IEEE Sens. J., vol. 19, no. 8, pp. 2814–2828, Apr. 2019.

T-Y Lin et al., Microsoft COCO: Common objects in context, 2015. https://arxiv.org/abs/1405.0312

J. Han et al., "Representing and retrieving video shots in human-centric brain imaging space," IEEE Trans. Image Process., vol. 22, no. 7, pp. 2723–2736, Jul. 2013.

J. Han, K. N. Ngan, M. Li, and H. J. Zhang, "Unsupervised extraction of visual attention objects in color images," IEEE Trans. Circuits Syst. Video Technol., vol. 16, no. 1, pp. 141–145, Jan. 2006.

D. Zhang, D. Meng, and J. Han, "Co-saliency detection via a self-paced multiple-instance learning framework," IEEE Trans. Pattern Anal. Mach. Intell., vol. 39, no. 5, pp. 865–878, May 2017.

G. Cheng, P. Zhou, and J. Han, "Learning rotation-invariant convolutional neural networks for object detection in VHR optical remote sensing images," IEEE Trans. Geosci. Remote Sens., vol. 54, no. 12, pp. 7405–7415, Dec. 2016.

M. A. Khan, P. Paul, M. Rashid, M. Hossain and M. A. R. Ahad, "An AI-Based Visual Aid With Integrated Reading Assistant for the Completely Blind," in IEEE Transactions on Human-Machine Systems, vol. 50, no. 6, pp. 507-517, Dec. 2020.

N. Carion, F. Massa, G. Synnaeve, N. Usunier, A. Kirillov, and S. Zagoruyko, "End-to-end object detection with transformers," May 2020. http://arxiv.org/abs/2005.12872

Q. Xie, O. Remil, Y. Guo, M. Wang, M. Wei, and J. Wang, "Object detection and tracking under occlusion for object-levelRGB-D video segmentation," IEEE Trans. Multimedia, vol. 20, no. 3, pp. 580–592, Mar. 2018.

S. Ren, K. He, R. Girshick, and J. Sun, Faster R-CNN: Towards real-time object detection with region proposal networks, IEEE Trans. Pattern Anal. Mach. Intell., 39, no. 6, 1137–1149, 2017.

Jothi Ganesan,,Ahmad Taher Azar, Shrooq Alsenan, Nashwa Ahmad Kamal,Basit Qureshi, and Aboul Ella Hassanien," Deep Learning Reader for Visually Impaired volume11,issues 20, 2022.