IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023

DOI: 10.17148/IJARCCE.2023.12215

An Intelligent Eye for Sand-Blind People Using Deep Learning and IoT

Prof. Chetana Srinivas[1], Anusha D[2], Bhavana B S[3], Kaisar Zahoor[4]

Associate Professor, Computer Science, East West Institute of Technology, Bangalore, India[1]

Student, Computer Science, East West Institute of Technology, Bangalore, India[2-4]

Abstract: Researcher's efforts to create a clever and intelligent directing mechanism that can function in both indoor and outdoor settings for persons with intelligent eyes have been hampered over the past few decades by advancements in the field of steer and routing devices. The equipment's is utilized to recognize items. We also use an ultrasonic sensor mounted on a servomotor to gauge the distance between objects and the persons wearing the prothetic eye. When compared to earlier systems, the given research recognizes the barrier with a noticeably high efficiency while just required straightforward computations for its implementation. The goal of this study is the creation of a tool that will aid stone-blind people and provide an efficient answer. Independent mobility and navigation are difficult for the blind. Daily tasks are hampered.

Keywords: Include Bluetooth, Cane module, Digital compass, IR ranging sensor, PIC microcontroller, Voice chip, Smart system, visual losses, biomedical sensor, tensorflow, Viola Jones, Ultra sensors, deep learning, obstacle detection and object recognition.

I. INTRODUCTION

Over 1.3 billion people are disabled worldwide, more than 36 million of whom are blind, according to the World Health Organization (WHO). 30% of all users of blindfolds are from India, which has the second-largest population in the globe. Despite the fact that enough efforts are being run to help these folks, it has been challenging to find enough supplies. Artificial intelligence has become very popular in this day and age as a result of the abundance of data and simplicity of processing. It is feasible to significantly simplify these people's lives using artificial intelligence. In the interim, until they have the necessary means to treat patients, the goal is to offer a "secondary sight." This might make daily tasks for people with incurable blindness more simpler and easier. Being able to see is a wonderful gift, and so is vision. People can perceive and understand the surrounding scene thanks to their vision. To this day, despairing people nevertheless put up a significant fight to live their lives. In the piece on display, a simple, worn-out client is created and actualized as a virtual eye to increase the adaptability of visually impaired and physically disadvantaged people in a specific area. By using their ears, blind people can map their surroundings thanks to this project. A camera, a raspberry pi, and headphones installed together with other linked internet-based working tools make up this project's core components, which are centered on the visual aspect. An image or video that has been recorded and is being processed as the project's input with the help of the camera connected to the Raspberry Pi/IOT technology, an image was taken and evaluated. As a consequence, the item is found and the blind person uses earbuds to listen to audio. This system deals with an approach to improve living for blind people as it is well-equipped with the most recent technology and aimed to enable individuals who are visually impaired live a life free of limits. Lack of visual recognition due to physiological or neurological factors is referred to as "visual deficit." Virtual impairment may make it difficult for persons to carry out daily tasks. Lack of development of the eye's optic nerve or visual focus is indicated by the incomplete visual impairment. 253 million persons worldwide are estimated to have vision problems. In contrast to the 36 billion blind individuals, 217 million people suffer moderate to severe visual impairment. The loss of sight has severe effects suffering on the part of the victims and their relatives. Humans can perceive their surroundings thanks to vision.

II. OBJECTIVES OF THE PROPOSED SYSTEM

- The proposed system architecture will utilize the features of microcontrollers, deep learning and IOT for its core functionalities.
- Development of a image recognition system for detecting and identifying a set of objects in a pre-defined data based.

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023
DOI: 10.17148/IJARCCE.2023.12215

- Development of a speech engine for announcing the name and description of an object stored and detected from the database.
- Integration of image recognition and speech engine blocks to detect and announce an object provided in the database
- This assists visually impaired people to navigate safely and to avoid any accident possible due to obstacles that may be encountered on their way.

III. EASE OF USE

The proposed system has the following advantages over the existing systems.

- Low Cost
- Very Handy
- Instruction is passed on through earphones
- Camera to detect the obstacle ahead
- Easy Navigation

IV. LITERATURE SURVEY

Title: Virtual Eye for Blind using IOT.

Authors: Niveditha K, Kavya P D, Nivedha P, Pooja B, Lakshmikantha G C, Published: International journal and engineering research technology (IJERT) IETE – 2020 (Volume 8 – Issue 11).

Abstract: This paper presents a smart stick assistive navigation system to help blind and visually impaired people. The Smart stick consists of a camera and raspberry pie attached to it which helps in the detection of the object which is present as an obstacle to the blind people, can be easily identified and informed to the blind people by the earphones which is directly attached to the blind people. In addition to the speech warning and another sensor is also placed at the bottom of the stick for the sake of avoiding the puddles. This can be achieved by using Yolo and Dark flow algorithm. By this paper we have learnt about the Yolo algorithm used for object detection and also image to text module.

Advantages: • GPS technology is integrated with pre-programmed locations to determine the optimal route to be taken. The user can choose the location from the set of destinations stored in the memory and will lead in correct direction of the stick.

Disadvantages: • If GPS is unable to detect the location then it may lead the blind to incorrect direction

Title: **Design and Implementation of an Embedded Real-Time System for Guiding Visually Impaired Individuals.**

Authors: S. Duman, A. Elewi and Z. Yetgin, Published: 2019 International Artificial Intelligence and Data Processing Symposium (IDAP), 2019, pp. 1-5

Abstract: This paper aims to design and implement a portable system to help visually impaired individuals in perceiving objects and people around them and estimating their distance precisely. The proposed system uses a CNN-based real-time object detection technique called YOLO (You Look Only Once) with a single camera mounted on Raspberry Pi board we have briefly gone through YOLO and CNN algorithm.

Advantages: • The random forest model is very good at handling tabular data with numerical features. Unlike linear models, they are able to capture non-linear interaction between the features and the target. The system has detected people and estimated their distance with 98% accuracy.

Disadvantages: • Accuracy becomes low when the model is trained with lesser data sets. • The predicted and actual distance can be varied when the system detection become low.

Title: A Virtual Eye to Aid the Visually Impaired text

Authors: Jinesh Ashah, Aashreen Raorane, Akash Ramani , Hitanshu Rami , Narendra shekokar. Published: 2020 3rd International Conference on Communication System, Computing and IT Applications (CSCITA) - Mumbai, India (2020.4.3-2020.4.4)

Abstract: To enable communication between a blind and deaf person, American Sign Language (ASL) is also to be detected and recognized. The resultant object or person or sign is then transmitted to the impaired person in the form of audio. The guardian can be notified via a text message when the person needs help or is in danger.

Advantages: • Eyeris is able to detect objects that a human interacts with on a daily basis. On to sending the guardian a text message including the live location of the user if the device senses any dangerous situation.

Disadvantages: • The accuracy completely depends on configuration of hardware and software units are to be.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023

DOI: 10.17148/IJARCCE.2023.12215

Title: Object Detection and Count of Objects in Image using Tensor Flow Object Detection API.

Authors: B. N. K. Sai and T. Sasikala. Published: 2019 International Conference on Smart Systems and Inventive Technology (ICSSIT), 2019, pp. 542-546

Abstract: Object detection not solely includes classifying and recognizing objects in an image however additionally localizes those objects and attracts bounding boxes around them. This paper mostly focuses on detecting harmful objects like threatening objects. To ease object detection for threatening objects, we have got Tensor flow Object Detection API to train model and we have used Faster R-CNN algorithm for implementation. Tensor Flow's Object Detection API is a powerful tool that can quickly enable anyone to build and deploy powerful image recognition software. We have understood about the tensor flow framework**.**

Advantages: • Enabled quick powerful tool to build the recognition software. **Disadvantages**: • Detection of harmful object may become difficult if system is failed to meet requirement

Title: A smart "virtual eye" mobile system for the visually impaired"

Authors: David Zhou, yonggao yang, and hanbing yan Published: International Research Journal of Engineering and Technology(IRJET) 14 November 2016

Abstract: This method works when users touch objects, allowing them to recognize that they are approaching something. A cane allows it through tactile learning. The latest relatively inexpensive smartphone devices, small and cheap embedded microprocessors, and various smart sensor systems together make it feasible to develop an affordable system to assist visually impaired people to better "feel," "see," "hear," and "conceive" their surroundings.

Advantages: • The developed application is robust and able to accurately detect up to ten feet away. Thus giving users detect objects up to ten feet away, thus giving users an interactive audible display of nearly proximity objects.

V. METHODOLOGY

The video is captured using a Camera which is then divided into a sequence of frames. Object detection is done using Haar cascade classifiers and color base object detection technique.

- **Haar Cascade Algorithm**: The Open CV library in Python has functions specifically to detect objects. It delivers software packages that are used to train classifiers for their object detection system, called Haar Training.
- Object Detection using Haar feature based cascade classifiers is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

• The algorithm extracts images using a lot of positive and negative images. A Haar-like feature can be considered as a template of several white and black rectangles interconnected. The features used are different size and rectangles.

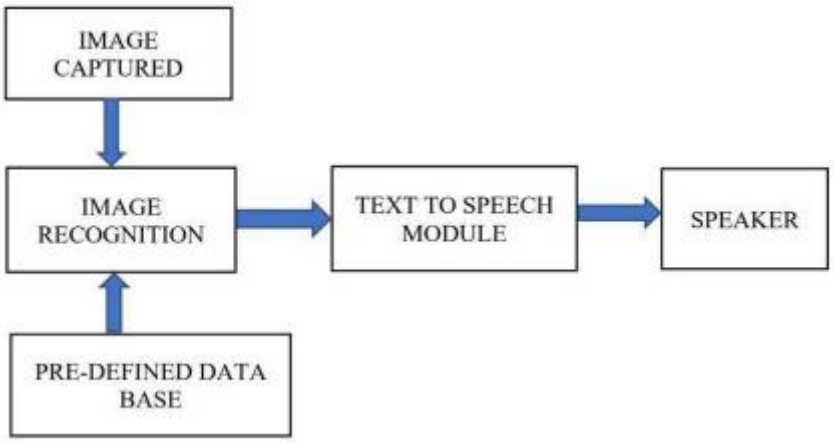

Fig : Block Diagram Of Proposed System

YOLO AND DARK FLOW REDUCED PROCESSING : LOAD AND PROCESSING TIME ARE NECESSARY IN ORDER TO PROCESS THEM. THIS IS CRUCIAL FOR THE SENSOR'S DEVELOPMENT BECAUSE IT WILL BE USED BY PEOPLE WHO ARE BLIND.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023

DOI: 10.17148/IJARCCE.2023.12215

Convolutional Neural Network (CNN) : CNN is mainly used for image recognition and image classifications. In CNN image classification takes an input image, process it and classify it under certain categories. CNN is an another type of neural network that can be used to enable machines to visualize things and perform tasks such as image classification, image recognition and object detection etc. Image classification is the task of taking an input image and outputting a class (Handgun, Hammer, Axe, Knife etc) or a probability of classes that best describes the image. CNN is specialized type of neural Network model designed for working with image data.
A computer should differentiate between all the images it is given. For that computer perform image classification by looking for low-level feature such as edges and curves then building up to more abstract concept through a series of convolution layer. In CNN the input image pass through a series of convolution layer and, pooling (down sampling) layer and fully connected layer and finally produce the output which can be simple class or probability of classes at best describes the image.

There are two main parts to a CNN architecture:
• A convolution tool that separates and identifies the various features of the image for analysis in a process called as Feature Extraction.
• A fully connected layer that utilizes the output from the convolution process and predicts the class of the image based on the features extracted in previous stages

The Viola Jones approach : which produces far better results, and modifies the Viola Jones algorithm very slightly. The framework mentioned has generated outstanding results as a consequence of its implementation and integration with OpenCV. The cascaded classifier in use has effectively merged the features. Without any notable errors, the framework is able to identify all the components. At this stage, it is necessary to emphasize that it takes more time.

Adaboost Instruction : The object identification framework picks the most useful attributes and trains classifiers that take use of them using a variation of the learning approach AdaBoost. This approach generates a strong classifier by linearly adding weighted simple weak classifiers.

Integral images have a performance advantage over more thorough versions : Any two-rectangle feature, any three-rectangle feature, and any four-rectangle feature may each be derived using six, eight, or nine array references. Since each feature's rectangular region is constantly close to it, the integral image is a representation of an image that analyses features by giving them access to at least one more rectangle.

Cascade classifier : Rapid and precise identification is possible with the help of a multi-stage classifier known as a cascade. A strong classifier is produced at each level by the AdaBoost algorithm. The number of weak classifiers rises as a strong classifier moves through the stages. A sequential (stage-by-stage) review of an input is performed. If a classifier provides a negative test result for a certain phase, the input is automatically rejected. Input advances to the next stage if the result is positive. This multi-stage technique, according to Viola and Jones, permits the development of simpler classifiers that may be used to quickly reject the bulk of negative (non-face) input and concentrate on positive (facial) data. Or, to put it another way, we are isolating the face from everything else in the image.

VI. POSSIBLE OUTCOME

- Detecting the hurdles that is been present in front of blind people
- Helps them in navigation.
- Detection the obstacles, take a photocopy of it.

VII. CONCLUSION

The IoT gadget has inspired the world over the past ten years by offering cutting-edge and intelligent applications for people. These applications include intelligent urban management, intelligent transportation management, intelligent medical, intelligent electrical, intelligent home, intelligent navigation, intelligent tracking, and many others. The creation of a navigation aid for blind or visually impaired patients, which enables them by giving navigation capabilities at indoor or outdoor situations without further help, is one of the most inspiring applications. A significant obstacle has been recognized as the requirement of safety, dependability, and accurate navigation skills in IoT-based navigation systems. Any form of impairment can be challenging in today's society, and blindness is no exception. Our objective is to develop a prototype for an artificial eye that will give blind individuals safety and freedom. Because the medical approach to treating this issue proved ineffective, a temporary simulation model is required. Since all the data

DOI: 10.17148/IJARCCE.2023.12215

is processed and saved on the Raspberry Pi, it may run without an internet connection. This is an extra benefit because the user's route may not always have internet availability. Under the variety of varied conditions encountered in this activity, the overall system gives us an average efficiency of about 91%, which is also a substantial improvement for our project. It also has a rechargeable battery with an approximate 24-hour capacity that enables the user to recharge it at night. Because VNC Viewer is included within the system, a person's mobile device can be connected to it. To transcribe text into voice, use the KNFB reader. The KNFB Reader provides accurate, rapid, and efficient access to single- and multi-page documents by instantly converting text into high-quality audio with a single tap. We believe that our strategy may be the starting point for a lot more advancement in the field of blindness assistance

VIII. ACKNOWLEDGEMENT

We are appreciative to have reached this point in our mission because it required a lot of help and work from many people to finish and had such a big impact on our enterprise. We are immensely appreciative and humbled by everyone who has helped us transform these concepts into something more profound.

We would especially like to express our gratitude to **Miss. Chetana Srinivas**, **Associate Professor,** (Department of Computer Science and Engineering, East West Institute of Technology), who gave us the wonderful opportunity to work on this wonderful project that also allowed us to conduct a great deal of research. We also wish to express our gratitude to the computer science and engineering professors whose suggestions enabled us to move past a lot of seemingly insurmountable obstacles.

REFERENCES

[1] The KNFB Reader's History. Accessed on: 20 August 2021. [Online]. You can access it at https://knfbreader.com/about-knfb-reader.

[2] Buck-Boost Converter: What is it. Accessed: Oct. 5, 2020. [Online]. Available: https://www.electrical4u.com/buck-boost-converter/

[3] R. Joshi, S. Yadav, M. Dutta, and C. Travieso-Gonzalez, ‘‘efficient multi-object detection and smart navigation using artificial intelligence for visually impaired people,’’ Entropy, vol. 22, p. 941, Oct. 2020, doi: 10.3390/e22090941.

[4] S. Singh and B. Singh, ‘‘Intelligent walking stick for elderly and blind people,’’ Int. J. Eng. Res. Technol., vol. 9, no. 3, Mar. 2020. [Online]. Available:https://www.ijert.org/intelligent-walking-stick-for-elderly-andblind-people

[5] Z. Xu, H. Chen, and Z. Li, ‘‘Blind image deblurring using group sparse representation,’’ Digit. Signal Process., vol. 102, Oct. 2020, Art. no. 102736, doi: 10.1016/j.dsp.2020.102736.

[6] Servo Motor SG-90. Accessed: Oct. 24 2018. [Online]. Available: https://components101.com/motors/servo-motor-basics-pinout-datasheet.

[7] Buck-Boost Converter: What is it. Accessed: Oct. 5, 2020. [Online]. Available: https://www.electrical4u.com/buck-boost-converter

[8] Raspberry Pi 4 Your Tiny, Dual-Display, Desktop Computer. Accessed: Aug. 15, 2020. [Online]. Available: https://www.raspberrypi. com/products/raspberry-pi-4-model-b

[9] M. J. Jones and P. Viola, Fast Multi-View Face Detection. Cambridge, MA, USA: Mitsubishi Electric Research Laboratories, 2003. [44] M. Karimi, N. Soltanian, S. Samavi, K. Najarian, N. Karimi, and S. M. R. Soroushmehr, ‘‘Blind stereo image quality assessment inspired by brain sensory-motor fusion,’’ Digit. Signal Process, vol. 91, pp. 91–104, Aug. 2019, doi: 10.1016/j.dsp.2019.03.004.