JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

Visually Impaired Aid using Computer Vision to read the obstacles

Pragati Chandankhede

Arun Kumar

[1] PhD scholar, Department of CSE, Sir Padampat Singhania University, Udaipur

[2] Professor, Department of CSE , Sir Padampat Singhania University, Udaipur

Received 2022 March 15; **Revised** 2022 April 20; **Accepted** 2022 May 10.

Abstract:

The world for normal human being is far different than visually impaired, due to either lack of vision or no vision. The difficulties in their daily routines can be minimized with help of technological support which is usually aids that can be used for travelling. Computer vision a field of artificial intelligence provides the assistance for helping impaired. The assembly of the device is made as handy as of user is using mobile and the architecture of YOLO (You Only Look Once) is used for accurate object detection. The feature detection of YOLO is more appropriate in real time. The object or the obstacle from which user can collide or the pedestrian localization is indicated to user with help of speaker which make system valuable. The compact size, Raspberry Pi 4 B 8 GB is used or processing, which has proved accuracy of 98% in real time scene.

Background:

The structure of designing a system for visually impaired to classify the aspect of the visual scene which represent the most important features for navigation and object identification (presence of the objects and their position in space). The auditory system, which is capable of combining information by classes of clues, plays a crucial role for the navigation. The thought of Computer vision is to acknowledge and interpret pictures an equivalent approach humans do, distinctive them, classify them, and type them supported their characteristic traits, like size, color, then forth. Images play a big role in human perception. However, in contrast to humans, computers or machines rework a picture into digital kind and perform some method thereon to urge some substantive data out of it.

Objectives:

Objectives identified were

1. Designing the compact size device that works on real time for visually impaired.

2.Cost effective system for understanding scene.

Keywords: travelling Aid, sensor based technology, navigation system, computer Vision, object detection, deep learning, pattern recognition, convolution neural network

1. Introduction

Visual impairment can be defined as the situation where eitherperson either not having ability to see or his vision has weakened to large extent. According to World Blind Union, there exist 314 million of blind and partially sighted people in the world. Out of which 45 millions are declared as completely blind. Reason for the blindness varies, but majorly exist due to neurology parameters or physiological. Thus those people with Low vision or blindness impacts their day to day life activities. Not only daily only chores but social communication also trims down due to reduced mobility. The majority of the primary causes of vision impairment includes cataract and under corrected refractive error, are subject matter to the epidemiological transition. This can be defined by changing pattern in various age group that impacts directly individual with societal costs. The blinding ophthalmic circumstances that are marked are called

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

epidemiological transition that includes age-related cataract, or when part of retina called macula is damaged and complication to diabetes patient that influence eyes[1].

With an blindness estimation of about 76 million by 2020, there arose a universal need that can help against circumstances . Major organization like International Agency for Prevention of Blindness and WHO have initiated progam "Vision 2020: The Right to Sight which take care of various national eye care plans. In 2013, the World Health Asssembly (WHA) launched a new plan, Towards universal eye health: a global action plan 2014–2019 (GAP). It set a global target: to achieve by 2019 a 25% reduction from the baseline of 2010 in prevalence of "avoidable" visual impairment, defined as the aggregated crude prevalence of cataract and undercorrected refractive error. These effort are acquired to since Vision impairment and blindness are directly associated with reduced economic, educational, and employment opportunities that affect quality of life. Being developing country like India, which get improved in progress on the scale of not only socioeconomic development but the way life seems to be satisfied with expectancies. As per National Programme for Control of Blindness & Visual Impair-ment(NPCBVI),Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India, there are 1,14,33,232 blind people registered in India till 2022(data obtained from https://npcbvi.gov.in/). It was found that hereditary diseases, Diabetic retinopathy, glaucoma, squint, keratoplasty, retinopathy with prematurity, congenital ptosis and cataract were the prominent causes in India for impairment.With immense greater part of vision impairment and blindness were caused through diabetic retinopathy, cataract, and glaucoma can be evaded with early detection and timely intervention.

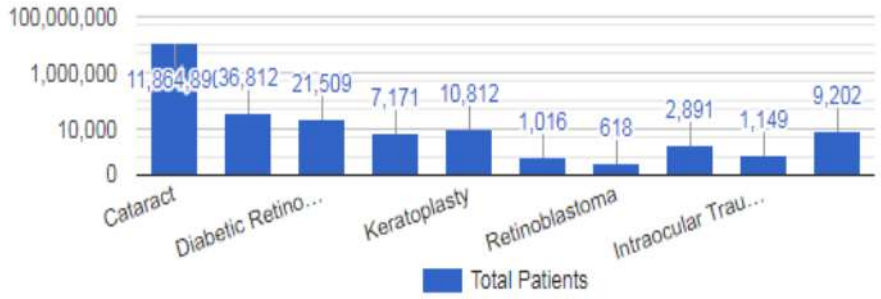

Figure 1: Total Registered Patient in India

2. Literature Review

2.1 Navigation System

In twentieth era for normal being, communication via social networking website are popular, the basic requiring like "going for walk" seems difficult for the visually person. The concept of orientation and way finding depends on how we avoid obstacles to do best mobility. Normally, individuals depend on vision to know their own position and which direction to move in the environment, they can recognize numerous elements in their surroundings, as well as their distribution and relative location. But can we imagine a mobility being carried out without vision? Vision less human being or low vision being finds difficulty and his performance slow down for basic tasks of finding his/her own stuff in his/her room. But with consistent efforts, blind person incorporate awareness from remaining sensory system, memories, verbal imagery to make life easy. The device or machine that can help the person to reach destination point is said as navigation system. Recent years had shown extraordinary improvement in tools that can help mobility.

Ability to travel and mobility of blind depends on four main factors, obstacle detection, and environment mapping, and navigation, relative location [5]. Over the decades, researcher were working on prototype of obstacle detection system, huge success in this was due to sonar and radar system. In both the phenomena the basic is determining target distance from the user and alerting user. Broadly travelling aids are categorized as Type I and Type II, both having unique features in them.Some prominent system of Type I and Type II are illustrated below.

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

2.2 Navigation system: Type I Electronic Travelling Aid

1. The Russell Pathsounder

The Russell Pathsounder invented in year 1966, by the author Lindsay Russell. The device has proved successful with exceptional applications, as it facilitate a man with low vision to retain his job as a floor supervisor in a sheltered workshop. The device has enabled a small boy who was neurologically impaired completely dependent on a support cane, to develop outdoor orientation and mobility skills. The phenomena underlying was, the use of ultrasonic waves into space at the rate of 15 pulses per second. The output here is either vibratory (tactile) and auditory[Li Kun , (2015)]. Device will haveno output if if waves do not collide with any reflecting surface which measures till length 79-182 cm. Developing a creative approach to the rehabilitation of visually impaired clients withcomplex needs. While the limitation was use of single output acoustic waves for object preview.

Figure2: The Russell Pathsounder

2. Ultrasonic Cone:

Invented in year 1972 by the researcher Geoff Mowat uses circular transducer, forward range to 4.02 meters. Also provided a switch to shorter distance range of about 1 meter. The acoustic waves creates divergence cone that cover up the size of body of human. However, there are certain problems with the device, which may have false readings under cold, rain, heavy snow weather conditions. The detecting regions by the cone are depicted in below figure.

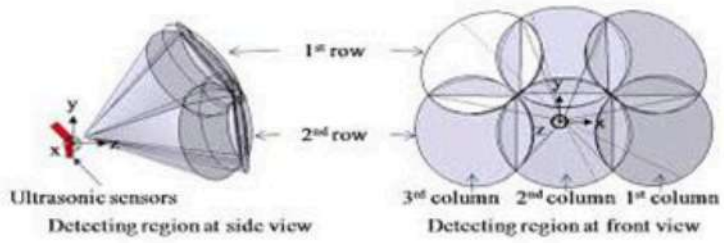

Figure 3: Ultrasonic Cone

3. Polaron:

The Nurion Industries brought out Polaron in 1980s. It can be applied on hand or chest. This devices make the use of laser cane that ranges selection of 1.22, 2.44, and 4.88 meters (4, 8, 16 feet), and an obstacles that are ahead are guided by vibrotacile or audible signals[3]. Problem with device was it cannot give any indication of the actual distance of the obstacle.

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

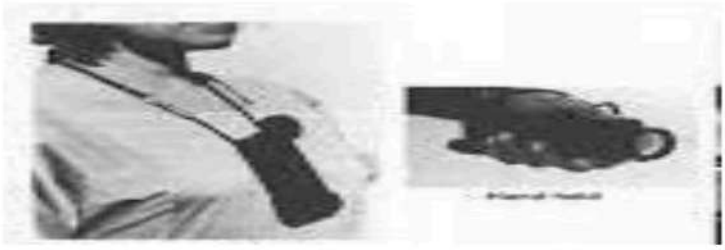

Figure 4: Polaron

4. WalkMate:

Developed in 1993, it emits U shaped beam of 0.7 meter wide and 1.82 meter tall. This u shaped beam maps the obstacles ahead. The shape was designed as 'u' which tries to acquire major objects ahead of it. But this model was not too effective in real life case and hence it's not available.

Figure 5: WalkMate

5. Miniguide US:

MiniGuide US is the only Type-I products still for sale these days. This product started as least from year 2004. It Provides a range of 7.92 meters, and the price was $545 online. Limitation of the system was as plastic case is used, chances of breakage. Being small in size, lack the coordination for control manipulation and accurate positioning.

Figure 6:MiniGuide US

6. vOICE:

Invented by MalikaAuvray, Sylvain Hanneton, J Kevin O'Regan, the technique is implemented for purely blind person, by the art of understanding images ahead through the process of rendering digital senses that lead to synthetic vision by true visual sensations through cross modal sensory integration.Such a technique need training.The phenomena is based on cognition.

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

Figure 7: vOICE

2.3 Navigation system: Type II Electronic Travelling Aid

This type of ETA primarily focuses on smart sticks, white can and smart dogs. Use of long cane tries to map the environment for about 1.5m with wind resistant capacity and its design in fashion so that it should be visible to pedestrians. Even though use of cane is simplest but it's have disadvantage that it can fetch enough information about big obstacle ahead. With the emergence of electronics tool after world war second, this simple cane is transformed to smart cane. The detail about smart cane is as shown below.

Type II Electronic Travelling Aid published year along with description and limitation of mentioned system are as follows.

1. White cane:

Invented in year 2001 by C. Wong, D. Wee, I. Murray and T. Dias has proposed design centres around the use of a micro controller to calculate distance measurements of ultrasonic signals sent and received by two sets of transducers fixed onto the white cane. The limitation of system are 1.The ability of a user to detect a dip is based on the user's sensitivity to ground levels 2.When travelling in crowded places the cane should be kept close to the body to avoid tripping other people.

2. Smart cane:

Invented by Whitney Huang, Hunter McNamara in the year 2014 uses Ardumoto to control Pulse Width Modulation. The Ardumoto can control vibrating motors in many ways through an analog input for the motor speeds, on and off features, and direction features. the device utilizes the information from an accelerometer to detect the orientation and motion of the hand. The limitation of the system was Accuracy of the distance reading is affected when a moving ultrasound source tries to detect a stationary object. The primary difficulty with creating a controlled experiment is maintaining a constant sweep rate with the cane.

Figure 8: Smart cane

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

3. Intelligent walking stick:

Invented by Nadia nowshinsakibshadmanSaha joy in the year 2017 has four ultrasonic sensor stick have sensor a and b implemented on the front side sensor c on the left side and senor d on the right side all four sensors detect obstacles and send the distance to an Arduino module then Arduino sends the correct distance to the mobile app through Bluetooth module then through the app user can hear the distance in their headphone.The system can be more effective with image processing.

3. Contextual Information needed by Visually Impaired

The way normal human being needs the information to take actions, the same way Contextual information is wanted by visually impaired innew, unfamiliar spaces outside their home. The information usually is the sound that they can follow to find the objects. Or the information is touch senses that they can feel via hand. Specifically in known environment, they can even tell the object they are touching. Sometime this information is tag along the path that came across them, by counting the number of steps they have till followed, that can lead them to valid destination. But the information needed by visually impaired is not restricted to above mentioned, it conforms from going to market place for purchasing basic needs, and crossing road. For which they have to rely on someone. Understanding the public services such as transport is also an important detail.

For visually impaired, out of many sectors of application, the education is the field which was considered as important and technological support has even strengthen the roots of this sectors. Braille was foremost effective technique for learning numbers and alphabets [4]. Following figures are demonstration of the same. The Braille is read by index figure rolling on the each line, as normal human being start writing from left to write its also read in same way. With Braille we can make aware to blind about punctuation or spelling and even the direction indication at public places. Efforts in such a direction were taken by IIT Delhi. By deploying Dot Book which is a Braille display. This Dot Book can give illustration for digital content or routines that can provide comfort in working environment.

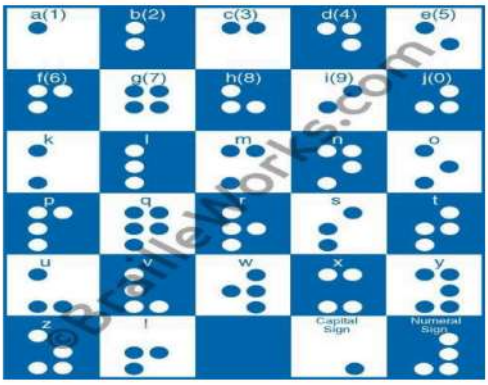

Figure 9: Braille work flow for learning alphabets and letter

Figure 10: DotBook

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

4. Present Navigation facility for Visually impaired at public places

This is the a way to be ready for written info that too in Braille, though once true square measure of real time scene like getting to malls, museums, there's so want of Navigation facility. The additional challenge is because of enough complexness through within house and lack of coaching in mobility. one amongst the incapacity startup of Asian country, AssisTech Foundation fabricated smart cane helps out these individuals to nice extent. This is often associate ultrasonic travel device which will be connected to a customary white cane for detection of knee on top of obstacles moreover as non-contact detection, it's sixty thousand user in Asian country[9]. Laws mandating access to public places by the Constitution of Asian. country states the security provision that require to be followed Sections 44-46 of the Persons with Disabilities Act, 1995 emphasize the importance of providing non-discriminatory access by removing all physical barriers. The access to public places within the following ways in which ought to follow following points

A. Apropriately fixing buses, airplanes, train compartments and vessels.

B.To form them accessible to persons with disabilities through chair user

C. putting in modality feedback in traffic signals for the advantage of the visually impaired.

D. creating necessary curb cuts and slopes in pavements for chair users.

E. Engraving the surface of equid crossings for the visually impaired.

F. Engraving the sides of railway platforms for the advantage of the visually impaired.

The malls have the fix structures, in such a case the "flow" info (example, voice message is passed on to user " you're on ground level, initially floor you'll obtain occasional, you're on second floor you'll obtain suits and dress, T shirt and Jeans")that is on the market is exploited to supply effective navigation support to the guests. however such location primarily based info is difficult as there'll be following with facilitate of either GPS, Bluetooth, or CCTV cameras. Such a system has not been nevertheless established.

5. Need of practicability for daily chores

All gratuitous obstructions should be removed, and every one access ways in which should be lit. Moreover, clear signposts, in conjunction with their Braille equivalents ought to be place up. Elevators should have clear Braille signs and modality feedback. The buttons of elevators should be accessible from a chair. Pictograms should be place up close to elevators and different necessary places like bogs. albeit a considerable portion of public places still stay inaccessible in Asian country, it's encouraging to notice that some samples of totally accessible buildings that square measure price emulating have appeared within the previous couple of years. The Old Delhi subway is probably the primary massive scale project in Asian country, a minimum of within the transport sector, that adheres to any or all accessibility standards and embraces an outsized array of best practices for the welfare of the disabled. The Chhatrapati Shivaji Maharaj Vastu Sangrahalaya, referred to as the patrician of Wales repository, in Mumbai is supplied with ramps, hydraulic lifts moreover as Braille aggregation for the advantage of the disabled.

6. Object Detection and Computer vision

To get insight for a entire image understanding, we must concentrate on categorizing different im ages, and make an attempt to exactly estimate locations of objects given in each image[2]. The process is said as object detection, which usually consists of different subtasks such as face detection, pedestrian detection. (Papert, Seymour A., 1966) proposed Ground Analysis and region analysis, the article was considered as a remark for stepping in direction for pattern recognition[8]. Over last 50 years, Computer vision has not been solved, and is still a extremely tough problem. We can define it as "a little that we humans do without thinking" but that is actually hard for computers to do or even to understand. Problems being hard because there is a enormous gap sandwiched between meaning and pixels. The

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

computer sees in a 200 × 200 RGB image is a set of 120, 000 values. The path from understanding these capability of visual system is incredibly proficient. Not only it recognizing fear and reacts to it immediately. And can we map of whether machine can do the same way as that of human can do? Answer was yes. Answer lies in roots of computer vision.Whether it's a computer or an animal, vision comes down by two components.

Foremost, sensing device that will capture details from a given image. For human, the eye will capture light coming through the iris and project it to the retina, where specialized cells will transmit information to the brain through neurons. Secondly, for a device with camera, captures images in a similar way and transmit pixels to the computer. In this part, cameras are better than humans as they can distinguish infrared, see far away or with more precision. Difficulty lies when device has to understand and process the information and extract meaning from it. The human brain resolves this in multiple steps in different regions of the brain. Computer vision is taking its step in direction to make it possible. Computer vision cannot work alone, with the technology of Artificial intelligence phenomena that manifests brain help out to lift results for image understanding.

Computer vision is a blended technology of pattern recognition and image processing. Image understanding is the focus of Computer vision. In order to make it work, we need to create models and extracts the data from the given images. Further, Image Processing is to transform them computationally. using an algorithm and sensor Computer vision has been motivated human visual system. But still it can't be as perfect as human. Along with gaining an image, analyzing image make computer vision more striking which involve steps 1) image creation, during this phase, image of object is captured and stored in computer; 2) image initialization/preprocessing, whereby quality of image is improved to enhance the image detail; 3) image segmentation, in which the object image is identified and separated from the background, 4) image measurement, where several significant features are quantized, and 5) image interpretation, where the extracted images are then interpreted.

A. MS COCO Dataset:

In order to enable a machine for recognizing object and then categorizing object, which include understanding patches, parts and features of given object, various dataset have been created. Dataset will also help into identifying each sort of a class from a broad collection of images.

MS COCO dataset (Common Objects in Context) is a large-scale object detection dataset that additionally includes segmentation, and captioning a part of dataset and is revealed by Microsoft [10]. So as to grasp visual scene, majority of Computer vision algorithmic rule used this dataset. The format of the dataset is mechanically taken by advanced neural network libraries that embody Tensorflow, PyTorch, OpenNN. There are eighty object classes aforesaid because the "COCO classes", that comprise "things" that individual instances is also merely labelled (person, car, chair, etc.) ninety one stuff classes, wherever "COCO stuff" includes materials and objects with no clear boundaries (sky, street, grass, etc.) that give important discourse data[Li Fei-Fei(2007)].

B. Object Detection Algorithm

To prepare algorithm seems being simple but second part to let them understand scene and react is quite difficult. It's because raw input to such learning system is always high dimensional entity. It may be solid object with 3Dimensional view. For such a case, computer vision and object recognition work together [2]. Image recognition is best handled by deep learning technique of AI, which can better serve visually impaired person.

Various object detection system come into existence, but the problem with many of them was, they depends on classifiers to be applied at multiple scale and location. The open source Neural Network, Darknet has presented many model, You only look once is one of them. Yolo resolvesthe problem by applying single network to full image. The network divides the image into regions and predicts the possibilities of object in an image with help of bounding box. The interesting part of Yolo v3 is its small feature map that packs lots of information within it. It can also be said as loss function, which has the capability of predicting same object of different size. The feature of IoU, Intersection over union value that notify that whether the object is present in said bounding box or not, it ranges 0 if not present and 1 if its perfectly able to predict. The purpose of loss function is to find most excellent IoU.

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

C. Working of YOLO version 3

Image Detection method typically apply localizer and classifiers for correct detection of object. additionally detection method is increased by giving input at completely different scales and site[4]. The absolutely connected model of the YOLO algorithmic rule is completely different than previous approach. The algorithmic rule applies one neural network to the complete full image. The given image is split into regions and regions offers proposal of bounding box. With notion of presence or absence of object within the region the possibilities is calculated. There are 5 versions of Yolo. Out of that version 3 is employed for the project [3].

YOLO V3 is fifty three layer network trained on Imagenet. For the task of detection, fifty three a lot of layers ar stacked onto it, giving United States a 106 layer absolutely convolution underlying design for YOLO. the foremost salient feature of v3 is that it makes detections at 3 completely different scales. YOLO may be a absolutely convolutional network and its ultimate output is generated by applying a one x one kernel on a feature map. The form of the detection kernel is one x one x (B x (5 + C)). Here B is that the variety of bounding boxes a cell on the feature map will predict, "5" is for the four bounding box attributes and one object confidence, and C is that the variety of categories. In YOLO v3 trained on coconut palm, B = three and C = eighty, therefore the kernel size is one x one x 255. The feature map created by this kernel has identical height and dimension of the previous feature map, and has detection attributes on the depth as delineated higher than. YOLO v3, in total uses nine anchor boxes 3 for every scale[7].

D. Architecture of system

The figure 10, represent the architecture of the system, even though the process looks long , YOLO object detection algorithm completes the detection and prediction in few second, the real life result of YOLO are effective for many cases. The confidence that is calculated by YOLO will give us accurate object prediction. YOLO is trained on COCO dataset that has labels for 80 classes, despite of variation in angel, color and shape all 80 classes can be recognized.

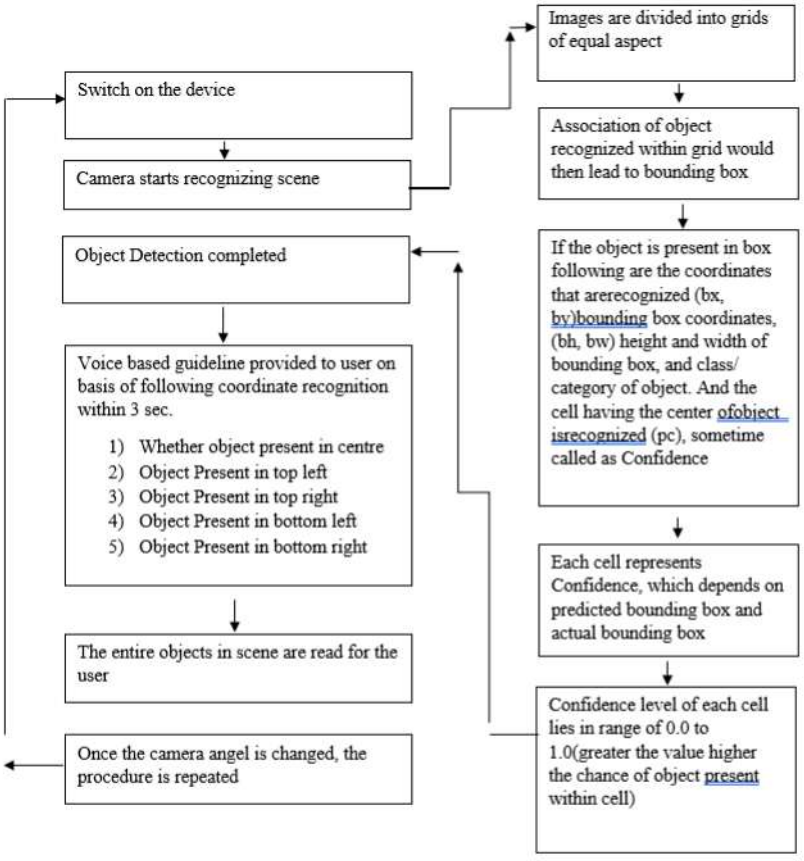

Figure 11: Architecture of system

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

7. Result and Discussion

A. Performing Object Detection with Predefined Weights and configuration of YOLO.

In today's world, RAM on a machine is reasonable and is on the market in lots. You wish many GBs of RAM to run a brilliant complicated supervised machine learning downside – it is yours for a bit investment / rent. On the opposite hand, access to GPUs isn't that low cost. you wish access to hundred GB VRAM on GPUs – it won't be undemanding and would involve important prices. we tend to attempt to solve complicated reality issues on areas like image and voice recognition. Once you have got some hidden layers in your model, adding another layer of hidden layer would want huge resources. A pre-trained model could be a model created by some one else to resolve an analogous downside. rather than building a model from scratch to resolve an analogous downside, you utilize the model trained on alternative downside as a place to begin.Pre-trained networks demonstrate a powerful ability to generalize to image.

Deep learning techniques area unit achieving progressive results for object detection, like on customary benchmark datasets and in computer vision competitions. Notable is that the "You only Look Once," or YOLO, family of Convolutional Neural Networks that deliver the goods close to progressive results with one end-to-end model which will perform object detection in period of time.[6]

Traditional systems repurpose classifiers to perform detection. Basically, to sight any object, the system takes a classifier for that object then classifies its presence at varied locations within the image. Alternative systems generate potential bounding boxes in picture mistreatment region proposal strategies so run a classifier on these potential boxes. This leads to a rather economical technique. when classification, post-processing is employed to refine the bounding boxes, eliminate duplicate detection, etc. because of these complexities, the system becomes slow and exhausting to optimize as a result of every part needs to be trained on an individual basis.

1. The primary step is to transfer the pre-trained model weights.

2. Offer the configuration and weight files for the model and load the network.

3. Load names of classes/labels

4. calculate the network response for blob

5. Loop over every of the layer outputs

6. Separate out weak predictions by guaranteeing the detected chance is larger than the minimum probability (confidence>0.4)

7. Convert detected image with speech as a voice output for direction and discovering obstacle or object ahead. Drive top left corner of bounding box.

8. Apply non-maxima suppression for overlapping boxes.

9. Guarantee a minimum of one detection.

The RaspberryPi 4 B 8 GB is used for processing object detection algorithm since the current era depends on compact size architect devices. This gives a chance to user to create something innovative. The Raspberry Pi is computer of shape as small as debit card with following key feature, 2 × USB 2.0 Ports 2 × USB 3.0 Ports, 2.4 GHz and 5.0 GHz IEEE 802.11b/g/n/ac wireless LAN, BLE Gigabit Ethernet, Bluetooth 5.0. And the operationg power is 5V 3A DC via GPIO Header 5V 3A DC via USB Type-C Connector Power Over Ethernet (PoE)–Enabled.use of c5-megapixel OV5647 Raspberry Pi Camera that even works in low light is used along Pi.

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

Figure: 11 The Raspberry Pi with Camera Module and Connection for Object detection

To access the Raspberry Pi command-line interface, PuTTY is used. It uses SSH (secure shell) to open a terminal window on your computer, which you can use to send commands to the Raspberry Pi and receive data from it. After inserting Yolo v3 setup in Raspberry Pi, whole configuration is made customize by three dimensional printing. The overall system ready for use seem to be, as shown in figure 11.

If visually impaired wish to connect it to Television for recognizing object in a living room, where every time he need not to on or off the system, that's possible with the approach. In all the cases object detected by the system will be informed to the user via headphone, so he need to apply them. Advantage of this approach is small objects which are located inhouse like watch, specs can be found by the person by simply moving the device camera around the room. And device will guide the user that specs are in bottom right corner.

Figure 12: Handy Device for Visually Impaired

4 x 4 x 1 inches is the totality size of device shown in above figure, which is same as medium size mobile and hence such a handy device can be carried and used whenever user who is visually impaired needs and environment is new to them. Following are the real life result obtained by the system.

Figure 13: Object Detection by the system

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

Figure 14: Visually impaired holding Device for detecting object ahead.

8. Conclusion and Future work

Various Travelling Aid have made mobility possible for visually impaired, but still there is lot of scope for up gradation, the work presented in paper is one step in the direction. By many surveys it was proved that visually impaired can hear better, sense better and can make themselves in scenario where they are safe. Taking into this consideration, the device aims of "telling" whatever it sees through camera module of Raspberry Pi 4 B 8 GB . The System has proved to be effective in real life scene with precision of 0.496 and recall of 0.623 with intersection over union for the range of 0.50 to 0.95. The key parameter of YOLO is, it understand contextual information about scene within minimum time. The location of object detected is alerted to the user with voice guideline providing either of five coordinate positions.The key features of the system is compact size device that can read obstacles can make visually impaired more independent that they can rely on. Future work involves optimizing the algorithm for the optical character recognition and ready Braille characters applied at public places. Future work involves Image magnification with computer vision algorithm can benefit many person who are not completely blind.

References

[1] Amira B, Ramadan T, "Face Detection and Recognition Using OpenCV", Journal of Soft Computing and Data Mining,VOL.2 NO. 1, 86-97, October 2021. https://www.researchgate.net/publication/355886757_Face_Detection_and_Recognition_Using_OpenCV.

[2] Dixit R, kushwahR, "Handwritten Digit Recognition using Machine and Deep Learning Algorithms", arXiv, 2106.12614, June 2021. https://arxiv.org/abs/2106.12614.

[3] FarhadiA. ,Redmon J. "YOLOv3: An Incremental Improvement", arXiv,1804.02767, Jan 2018. https://arxiv.org/abs/1804.02767.

[4] Kavalgeri S, "E - Braille: A Study Aid For Visual Impaired", International, Journal of Research in Engineering, Science and Management, volume 2, Issue 2, April 2019. https://www.researchgate.net/publication/332571033_E_-_Braille_A_Study_Aid_For_Visual_Impaired.

[5] "An Industry Landscape Study Electronic Travel Aids for Blind Guidance", Sutardja Center for Entre-preneurship & Technology Technical Report,1-10.Dec 2015.

[6] Li Fei-Fei, Fergus R. , Pietro P., "Learning generative visual models from few training exam-ples:An incremental Bayesian approach tested on 101 object categories", Journal of Computer Vision and Image Understanding, 106 59–70,April 2007. https://ieeexplore.ieee.org/document/1384978.

[7] Pathak A. , Pandey M., Rautaray S, "Application of Deep Learning for Object Detection", Inter-national Conference on Computational Intelligence and Data Science , 132 ,1706–1717, 2018. https://www.sciencedirect.com/science/article/pii/S1877050918308767.

[8] Rupert R, "Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight" An analysis for the Global Burden of Disease Study, Blindness and Vision Impairment Collaborators, volume 9 issue 2 .2021. https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30489-7/fulltext.

[9] Real S, Araujo A "Navigation Systems for the Blind and Visually Impaired: Past Work, Challenges, and Open Problems", International Journal of Sensors, 2019,3404.", International Journal of Research in Engineering, Science and Management, 2581-5792. June 2019. https://www.mdpi.com/1424-8220/19/15/3404.

[10] Tsung-Yi Lin, Michael Maire et,al, "Microsoft COCO: Common Objects in Context", ar-Xiv,1405.0312, 2015. https://arxiv.org/abs/1405.0312.

Pragati Chandankhede , PhD scholar at Sir Padampat Singhania University and presently working as Assistant Professor in KCCEMSR Thane. She holds master's degree in Computer Science and Engineering from G.H. Raisoni College of Engineering and Bachelor's degree in Information Technology from Amravati University. She has interest in the streams of Artificial Intelligence, Computer vision and Cloud Computing. She has guided various BE projects. Has Presented papers at various International conference and published the research article in Journals

Prof Arun Kumar is presently working as Professor in the Department of Computer Science and Engineering at Sir Padampat Singhania University, Udaipur, Rajasthan. He is also shouldering the responsibility of Dean of School of Engineering at SPSU. He holds a Bachelor's degree in Applied Electronics and Instrumentation Engineering from NIT Rourkela, a master's degree in Computer Science and Engineering from University of Madras and a Doctoral degree in the area of Computer Vision. He has interest in the development of application in the area of Data Science, Recommender Systems, and Fake News Analysis. He holds two granted patents from Govt of India. He is a registered PhD guide with SPSU and has four research scholars who have already graduated from the department of Computer Science and Engineering

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Mi in nulla posuere sollicitudin aliquam. Egestas diam in arcu cursus. Tincidunt arcu non sodales neque. Id neque aliquam vestibulum morbi. Donec enim diam vulputate ut pharetra sit amet aliquam id. Enim sed faucibus turpis in eu mi bibendum neque egestas. Sed enim ut sem viverra. Donec ultrices tincidunt arcu non. Varius sit amet mattis vulputate enim nulla aliquet porttitor. Ultrices dui sapien eget mi proin sed libero enim. Sem viverra aliquet eget sit. Malesuada nunc vel risus commodo viverra maecenas accumsan lacus vel.

Quis risus sed vulputate odio ut enim. Laoreet suspendisse interdum consectetur libero id faucibus nisl. Egestas maecenas pharetra convallis posuere morbi. Vitae suscipit tellus mauris a diam maecenas. Sit amet cursus sit amet. Dui nunc mattis enim ut tellus. Amet nulla facilisi morbi tempus iaculis. A iaculis at erat pellentesque adipiscing commodo elit at imperdiet. Pulvinar mattis nunc sed blandit libero volutpat sed. Tincidunt ornare massa eget egestas purus viverra accumsan in nisl. Fermentum odio eu feugiat pretium. Tellus mauris a diam maecenas. Tincidunt lobortis feugiat vivamus at. Tincidunt tortor aliquam nulla facilisi cras. Enim neque volutpat ac tincidunt vitae. Amet massa vitae tortor condimentum. Ut tortor pretium viverra suspendisse potenti nullam ac tortor. Convallis aenean et tortor at.

JOURNAL OF ALGEBRAIC STATISTICS
Volume 13, No. 3, 2022, p. 4467-4481
https://publishoa.com
ISSN: 1309-3452

16. Methods

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Orci a scelerisque purus semper eget duis at tellus at. Quisque egestas diam in arcu cursus. Pulvinar mattis nunc sed blandit. Tempus iaculis urna id volutpat lacus laoreet non curabitur. Morbi tincidunt ornare massa eget egestas purus viverra accumsan in. Vehicula ipsum a arcu cursus. Sapien et ligula ullamcorper malesuada proin. Ut diam quam nulla porttitor. Tincidunt dui ut ornare lectus sit. Neque ornare aenean euismod elementum nisi quis eleifend. Mus mauris vitae ultricies leo integer. In nulla posuere sollicitudin aliquam ultrices. Eget duis at tellus at urna condimentum mattis. Tellus molestie nunc non blandit. Quam quisque id diam vel quam elementum pulvinar. Integer quis auctor elit sed vulputate mi. Pellentesque elit eget gravida cum sociis natoque penatibus et. Aliquet risus feugiat in ante. Commodo ullamcorper a lacus vestibulum sed.

Congue nisi vitae suscipit tellus mauris a diam maecenas. Aliquet nec ullamcorper sit amet risus. Pulvinar sapien et ligula ullamcorper malesuada proin libero nunc consequat. Non consectetur a erat nam at lectus urna duis convallis. Purus viverra accumsan in nisl nisi scelerisque eu. Netus et malesuada fames ac turpis egestas maecenas pharetra convallis. Sed turpis tincidunt id aliquet. Et malesuada fames ac turpis egestas sed tempus urna et. In dictum non consectetur a erat nam at. Nulla aliquet porttitor lacus luctus accumsan tortor posuere. Nunc consequat interdum varius sit amet mattis vulputate enim nulla. Cras tincidunt lobortis feugiat vivamus. Venenatis a condimentum vitae sapien pellentesque habitant morbi. Suscipit adipiscing bibendum est ultricies integer. Et ultrices neque ornare aenean. Ut porttitor leo a diam sollicitudin tempor id eu. Lorem ipsum dolor sit amet consectetur adipiscing elit. Morbi tincidunt ornare massa eget egestas purus viverra accumsan in. Sit amet consectetur adipiscing elit duis tristique.

Ipsum dolor sit amet consectetur adipiscing. Arcu felis bibendum ut tristique. Lectus sit amet est placerat in egestas. In massa tempor nec feugiat nisl pretium. Vel pharetra vel turpis nunc eget lorem dolor. Ornare aenean euismod elementum nisi quis eleifend quam. Tellus id interdum velit laoreet id donec. Eget arcu dictum varius duis at consectetur lorem donec massa. Amet facilisis magna etiam tempor orci eu lobortis. Consectetur adipiscing elit duis tristique sollicitudin. Pellentesque dignissim enim sit amet venenatis urna cursus eget.

Pellentesque adipiscing commodo elit at imperdiet. Lectus proin nibh nisl condimentum id venenatis. Dignissim diam quis enim lobortis scelerisque fermentum dui faucibus in. Volutpat diam ut venenatis tellus. Vehicula ipsum a arcu cursus vitae. Volutpat maecenas volutpat blandit aliquam etiam. Sed id semper risus in. Eget nulla facilisi etiam dignissim diam quis enim lobortis scelerisque. Tellus in hac habitasse platea dictumst. Non enim praesent elementum facilisis leo. A cras semper auctor neque vitae tempus quam pellentesque. Dolor magna eget est lorem ipsum dolor sit amet consectetur.

Neque laoreet suspendisse interdum consectetur libero id faucibus. Ac turpis egestas maecenas pharetra convallis. Sagittis aliquam malesuada bibendum arcu vitae elementum curabitur vitae nunc. Nulla facilisi cras fermentum odio eu feugiat pretium nibh. Tortor at auctor urna nunc id cursus. Bibendum enim facilisis gravida neque convallis a cras semper auctor. Feugiat vivamus at augue eget arcu. Et netus et malesuada fames ac turpis egestas. Quisque id diam vel quam elementum. Amet est placerat in egestas erat. Egestas maecenas pharetra convallis posuere morbi leo. Sagittis aliquam malesuada bibendum arcu vitae. Ultricies lacus sed turpis tincidunt id aliquet risus. Ipsum dolor sit amet consectetur adipiscing elit. Cursus sit amet dictum sit amet justo donec.

17. Results

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Laoreet id donec ultrices tincidunt arcu. Sollicitudin aliquam ultrices sagittis orci a scelerisque. Sit amet aliquam id diam maecenas ultricies mi. Proin fermentum leo vel orci porta non. Ornare arcu dui vivamus arcu. Lorem ipsum dolor sit amet consectetur. Cras fermentum odio eu feugiat pretium nibh ipsum. Sapien nec sagittis aliquam malesuada bibendum arcu vitae elementum curabitur. Rhoncus est pellentesque elit ullamcorper dignissim cras tincidunt lobortis feugiat. Venenatis urna cursus eget nunc scelerisque viverra mauris in. Diam volutpat commodo sed egestas egestas fringilla phasellus faucibus. Sit amet volutpat consequat mauris nunc congue nisi vitae. Tincidunt ornare massa eget

egestas purus viverra accumsan in nisl. Semper quis lectus nulla at volutpat diam ut. Lobortis feugiat vivamus at augue eget arcu dictum varius duis. Vel facilisis volutpat est velit egestas dui id ornare arcu.

18. Discussion

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Tempor id eu nisl nunc mi ipsum. Gravida neque convallis a cras semper auctor neque vitae. In arcu cursus euismod quis viverra nibh cras pulvinar mattis. Pellentesque id nibh tortor id aliquet. Viverra adipiscing at in tellus integer. Volutpat lacus laoreet non curabitur gravida arcu. Arcu dui vivamus arcu felis bibendum ut tristique. Sollicitudin ac orci phasellus egestas tellus rutrum tellus pellentesque eu. Venenatis urna cursus eget nunc scelerisque viverra mauris in aliquam. Sociis natoque penatibus et magnis dis parturient. Morbi non arcu risus quis varius quam. Faucibus ornare suspendisse sed nisi lacus sed viverra tellus in. Sit amet commodo nulla facilisi nullam vehicula ipsum a arcu. Gravida in fermentum et sollicitudin. Aenean et tortor at risus.

Consequat ac felis donec et odio pellentesque diam. Nulla malesuada pellentesque elit eget gravida cum. Leo urna molestie at elementum eu facilisis sed. Nulla pharetra diam sit amet. Non arcu risus quis varius quam quisque id diam vel. Neque laoreet suspendisse interdum consectetur libero id faucibus nisl tincidunt. Platea dictumst vestibulum rhoncus est pellentesque elit ullamcorper. Velit laoreet id donec ultrices tincidunt arcu non sodales. Venenatis urna cursus eget nunc scelerisque viverra. Lectus magna fringilla urna porttitor rhoncus dolor. Proin libero nunc consequat interdum varius sit. Arcu felis bibendum ut tristique et egestas quis.

Refrences

[1].Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
[2].Ipsum dolor sit amet consectetur adipiscing elit pellentesque. Orci eu lobortis elementum nibh. Faucibus a pellentesque sit amet porttitor.
[3].Egestas tellus rutrum tellus pellentesque eu tincidunt tortor. Sagittis orci a scelerisque purus semper eget. Vitae purus faucibus ornare suspendisse sed nisi lacus sed viverra.
[4].Augue interdum velit euismod in pellentesque massa placerat duis ultricies. Metus aliquam eleifend mi in nulla posuere sollicitudin aliquam ultrices.
[5].Velit laoreet id donec ultrices tincidunt arcu non sodales neque. Non curabitur gravida arcu ac tortor dignissim convallis aenean et.
[6].Euismod in pellentesque massa placerat. Morbi non arcu risus quis varius quam quisque.