Third Eye for Blind Person

Ritik Singh[1], Rishi Kumar Kamat[2], Faraj Chisti[3]
[1,2,3] *Information Technology, ABES Institute of Technology, India*

Abstract **- Third eye for the blind is advancement with the assistance of the multidiscipline subjects like software engineering, hardware designing and which encourages the visually impaired individuals to explore with speed and certainty by recognizing the object and person close-by deterrents utilizing the assistance of ultrasonic waves and inform them with a beep sound and audio assistance. The influenced ones have been utilizing the convention white stick for a long time which in spite of the fact that being powerful, still has a considerable measure of weakness. This will be wearable innovations for the blinds. The raspberry pi 4 module it is a small computer. This will be furnished with the ultrasonic sensors, comprising of raspberry pi 4 modules with camera. Utilizing the sensor, outwardly hindered can recognize the articles around them and camera help to identifying the object which can help can to travel effectively. At the point when the sensors recognize any question it will inform the client by headset. And person and object name will recognize by camera and output by headset which can help to know about the object in front of client. In this manner this is a computerized gadget[1]. Accordingly this gadget will be of an awesome use for blinds and help them travel better places.**

Index Terms **- Beep sound, Raspberry pi 4 module, voice assistant, camera module, speech recognition, object detection, pi operating system, pi camera, speech recognition.**

I.INTRODUCTION

In this modern era of technology, Smartphone devices have become one of the most common consumer devices. [1] A Smartphone plays a very important role in human life. Smartphone's make life easier with its various functionality like – communicating with others through voice calls, emails, messages, browsing the internet, taking photos, etc. With the help of Smartphone's, these all have become a matter of seconds. For example, you just have to dial the person's contact number from your phone and wait till he/she responds. But this pleasure is only for those people who do not have any disability.

Blind people can live a normal life and do things according to their lifestyle but, they have to face a lot of difficulties as compared to the normal people without any disabilities. One of the biggest problems for visually impaired person, especially the one who is totally visually impaired, or blind is that they cannot use a smart mobile phone.

[6] There are no such gadgets accessible in the market that can be worn like a material and having such a minimal effort and straightforwardness [6]. With the utilization of this extemporized gadget in a huge scale, with changes in the model, it will definitely profit the network of the outwardly debilitated or the visually impaired individuals [1]. The target of this task The Third Eye for the Blind is to plan an item which is particularly helpful to those individuals who are outwardly debilitated and the individuals who frequently need to depend on others. [1] Third eye for Blind task is a development which helps the outwardly debilitated individuals to move around and move between Different places with speed and certainty by knowing the adjacent hindrances utilizing the assistance of the wearable band which delivers the ultrasonic waves which inform them with the inbuilt voice assistant.

II.EXISTING SYSTEM

Till now, there are many new technologies developed for visually impaired person but they are hard to operate and not very accurate like the object detection system only detects the object and the direction of the object but it does not tells the distance between the person and the object. There are some devices which can also make contacts and send messages to another person but it can be hard for the visually impaired person to operate since they don't know how to select the one who needs to be called or messaged. These are the features of the existing system or the systems which are made till date-

1. System makes two different types of sounds depending on the situation. The major drawback of this system was that the blind people cannot differentiate the sound even if he/she can then it will take some time to identify the front obstacle according to the sound.
2. Object detection sensor is also introduced in the new devices which can detect the object but it cannot specify the distance between the person and the object.
3. To overcome above limitation JM Benjamin [3][1] proposed a three-direction detectable laser cane. [1] The direction is 45 degrees over and parallel to the ground and with sharp deepness. This laser
4. works when an object or obstacle comes in its range only and the range was very less so it can only be used in indoor systems and cannot be used for outdoor systems.
5. Now, they are introducing voice assistants who only tell the output of the sensors to the user like the distance, direction and the object's name.[1]

All the above systems cannot satisfy the exact needs of the blind peoples.[1] To overcome that limitation mentioned above this project will help to make a better and reliable system for the blind people. With the latest technology it will be cheaper and will be an easily wearable device with all the functionalities which can help the visually impaired to perform most of the daily tasks with ease.

III.PROPOSED SYSTEM

In this system we are developing the navigation system for the blind persons. This is very easy to use and work as a navigator to the blind people to easily navigate.

In this system the ultrasonic or sensor will detect the object and gives sound (object 'beep sound') and camera scan the object using object detection technique and predict the object and by using speech recognize the object name is convert into sound and client can know the object by the help of headset.

The object and person name and data are store in the module and if the data is not present it will simply said no data image present give a beep sound.[2]

In this system we are using some hardware and software components which are following

Also we add some extra feature like distance measurement technique to identify how far the distance between the object and the client and voice assistant for various extra features.

Software's and Technique

We can use following software.

- Pi operating system.
- Object detection Technique
- Distance Measurement Technique
- Speech Recognition.

Hardware Components.

- Raspberry pi 4 module
- Ultrasonic sensor
- Headset
- Pi cam (camera)
- 5 mm LED: Red
- Slide Switch
- Female Header
- Male Header
- Jumper wire
- Power bank
- 1kΩ Resistor
- 2kΩ Resistor
- Some elastics and stickers

Let us see about the components in brief:

OBJECT DETECTION USING TENSOR FLOW:

The tensor Flow object detection API is the framework for creating a deep learning network that solves object detection problems.

[4]This technique can be very useful to assist the blind and the elderly if deployed on their handy mobile.

[4]Objects can be detected via Smartphone's camera, identifies them and then reports back audibly to the user, thus helping the blind navigate and perform daily tasks with greater ease.

[4]To detect an object of your choice, we need to follow these steps:-

Data Generation: [4]Gather images of similar objects.

Image Annotation: Label the object with bounding box.

API Installation: Install Tensor Flow object detection API.

Train and validate model: Using annotated images.

Freeze the model: [4]To enable mobile deployment.

Deploy and run: [4]In mobile or virtual environment.
Algorithms for object detection and they can be split into two groups:

1. Algorithm based on classification-

They are implemented in two stages.

a. First, they select regions of interest in an image
b. Second, they classify these regions using convolution neural network

2. Algorithm based on regression-

Instead of selecting interesting parts of an image, they predict classes and bounding boxes for the whole image in one run of the algorithm. [2]Two best known examples from this group are the YOLO (You Only Look Once) and SSD(Single Shot Multibox Detector)

DISTANCE MEASUREMENT

Using ultrasonic we can measure the distance between the object and the user. Object can be anything like vehicle, chair, person, table etc.[3] This will be a relative measure given that the picture can be different angles and perspectives.
[3]To draw the lines around the objects we need to import some inbuilt modules-

```
From PIL import Image,
Image Draw
Import itertools
From itertools import compress
```

The main idea is to follow the complete the following steps:

- Get every detected object from the Tensor Flow[3].
- Filter them by class and score. It will show the object matching more than 50%.
- It will then calculate the centroid(center of the box) of the boxes.
- [3]Calculate permutations between all the centroids.
- Calculate distance between the different permutations.
- [3]Apply a threshold to the permutations based on the distance.
- Draw the lines.
- Show the picture

To calculate the centroid of the box-

```
Def calc_centroid(bounding_box):
return(((bounding_box[3]-
bounding_box[1]/2)+bounding_box[1],
((bounding_box[2]-
bounding_box[0])/2)+bounding_box[0])
```

To calculate centroids-

```
Def calc_perm(detection_centroids):
Permutations=[]
for current_Permutation in
itertools.permutations(detection_centroids, 2):
if current_permutation[::-1]
not in permutation:
permutations.append(current_permutation)
return Permutations
```

To Calculate the distance (using Euclidean distance)-

```
Def calc_cent_distances(cent1, cent2):
return math.sqrt((cent2[0]-cent1[0])**2 + (cent2[1]-
cent1[1])**2)
```

To calculate the distance for a group of permutations-

```
Def calc_all_distances(centroids):
Distances =[]
for centroid in centroids:
Distances.append(calc_cent_distances(centroid[0],
centroid[1]))
Return Distances
```

To draw the lines (normalizing the centroids using the image width and size)-

```
Def nor_centroids(centroids, img_width, img_height):
newCentroids = []
for centroid in centroids:
newCentroids.append((centroid[0]*img_width,centro
id[1]*img_height))
return newCentroids
```

SPEECH RECOGNITION:

The blind cannot use keyboard on android Smartphone or even if he/she is able to type then it is obvious that It will take more time than the normal person. So, to take the input from the user we will use the speech recognition module which is a python module which converts the speech in text and then based on the text it will take actions and control other modules based on the user's command.

We will be using CMU Sphinx engine because it can work without an internet connection to recognize the audio as-
recognize sphinx()
To access microphone with SpeechRecognizer we will use PyAudio Package.
This module will be directly connected to other modules(object detection, distance measurement) of the project and these can be called by this speech recognizer like-
Turn ON "module name" – will activate the module name spoken after "Tun ON"
Distance between me and "The object name" – will give the distance between the user and the object name spoken by the user.
Save Face of "the person's name" – will save the face of the person's face by the specified name
Who is in front of me – will tell the user the person standing/sitting in front of him/her
Call "person's name or mobile number" – will the mobile number. In case, if more than two numbers exist with same person's name then it will ask the mobile number.
Additionally, messaging and emailing feature can also be added and can be used or accessed via speech recognizer. If the user receives mail or message then the content will take as a text and will be read by user's command, in case, of audio file it will be played after user's command.

1. RASPBERRY PIE 4 MODULES: [5]
The Raspberry Pi 4 is a latest and low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. [4] It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.
All over the world, people use Raspberry Pi is to learn programming skills, build hardware projects, do home automation, and even use them in industrial applications.
[5]The Raspberry Pi is a very cheap computer that runs Linux, but it also provides a set of GPIO (general purpose input/output) pins that allow you to control electronic components for physical computing and explore the Internet of Things (IOT).

Figure1: Raspberry Pi 4 Module

2. ULTRSONIC SENSOR:
The ultrasonic sensor consists of transmitter, receiver and transceiver. [1] The transmitter convert electrical signal into sound waves. The receiver converts the sound waves into electrical signal again. [1] It also has crystal oscillators in it. It will perform the stabilization operation in the ultrasonic sensor.

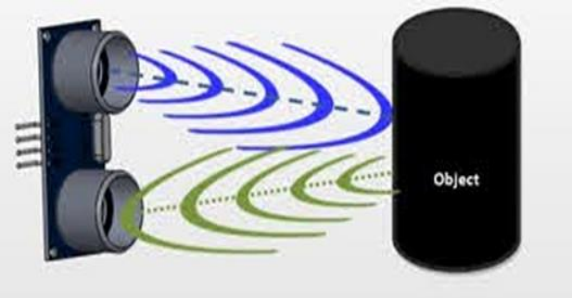


Figure2: Ultrasonic sensor

3. HEADSET:
A headset is a hardware device that connects to a telephone or computer, allowing the user to talk and listen while keeping their hands free.
Headsets are commonly used in technical support and customer service centers, and allow the employee to talk to a customer while typing information into a computer.

Figure3: Headset

4. PI CAMERA:

The Pi camera module is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol.

It is normally used in image processing, machine learning or in surveillance projects.

The Camera Module can be used to take high-definition video, as well as stills photographs. It supports 1080p30, 720p60 and VGA90 video modes, as well as still capture. It attaches via a 15cm ribbon cable to the CSI port on the Raspberry Pi.

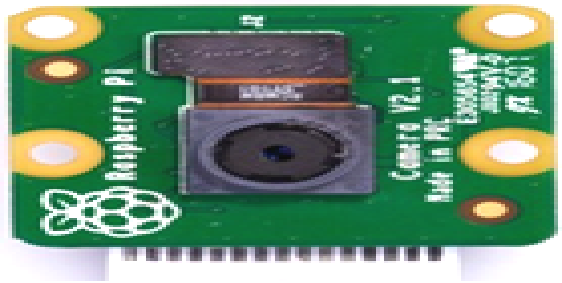
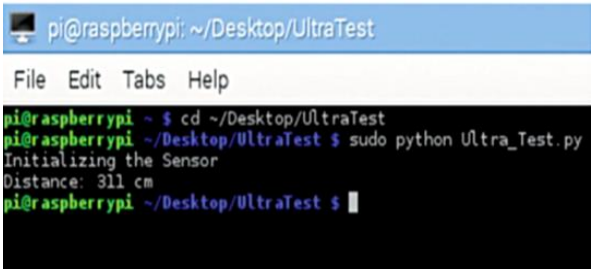


Figure4: Pi camera

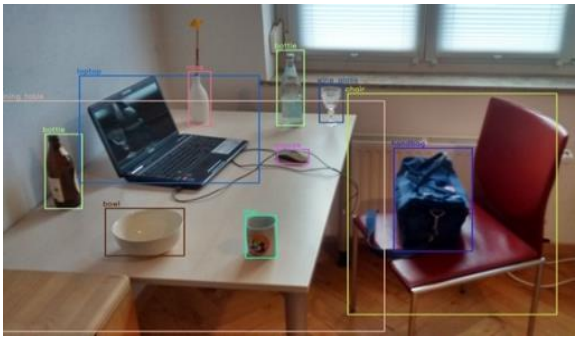
Ultrasonic Distance Sensors

IV.IMPLEMENTATION

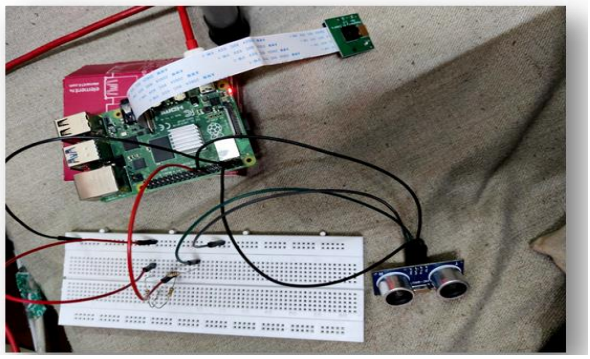
DISTANCE MEASUREMENT USING ULTRASONIC SENSOR IN RASPBERRY PI.



OBJECT DETECTION USING PI CAMERA IN RASPBERRY PI.



THE RASPBERRY PI WHICH CONTROLS THE OVERALL OPERATION OF THIS PROPOSED SYSTEM



V.CONCLUSION AND FUTURE ENHANCEMENT

As of now, the whole idea of this project is made in a simple glove, which also means that there is less feature available since various other types of modules cannot be installed in a small glove. In future, the modules can be installed in other wearables like shoes, glasses, hat etc. which we can access with the help of our main module giving the gadget some extra features or the whole venture can be made as a coat, with the goal that the gadget doesn't need to be wear one by one. Furthermore, the better sensors installation can make it more fast and reliable. These are some updates which can be made in future also the software's can be upgraded with the supporting functionalities of the new modules.

In future we will also add so many features like gesture control for deaf and dump they are also contact with blind people because they are not contact with blind e people.

We will also add smart navigation system by this blind people are navigate easily and go whether they want because they cannot able to see maps.

REFERENCES

[1] vpmthane.net/polywebnew/notice/industryproc.pdf
[2] www.ijeat.org/wpcontent/uploads/papers/v9i1s4/A10901291S419.pdf
[3] medium.com/@drojasug/measuring-social-distancing-using-tensorflow-object-detection-api-7c54badb5092

[4] becominghuman.ai/third-eye-in-your-hand-850b77e1d45a
[5] medium.com/@codebugged/the-era-of-credit-card-sized-computer-5087d7bf6e09
[6] wthtjsjs.cn/gallery/8-whjj-july-5520.pdf
[7] www.raspberrypi.org/help/what- is-a-raspberry-pi/
[8] medium.com/@AnandAI/excellent-work-can-i-ask-you-one-question-13cdc040e549
[9] www.analyticsvidhya.com/blog/2020/04/build-your-own-object-detection-model-using-tensorflow-api/
[10] laserstechs.wordpress.com/2017/11/09/for-home-use-check-cosmetic-lasers-for-sale-online/
[11] S. Shovel, I Ulrich, J. Borenstien.Nav Belt and the Guide Cane, IEEE“Transactions on Robotics & Automation”. 2003;10(1):9-20.
[12] D. Yuan R. Manduchi. “Dynamic Environment Exploration Using a Virtual White Cane”, Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), University of California.
[13] JM. Benjamin,NA. Ali, AF. Schepis. “A laser cane for the blind”, Proceedings of San Diego Medical Symposium, 1973, 443-450.
[14] S. Sabarish. “Navigation Tool for Visually Challenged using Microcontroller”, International Journal of Engineering and Advanced Technology (IJEAT), 2013; 2(4):139-143.
[15] wthtjsjs.cn/gallery/8-whjj-july-5520.pdf
[16] Pooja Sharma,SL. Shimi,S. Chatterji. “A Review on Obstacle Detection and Vision”, International Journal of Science and Research Technology. 2015; 4(1):1-11.
[17] AA. Tahat.” A wireless ranging system for the blind long-cane utilizing a smart-phone”, in Proceedings of the 10th International Conference on Telecommunications. (ConTEL '09), IEEE, Zagreb, Croatia, June. View at Scopus. 2009, 111-117.
[18] Smart walking stick by Mohammed H. Rana and Sayemil (2013)
[19] The electronic travelling aid for blind navigation and monitoring by Mohan M.S Madulika (2013)
[20] Multi-dimensional walking aid by Olakanmi. O. Oladayo (2014).
[21] 3D ultrasonic stick for the blind by the Osama Bader AlBarm (2014):
[22] Mo, J. P. Lewis, and U. Neumann, “Smart Canvas: Agesture driven intelligent drawing desk system”, in Proc. ACM IUI, 2009, pp. 239-243.
[23] S. BHARATHI, A. RAMESH, S. VIVEK, Effective navigation for visually impaired by wearable obstacle avoidance system. International Conference on Computing, Electronics and Electrical Technologies (ICCEET), 2012.
[24] K. XIANGXIN, W. YUANLONG, L. MINCHEOL, Vision based guidedog robot system for visually impaired in urban system. 13th International Conference on Control, Automation and Systems (ICCAS), 2013.
[25] THIRD EYE FOR BLIND PEOPLE USING ULTRASONIC VIBRATING GLOVES WITH IMAGE PROCESSING. Suprabha Potphode1, Sneha Kumbhar2, Prashant Mhargude3, Parvin Kinikae-ISSN: 2395-0056 Volume: 07 Issue: 03 | Mar 2020 www.irjet.net p-ISSN: 2395-0072.

AUTHOR PROFILE

Ms. Faraj Chisti working as an assistant professor in ABES institute of technology Ghaziabad. Her area of interest are machine learning, artificial intelligence and software engineering.

Ritik Singh currently pursuing his B.Tech (4th year) degree in Information Technology through ABESIT, Ghaziabad associated by AKTU Lucknow, Uttar Pradesh. His area of interest is backend development, Algorithm and Operating system.

Rishi Kumar Kamat currently pursuing his B.Tech (4th year) degree in Information Technology through ABESIT, Ghaziabad associated by AKTU Lucknow, Uttar Pradesh. His area of interest is backend development.