Smart Glass for Visual Impaired People

V. Prabhu, D. Ruban Thomas ,V. Senthil Kumar

Abstract: To defeat the voyaging trouble for the outwardly debilitated individuals, this endeavor presents an ETA (Electronic Travel Aids)- canny controlling device in the condition of a few eyeglasses for provide these people guidance gainfully and safely. Unique in relation to existing works, a novel Convolution Neural Network (CNN) based deterrent keeping away from calculation is proposed, which uses Google’s pre-prepared datasets of different classes to take care of the issues of identifying little impediments, and straightforward obstructions, for example bicycle. For absolutely visually impaired individuals, three sorts of voice guidelines to educate the bearing where they can proceed. For deaf and dumb people we integrate two servo motors to insist them through touch. The prototype consists of pair of servo motors and camera in the eye glass and its effectiveness and precision were tried by an ongoing snag. The test result demonstrates that the savvy controlling glass is effective in accuracy than any other traditional algorithms. Thus it serves as a user friendly device by its simplistic design.

Keywords—convolution neural network, servo motor, ear-pods, open cv, raspberry-pi.

I. INTRODUCTION

As indicated by the official measurements from World Health Organization (WHO), which is around 272 million outwardly debilitated people on the planet up to the time of 2014 around 39 million are totally visually impaired and 4 million individuals are going to have absolutely both outwardly and hearing hindered individuals. These outwardly hindered individuals have extraordinary trouble in seeing and collaborating with the environment. Customarily, the vast majority depend on the white stick for nearby route, continually influencing it in front for deterrent discovery. The main objective of the “Smart Glass” are unite the visually and Hearing disable persons to the real world, but traditional methods (cane) doesn’t allow them to interact so that we propose new algorithm through AI. The main agenda of the proposal is to minimize the time and to attain the precision of obstacle detection by guiding them through the voice instructions (Ear-pods) and servo motor for Navigation under any circumstances through convolution neural network (CNN). This proposes simple and user friendly design by pair of glasses.

II. METHODOLOGY

Hardware Setup:

The block diagram of hardware setup for the visually disable persons as shown in the fig.1

Raspberry PI

The Raspberry Pi is an amazing, little PC having the elements of charge card which is concocted with the desire for moving age of students to be inventive. Rpi is used to train the data and update weights, biases based on the loss the function and back propagated. The key components of the raspberry pi are USB keyboard, Prepared Operating System SD card, Display with HDMI, Power supply.

Servo Motor

A Servo is a little gadget that fuses a three wire DC engine, a rigging train, a potentiometer, an incorporated circuit, and an output shaft bearing. Servos are rated for Speed and Torque.

The servo will maintain the angular position of the shaft. The shaft of the servo can be situated to explicit rakish positions by sending a coded sign. The servo motor is used for navigating the hearing impaired people to guide them in their route by using three kind of classes. Servo motor is the feature used for navigating and guiding them to go ahead.

Raspberry- PI Web Cam

The Raspberry Pi camera module can be used to get predominant quality video, similarly as pictures. The module has a 5 super pixel fixed-center camera that supports 1080p30, 720p60 and VGA90 video modes, just as picture capture. The camera contains somewhat (25mm by 20mm by 9mm) circuit board, which partners with the Raspberry Pi’s Camera Serial Interface (CSI) which is associated through adaptable lace link. The images are captured and trained by the processor for guiding and detecting the obstacles for the visual and hearing impaired people.
Arduino
Arduino is an open-source stage utilized for structure hardware ventures. The Arduino is given a program with pre-transferred set of directions which will control the servo engine. Atmel 8-piece AVR RISC-based miniaturized scale controller consolidates 32kB ISP streak memory with read-while-compose abilities. The gadget works between 1.8-5.5 volts. The gadget accomplishes throughput moving toward 1 MIPS for each MHz. fig.2 shows that entire experimental setup of smart glass.

![Fig.2 Experimental setup of Smart Glass](image)

III. SOFTWARE

Python
Python is a universally useful, adaptable and well known programming language. Python is a universally useful programming language begun by Guido van Rossum, which turned out to be exceptionally well known in brief time basically in view of its straightforwardness and code comprehensibility.

Numpy
Numpy is highly optimized library for which is a numerical operation. It gives a MATLAB - style syntax.
An implementation of a matrix package to become Numeric, also variously called Numerical Python extensions or NUMPY.

Matplotlib
Matplotlib is an amazing visualization library in Python for 2D and 3D plots of arrays. Matplotlib can be utilized in Python contents, the Python and I-Python shells, the Jupyter journal, web application servers, and four graphical UI tool boxes.
Matplotlib consists of several plots like line, bar, scatter, histogram etc. For basic plotting the pyplot module gives a MATLAB-like interface, especially when joined with I-Python.

Pyplot
Pyplot maintains state across calls. Useful for use in Jupyter or I-Python notebooks. The PYPLOT is imported by using the Matplotlib. Pyplot name space.

Tensor Flow
- Tensor Flow is Google Brain's second-age framework.
- Tensor Flow is a free and open-source programming library for dataflow and differentiable programming over a scope of errands.
- Tensor Flow gets from the exercises that such neural frameworks perform on multidimensional data shows, which are alluded to as tensors.
- Tensor Flow packages together a large number of AI and profound learning (otherwise known as neural systems administration) models and calculations and makes them valuable by method for a typical analogy.
- Tensor Flow enables designers to make dataflow charts—structures that depict how information travels through a diagram, or a progression of preparing hubs.

Open-CV Python
Open CV bolsters the profound learning systems Tensor Flow.
Open CV-Python is a library of Python ties intended to take care of PC vision issues. The Open CV exhibit structures are changed over to and from Numpy clusters.

Data Image Processing:

RGB Image

In the first shading picture the pixel shading in a picture is a blend of three hues Red, Green, and Blue (RGB) as appeared in fig.3. The quantity of bits chooses the most extreme number of various hues bolstered by the advanced gadget. On the off chance that every red, green and Blue involves 8 piece then the mix of RGB occupies24 bit and supports16,777,216 various hues.

Gray Scale Image
A gray scale picture, otherwise called a power picture, is an information framework, I, whose qualities speak to powers inside some range as appeared in fig.4. A grayscale picture contains just shades of dim and no shading. The dim scale picture is changed over on the grounds that it decreases the direct that is in 0’s and 1’s.

**Blur Image**

![Blur Image](image)

**Fig. 5 Blur Image**

In blurring, it is simply blur an image. In blurring, it simple reduces the edge content and makes the changes from one color to the other very shine. In blurring the edges are not observed. A blur is very common operations that need to perform before other tasks such as edge detection as shown fig.5.

\[ G(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{x^2}{2\sigma^2}} \]  

In a Gaussian haze, be that as it may, the pixels in the piece nearer to the middle pixel convey more weight than the pixels close to the edge of the bit. In picture preparing, a Gaussian smoothing is the aftereffect of obscuring a picture by a Gaussian capacity.

**Canny Image**

![Canny Image](image)

**Fig. 6 Canny Images**

Fig.6 demonstrates that Canny edge discovery is a multi-step calculation that can identify edges with commotion smothered simultaneously. Low blunder rate: Meaning a decent recognition of just existent edges. Great restriction: The separation between edge pixels recognized and genuine edge pixels must be limited. Negligible reaction: Only one locator reaction for every edge.

**Canny Edge Detection**

- By using the Gaussian filter the image is smoothen to decreases noise and unwanted details and textures of image
- Find the gradient by using gradient operation,

\[ G(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{x^2}{2\sigma^2}} \]  

\[ M^T(m,n) = \begin{cases} M(m,n), & \text{if } M(m,n) > T \\ 0, & \text{otherwise} \end{cases} \]

**Region of Interest**

![Region of Interest](image)

**Fig. 7 Mask**

An area of intrigue, are tests inside an informational index recognized for a specific reason. In PC vision and optical character acknowledgment, the ROI characterizes the fringes of an article under thought as appeared in fig.7.

**Fig. 8 Masked Images**

In the above figure the region of interest is placed in the canny image and it is plotted as the ROI of the original image as shown in fig.8.

**Face Recognition**

A real time face acknowledgment framework is equipped for distinguishing or confirming an individual from a video outline.

In this acknowledgment there are three sections
Creating a database
Training
Testing

Making a Database:
For the face acknowledgment snap the photo in the wake of running creat_database.py content. Train the dataset that as been made while preparing change the individual's name. There is a 0.38 postponement is given in the code for making the datasets.

Training and Testing:
The datasets is prepared by utilizing Face_rec.py code.
Two properties regular to human appearances are:
• The eye locale is darker than the upper cheeks.
• The nose connect locale is more splendid than the eyes.

Testing:
The project was tested on U-buntu 16.04 using Open CV.
The clarity works on the number of data groups as well as the excellence and standard light conditions.

Object Detection
The tensor flow models Git-Hub store has a huge assortment of pre-prepared models for different AI assignments, and one phenomenal asset is their article identification API.

Gathering Datasets
The datasets that is already created by the COCO are used in the object detection. If to train the object, create the object dataset and label it.

Creating Bounding Boxes
To make a jumping box of each class by the width, tallness and particular x min, x mama, y min, and y max bouncing box. The jumping box is to catch the picture. The names for every one of the pictures utilized in the pawn identifier building are incorporated into the Git-Hub vault.

Choose the Model
The article discovery is utilizes the Tensor stream API model.
The articles are distinguished by sliding distinctive estimated boxes over the picture and running the classifier ordinarily on various areas of the picture. Be that as it may, in the neural system the portable net model is utilized which is structured as versatile application.

Retrain the Model with Real Time Data
A model effectively prepared on an enormous informational index and clasp off the last layer, which has the classes from the prepared model, and supplant it with the possess classes. The component indicators prepared in the past model and utilize these highlights to attempt to identify your new classes. To the datasets the 'train.py' document is utilized for item identification in the API index. Consequently the testing is accomplished for the prepared datasets and the exhibition is taken out.
V. CONCLUSION

A keen controlling gadget for outwardly and hearing hindered people groups in the state of a couple of eyeglass which can enable them to move securely, proficiently and easy to use. The Convolution neural system (CNN) is the proposed calculation utilized for obstruction shirking which uses the pre-prepared datasets. For the outwardly debilitated individuals three sorts of voice guidance are utilized for the investigating purpose behind existing were made and attempted in different circumstances, and results show that the sound based controlling headings are the most beneficial, composed and straightforward structure. For the hard of hearing and unable to speak individuals, the pair of servo engine is utilized and it causes the clients to walk securely through the feeling of touch. The figuring is speedy enough for the ID and show of blocks. Exploratory results show that the proposed quick controlling glasses can improve the voyaging information of the ostensibly obstructed people. The section used in this device is direct and effortlessly, making it possible to be comprehensively used in purchaser promote.

FUTURE WORK

In future the datasets are trained using the Google map system for the navigation. Creating intuition about a detected unknown object and by training them it is added to the trained datasets by setting class for future prediction. Further, the design can be minimised in the form mobile application for IOS, Android.

REFERENCES

1. Aladrén, G. López-Nicolás, L. Puig and J. J. Guerrero,(2016), IEEE Systems, “Navigation assistance for the visually impaired using RGB-D sensor with range expansion”, J., vol. 10, no. 3, pp. 922-932.
2. Dakopoulos and N. G. Bourbakis,( 2010), IEEE Trans. Systems, “Wearable obstacle avoidance electronic travel aids for blind: A survey,” Man, Cybern., vol. 40, no. 1, pp. 25-35, Jan
3. H. Fernandes, P. Costa, V. Filipe, L. Hadjileontiadis and J. Barroso, (2010), “Stereo vision in blind navigation assistance,” World Automation Congr., Kobe, pp. 1-6.
4. L. Tian, Y. Tian and C. Yi, ,(2013), IEEE Int. Conf. Bioinformatics and Biomedicine “Detecting good quality frames in videos captured by a wearable camera for blind navigation”, pp. 334-337.
5. Söveny, G. Kovács and Z. T. Kardkovács, (2014), IEEE Conf. Cognitive Info communications (Cog Info Com), “Blind guide - A virtual eye for guiding indoor and outdoor movement”, pp. 343-347.
6. Prabhu, V., Kuppusamy, P.G., Karthikkeyan, A. et al. (2018) Evaluation and analysis of data driven in expectation maximization segmentation through various initialization techniques in medical images, Multimedia Tools and Application.

AUTHORS PROFILE

Dr.V Prabhu, Vel Tech Multi Tech Dr.Rangarajan Dr.Sakunthala Engineering College, Associate Professor, Department of Electronics and Communication Engineering. He has published 16 papers in referred international journals and IEEE conferences. He is a member of IETE. His research interest includes Speech Processing, Medical Image Processing, low power VLSI Design, Device modeling

D. Ruban Thomas, Vel Tech Multi Tech Dr.Rangarajan Dr.Sakunthala Engineering College, Assistant Professor, Department of Electronics and Communication Engineering.