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Vision Lens for Visually Impaired People

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Abstract: *Total blindness is a term used to describe those who have complete lack of light perception, documented as no light perception (NLP). Only about 15% of people with eye disorders have total blindness, the majority of those with visual impairment have some level of vision. Low vision is a term used to describe those whose vision cannot be fully corrected by conventional method such as glasses, contact lenses, medicine, surgery, magnification aids or assistive technology. Visual impairment is a functional term to describe those whose decreased visual function interferes with the ability for one to perform their activities of daily living, such as reading, driving, and watching TV. People with visual impairment face various problems in their daily life as the modern assistive devices are often not meeting the consumer requirements in term of price and level of assistance. All the computing and processing operations were done using the Raspberry Pi 4. For the result, the combination of using OCR with EAST detector provide really high accuracy which showed the ability of the glasses to recognize almost 99% of the text. However, the glasses have some drawbacks such as: supporting only the English language and native language and the maximum distance of capturing the images is between 40-150 cm. As a future plan, it is possible to support many languages and enhance the design to make it smaller and more comfortable to wear.*

Keywords: Visually Impaired, Object Detection, OCR, Raspberry pi

I. INTRODUCTION

The number of visually impaired people is growing over the past decades. As reported by the world health organization (WHO), about 285 million people worldwide are estimated to be visually impaired. However, until now many schools and jobs cannot accommodate them mainly due to lack of assistive technologies and economic barriers. As a result, 90 % of them still live in low level of income. Even when the new aids or technologies become available, they are either too expensive ($3000 and above), or affordable ($200) but with single or limited task functions only. Among all assistive devices, wearable devices are found to be the most useful because they are hand free or require minimum use of hands. The most popular type is head mounted device. Their main advantage is that the device points naturally at the viewing direction, thus eliminates the need of additional direction instructions, unlike other devices. This paper presents a new design of smart glasses that can provide assistance in multiple tasks while maintaining at a low building cost. The design uses the new raspberry pi 2 single board computer, a camera, and an earpiece to convey information to the user. Due to page limit, we only demonstrate reading task only. The experiment results and how additional tasks may be added are discussed.

II. LITERATURE SURVEY

STUDY OF RESEARCH PAPER

Text and Object recognition have been a challenging issue in different computer vision fields. There are many research papers that have discussed different methods and algorithms for extracting the text from images. In end-to-end text recognition with the power of neural network combined with the new unsupervised feature, learning growth took advantage of the known framework for the train to achieve high accuracy of the text and character detection and recognition modules. These two models have been combined using simple methods to build end to end text recognition system. The datasets that been used are ICDAR 2003 and SVT. The method of 62-way character classifier obtained 83.9% of accuracy for a cropped character from the first dataset. For text recognition in natural scene images method, this method has proposed an accurate and robust method for detecting texts in natural scene images. This method has used an (MSER) algorithm to detect almost all characters 8 from any image. the datasets used for this system are

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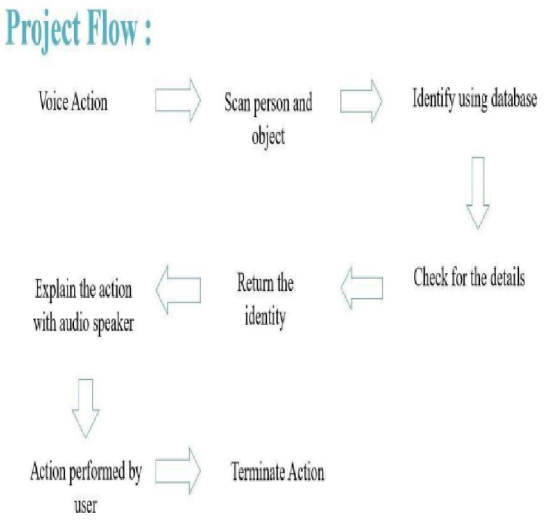
ICDAR 2011 and Multilingual datasets. The results showed that the MSER has achieved 88.52% in character level recall. End-to-end real-time text recognition and localization system have used ER (External Regions) detector that covered about 94.8% of the characters, and the processing time of an image with 800×600 resolution was 0.3s on a regular personal computer. The system used two datasets ICDAR 2011 and SVT. The average run time of the method on an 800×600 image was 0.3s on a standard PC. On the ICDAR 2011 dataset, the method achieved 64.7% of image recall. For SVT, it achieved 32.9% of image recall. 9 ZCOER, Department of Computer Engineering 2022-2023 Text detection and localization using Oriented Stroke Detection is a method that took advantage of two important methods that are connected to a component with a sliding window. The character or the letter has been recognized as a region in the image that has some strokes in a particular direction and particular position. The dataset that has been used is ICDAR 2011, the experiment results showed 66% recall better than the previous methods. EAST is an abbreviation of an Efficient and Accurate Scene Text Detector. This method is a simple and powerful pipeline that allows detecting a text in natural scenes, and it achieves high accuracy and efficiency. Three datasets have been used in this study, ICDAR 2015, COCO-Text and MSRA-TD500. The experiment has shown that this method has better results than previous methods regarding accuracy and efficiency. In a rapidly flourishing country like our innumerable number of attempts has been made for the welfare of especially able people of our society. One of such attempts is the project “Project Prakash" an empathetic attempt towards the blind children to help them gain knowledge of a set of obstacles around them by using their brains. Sheth et al worked on how a blind people can be able to detect any type of pits, potholes and several ups and downs by using a smart white cane where they have used ultrasonic sensors.

III. PROPOSED SYSTEM

Conceptual Design At the early stage, the initial idea of the project was to create “Smart Glasses” that capture any text images and convert it to voice, then, if the user wants to translate the text, he/she can press another button to translate. Initially, the team chose NOOBs as an operating system to be installed on the Raspberry Pi B+ and implement all the glass functions. Also, the camera was built in the camera inside the glass and the Raspberry Pi was put directly on the glass. At the early stage, the initial idea of the project was to create “Smart Glasses” that capture any text images and convert it to voice, then, if the user wants to translate the text, he/she can press another button to translate..



Initially, the team chose NOOBs as an operating system to be installed on the Raspberry Pi B+ and implement all the glass functions. Also, the camera was built in the camera inside the glass and the Raspberry Pi was put directly on the glass. The main target for the “Smart Glasses” was blind people to allow them conceptually to use it anytime anywhere such as: Schools, Malls, Hospitals, Museums. In order to accomplish the project, at the conceptual design the team proposed the initial hardware below: Smart glass with a built-in camera, Raspberry Pi , Headphone, Buttons Team members decided to draw an initial design to make it easy for them to set up the components to be done to complete the project

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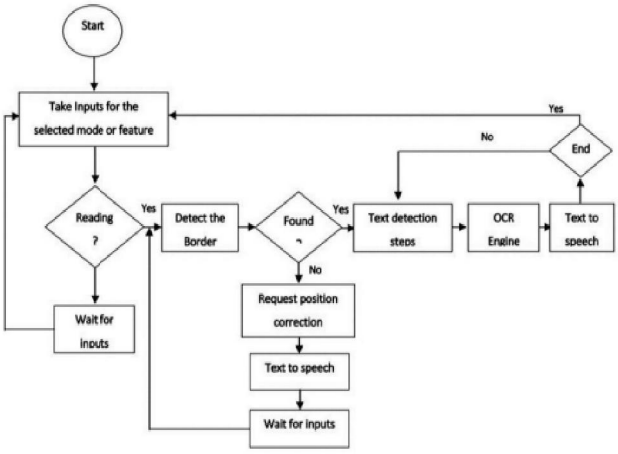
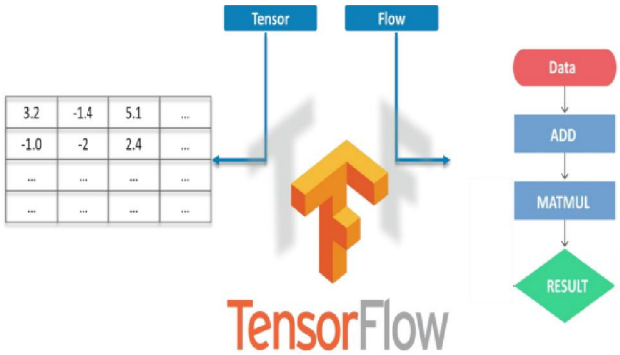


IV. PROJECT IMPLEMENTATION

TENSORFLOW ALGORITHM

Tensor Flow algorithm is open machine learning framework for used in developers. Tensor Flow algorithm are also called "Goggle "product. It is API are used in the object detection that is images and video. The Tensor Flow algorithm are used in deep learning it can help to classifier. The Diagram are the working of tensor flow algorithm is the shows the one side the table that are collected the data that is called the "Tensor." and another side are the flow the data are the add and multiple data are the lastly result are founded. Tensor Flow is Google Brain's second-generation system. Version 1.0.0 was released on February 11, 2017. While the reference implementation runs on single devices, Tensor Flow can run on multiple CPUs and GPUs (with optional CUDA and SYCL extensions for general-purpose computing on graphics processing units). Tensor Flow is available on 64-bit Linux, macOS, Windows, and mobile computing platforms including Android and iOS. Its flexible architecture allows for the easy deployment of computation across a variety of platforms (CPUs, GPUs, TPUs), and from desktops to clusters of servers to mobile and edge devices.



Tensor Flow computations are expressed as state full dataflow graphs. The name Tensor Flow derives from the operations that such neural networks perform on multidimensional data arrays, which are referred to as tensors. During the Google I/O Conference in June 2016, Jeff Dean stated that 1,500 repositories on GitHub mentioned Tensor Flow, of which only 5 were from Google. In December 2017, developers from Google, Cisco, RedHat, CoreOS, and CaiCloud introduced Kubeflow at a conference. Kubeflow allows operation and deployment of TensorFlow on Kubernetes. In March 2018, Google announced TensorFlow.js version 1.0 for machine learning in JavaScript. In Jan 2019, Google announced TensorFlow 2.0. It became officially available in Sep 2019.

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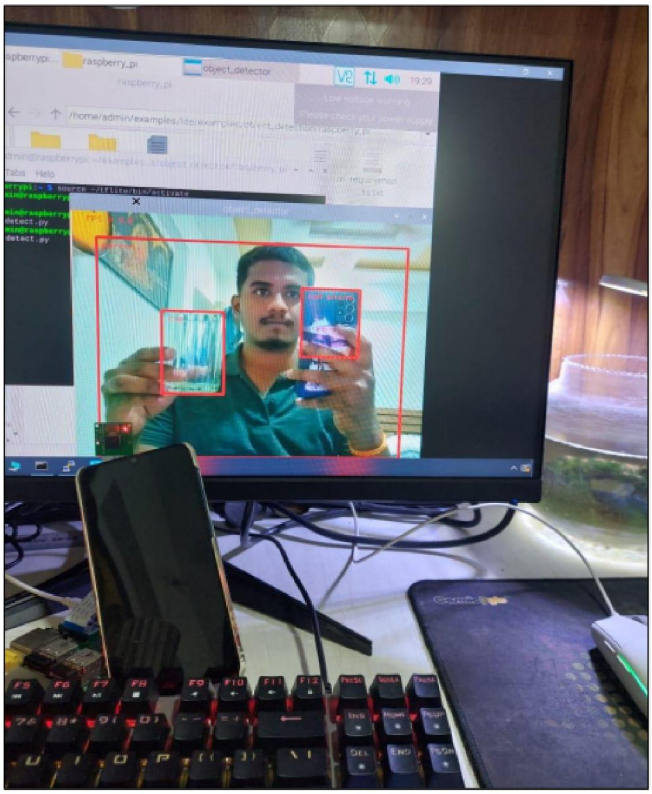
V. RESULT



VI. APPLICATIONS

- Text and object detection.
- Read and scan signs and books.
- Identification of human name from database.

VII. FUTURE SCOPE

The paper objective is underlined by the necessity of voice assistant system for the increasing number of blind people all over the globe. The " Vision lens For Visually impaired " is practically, a feasible device can be conveniently carried by any blind person. It does have few limitations which well target to solve in its future developments. Language Barrier as the default language is English and in future we will have native language. In future all components will be advanced. Size along with weight of the gadget will be reduced so as to make it comfortable to carry. The camera capture will be 180 degree so as to cover maximum area of the surrounding. Camera pixels will be increased as to make the clear detection of object and surrounding. We can add GPS to the device to direct user from one place to another. Further we can increase the efficiency by upgrading hardware to a newer version.

VIII. CONCLUSION

Visually impaired people are those who are either totally blind or having a very low vision that is legally considered as blindness. The number of the visually impaired people has increased in the recent decades and the difficulties they face in their everyday life are becoming more and more serious with the new technologies, buildings, population and so on. This project is intended to help this type of people to widen their scope of independence by giving them a description of the live scenes delivered in an audio format using an earpiece.

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