Raspberry Pi based Smart Assistant for the Blind

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Abstract - *This is a Raspberry Pi based smart assistant for the blind. The project is intended to involve hardware including a reader, face recognition, and object detecting spectacles/glasses and an audio assistant connected to earphones phones. The project took us deep into the world of open CV, Tesseract, and machine learning for its realization through the python environment. The final result would enable blind people in need of assistance, to detect people and objects, have a smart assistant as well as read text. A person with the assistance of our project would be able to walk on a road or public place excluding assistance from another human, along with reading boards and signs much faster.*

*Key Words***:** Face Recognition, Object detection, Text to speech.

1.INTRODUCTION

According to WHO, globally, at least 1 billion people have a near or distance vision impairment that could have been prevented or has yet to be addressed. Population growth and aging are expected to increase the risk that more people acquire vision impairment. In a world where we are building the tallest skyscrapers, we believe that as engineering students it is our responsibility to develop affordable technology and facilities using our knowledge to even out the social disparity. The blind reader is a low-cost, portable device which can be the hype as the braille system are expensive and not accessible to many. It can be a complete aid for the visually impaired making their life much sweeter while traveling, reading bulletins, making notes, remembering events, etc. Blind Reader is an intelligent assistant based on Raspberry Pi. Using this device, it is easier for the visually impaired to read text, to recognize people, and to detect the objects appearing in front of their goggles. A speech assistant made out of python language is also incorporated into this. The text detection is made using OCR technology. Here we use OpenCV to detect text in images that are scanned by the camera mounted in front of the goggles. A document scanner is made for the proper scanning of images. Tesseract is an open-source library for OCR and PyTesseract is an OCR tool for python. We use YOLO for object recognition in the OpenCV framework and the haar- cascades are used for face recognition.

2. WORKING

The camera is mounted inside goggles. The image containing text is placed in the camera's field of view. It captures image into the system. When the camera takes the snapshot of the image, the system takes the photo, processes it and it recognizes the content written on the paper using OpenCV and Tesseract. The raspberry pi camera module can video capture faces in real time, these faces are recognized by using a training model and Frontal Face Haar Cascade on pre-stored faces of people as per user's needs. The system would also be able to track and recognize objects in real time by use of coco.names file and YOLOv3 cfg and weights files used. All this is later converted to speech using TTS. After this the speaker speaks out the contents of the image. We have also incorporated a smart assistant named Aimy, using GTTS helping the user to note down calender dates and shdeule his meetings. Everything is given as audio output to the user via earphones connected.

3.SOME HARDWARE COMPONENTS

The major components used in our project are
Raspberry Pi, Camera Module, Power Supply, SD Card, Speaker.

3.1 Raspberry Pi

A Raspberry pi is a small single board computer which contains a SOC. It uses Broadcom BCM2836 SOC Cortex A7. uses an ARM based processor. The Raspberry Pi model 3B+ is used here.

3.2 Camera Module

5 MP camera module compatible for raspberry pi is connected and the camera interface is enabled on the Raspberry Pi. This 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. It is commonly used in surveillance drones since the payload of camera is very less. Apart from these modules Pi can also use normal USB webcams that are used along with computer

4. RESULTS

FIG 1. Product Model

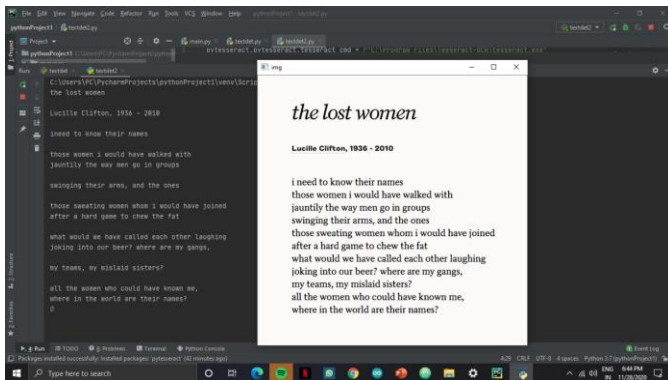FIG 2. Object detection and tracking.

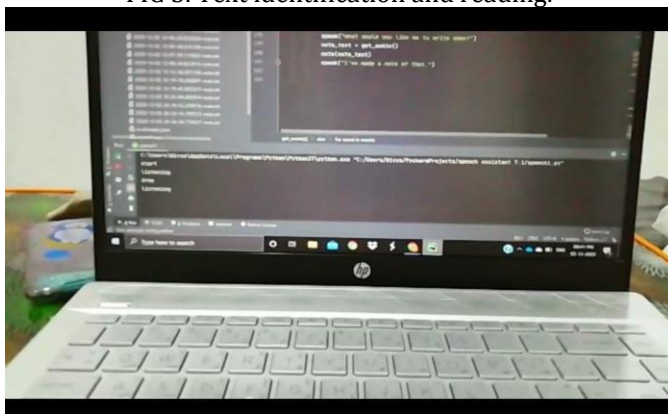

FIG 3. Text identification and reading.
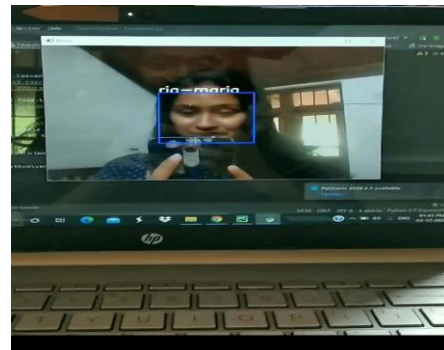

FIG 4. Speech to Text, Aimy.

FIG 5. Face detection and identification.

5s. CONCLUSIONS

This system enables the visually impaired to not feel at a disadvantage when it comes to reading text not written in braille. The technology of optical character recognition (OCR) enables the recognition of texts from the image data. The technology of speech synthesis enables a text in digital format to be synthesized into human voice and played through an audio system. The objective of TTS is the automatic conversion of sentences ,without restrictions, into spoken discourse in a natural language, resembling the spoken form of the same text, by a native speaker of the language. Raspberry P i based reader for blind produces a positive outcome when applied in practical world. Since the OpenCV platform is used for text detection, it is very handy and convenient to use compared to the PC platform. This system is useful for visually impaired persons to access information which is in the form of documents, texts or printed forms. Object detection is using Open Cv dnn module with a pretrained YOLO. With the help of a simple push button a person can run the entire program. So in this way Raspberry Pi based Reader for Blind helps a visually impaired to read a paper without the help of human reader or without the help of tactile writing system. It helps to make their life hassle free by detecting the objects and recognizing the faces in front of them. The speech assistant is always out on their reach even if there is no internet connection.

ACKNOWLEDGEMENT

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