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Future Vision Technology

Yuraja Kadri[1], Utkarsha Khot[2], Dona Joy[3], Rohit Barve[4]
[1,2,3]*Student, Department of Information Technology, Vidyalankar Institute of Technology, Mumbai, India*
[4]*Professor, Department of Information Technology, Vidyalankar Institute of Technology, Mumbai, India*

***Abstract*: In this paper, we present a "Future vision Technology" for people who are visually impaired or people with low eye sight. Usually people with visual disability face much more difficulty in communicating with the environment than the rest of the people. These people rely largely on someone or either on their other senses such as hearing, touch, and smell for their daily functioning like travelling, reading. Giving visually impaired people the great opportunity and accessibility of the environment is the main aim of the smart Future Vision Technology. This smart glass will make them more independent. We have designed an application for visually disabled people to easily read the text content as smart glasses system will view the content and read out to them through hearing aid. The proposed prototype system is based on Raspberry pie 4, and the application in the system is written in Python with libraries of OpenCV.**

***Keywords*: Smart glass system, Raspberry pie 4, Blindness.**

1. Introduction

The estimated count of visually impaired people in the whole world according to WHO in 2012 is about 285 million out of which only 39 million are completely blind and the rest 246 million have low vision and these numbers goes on increasing. It becomes very difficult for the visually impaired people to adapt into the environment after losing one of the most important sensing element that we rely mostly on in our day to day activities. As losing this ability they have to depend on their other sensing elements such as touch, voice etc. which increases the difficulty for them to interact with other people. One of the most important difficulty they face in their day to day life is READING and gaining knowledge. They mostly have to rely on other people in order to read the things in front of them such as books, menu, posters etc. which makes them more dependent. Many a times they can also be fooled by people as they cannot read the menu, bills etc. Thus there is a need of a product that help these people to understand what is written in front of them correctly. This is where the future vision technology glasses come into frame.

These are pair of glasses that helps their masters to read the document or text in front of them with the help of an NOIR camera and reads them out through a hearing aid to their master. This reduces the need of dependency to a great level as well the frauds. Our glasses basically capture the image of the text or document etc. in front of them by clicking a button on the camera and then the processing begins in the raspberry pi zero of converting that image into a document format through OCR in open cv using python which then is read out to the person through text to speech in an earphone or speaker.

As this model is light weighted it is very convenient for the people to use as well as due to its small size and portability feature it can be easily carried wherever required and can be used anytime anywhere.

A. Problem Statement

Blind people can't see anything and the people with low vision also not able to read text properly, due to this inconvenience in reading the letters they not able to work properly & if any obstacle come while walking then they are not able to detect that obstacle. These is the major problem for blind people there are many solutions invented for them but these solutions have many limitations also like most of it limitation is that they are too costly not affordable to most of the blind person. These are the major problem face by blind people.

2. Literature survey

In Paper 1 "K-Reader Mobile" - Ray Kurzweil proposes Braille Readers Mobile number of portable reading aid are developed clearly for the visually impaired. "K-Reader Mobile" is a mobile application which allows the user to read mail, receipts, fliers, and many other document. But these systems/ devices are not feasible economically.

In Paper 2 "Smart Screen Reader"- Athira Panicker proposes Screen Reader reading system with vocal output for visually impaired people using raspberry pi. This project reads the document on nearly levelled surface which is dark surface that contain mostly black text printed on white background and it cannot read data from complex backgrounds

In Paper 3 "Smart Navigation System for blind people" - Marut Tripathi proposes A Navigation System for visually impaired people to move safely and quickly. In these proposed system barrier detection and realization is done with the help of ultrasonic sensors and USB camera. This system detects the obstacles up to 300 cm via ultrasonic sensors and sends observation in the form of sound via earphone to notify the person about the obstacle.

In Paper 4 "Future Wearable Obstacle Avoidance" - Dimitrios Dakopoulos proposes OrCam A Wearable Obstacle Avoidance Electronic Travel Aids for Blind that presents a comparative survey among handy, lightweight and movable

obstacle detection and avoidance systems. In is an attempt to convey the research community and users about the capabilities of these systems and about the progress in assistive technology for visually impaired people.

In Paper 5 “Automatic detection and Recognition” - X. Chen proposes Esight Automatic detection and realization of signs from natural scenes. the system displays an approach to automatic detection and recognition of signs and its application to a sign translation task. They have tried this approach by developing a Chinese sign translation system.

In Paper 6 “Smart Audio Book”-William A. Ainsworth proposes a system Audio Books for translating English text into speech. The feasibility of converting English text into speech using an economically feasible computer and a small amount of stored data has been investigated but it’s not suitable for all memory range of computers.

3. Proposed system

Our system design comprises of two parts: hardware design and software design. And The block diagram of the system is in Fig. 2. As the system block diagram shows, the NOIR (No Infrared) camera on the glasses captures the content in front of the blind, and then transfers it to the Rasberry pie for processing it into document(pdf). When Rasberry pie gets the captured content, Opencv functions to analyze and process the images. When the system matches the datasets, Rasberry pie would give corresponding instructions according to the matched character. And the system would transform the instructions to voice through headphones.

A. Hardware design

In hardware design, we built the smart glass system using Raspberry pie on one side of the smart glass. Raspberry pie combines a small, cheap, powerful, adaptable hardware platform and partner- enabled ecosystem with extended software compatibility and supportive online environment. Raspberry pie has integrated Wi-Fi, bluetooth Low-Energy* (LE), memory, and storage simplifies configuration and increases scalability. We also have located a camera towards the front of the glasses. The smart glass is powered by mobile phones, power bank using USB wire. It’s lightweight, easy for the blind to use. The image will be captured by camera in front of the glass, and processing begins. When finding the characters, the smart glass gives hints with a voice through the headphones. The Raspberry Pi Camera that is (NoIR) is used to capture the image. It uses the dedicated CSI interface, which was designed for interfacing to cameras.

B. Software design

In this design we have written program in python using an integrated development environment (IDE) Pycharm. we also used OpenCv to implement the system. While designing the system we had noticed that lot of words were being detected wrong so in order to get more accuracy of detection of the alphabets we have used the Convolutional neural network which provides more accuracy than the regular neural networks. The output obtained from the ocr module is a text document which then with the gtts API is converted to voice.

4. Methodology

In this system the Image captured is gone through the OCR module which is optical character recognition which recognizes each character in the image which is then checked against the dataset of alphabets and numbers that is trained using CNN algorithm and stored in the database. After checking against the database of alphabets it identifies the alphabet. The result of this is a document of the image in the form of pdf, word etc.
Once the document is formed then the next step is to convert he word document to speech which is done by using text to speech convertor called as espeak which reads out the document aloud to the user through the earphones or speakers as per the comfort.

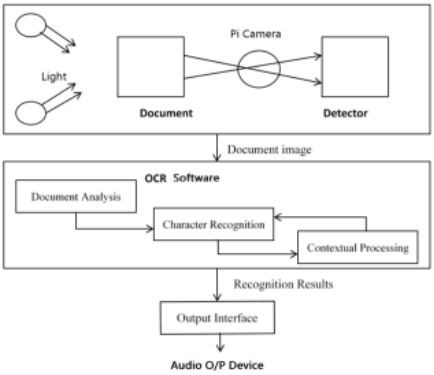

Fig. 1. Block diagram

The linear working of our project can be explained in the following manner (Refer figure 1 and 2):

- Step 1: Capture the image in front of the glasses.
- Step 2: Once the image is captured the processing starts.
  - Step 2.1: The OCR module recognizes the characters by comparing with the trained datasets.
  - Step 2.2: Once the characters has been recognized a text document is created.
- Step 3: This text document is then read out loud through the Google Api

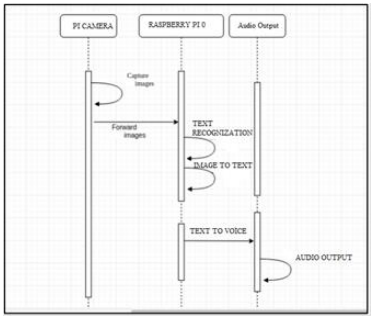

Fig. 2. Sequence diagram

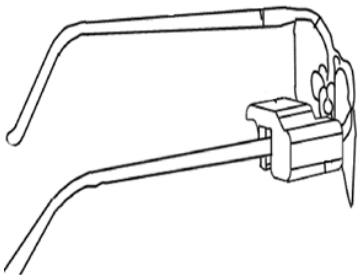

Fig. 3. Process structure

5. Conclusion

This paper presents a prototype of lightweight smart glasses for visually impaired people. We exhibited the working of the glasses, along with the hardware design and software design. And we have implemented many excellent image processing, text recognition algorithms on the new lightweight smart glass system. This system can detect and recognize the text in real time. In the soon future, we will implement more useful applications in the smart glass system such as handwritten texts, image identification.

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