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Cyber Eye: Cloud Based Reading Aid for Visually Impaired

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Abstract

Visual impairment is a decreases ability to see because they do not have access to glasses or contact lenses. It is also known as vision impairment or vision loss. Visual impairment may cause many problems in normal daily life activities. There are different methods to solve this issue. One method is by using modern smartphone application. Another method is by using microcontroller.

Keywords—Visual Impairment, Smartphones, Optical Character Recognition, Text To Speech.

1. Introduction

The visual impaired people have difficulties in reading the printed information. Reading aids with the capabilities of smart phone is less weight, cost effective and user friendly techniques. In the reading aid with android application, the screen of android phone have button to capture the image and automatically upload the image to ABBYY OCR cloud. The output text from the cloud is applied to TTS engine in the android phone. It converts the text to audio.

The project aims to implement a reading aid that is small in size, lightweight, and efficient in using computational resources, cost effective and of course user friendly.

2. Related work

Robert Keefer and Nikolaos Bourbakis [2] have proposed a highly interactive method for processing digital images. This methodology supports the use of inexpensive hardware components, and as such requires enhanced document image processing techniques. Tyflos camera is used in method. Problem in tyflos is not process the shaken images.

Nagaraja L, Nagarjun R S, Nishanth M Anand, Nithin D, and Veena S Murthy [3] have proposed a system that ensures to read

text present in the image for assisting blind persons. Pre-processing part ensures efficient foreground extraction, which possess the required text region to be analyzed. But the system fails to extract the foreground when they possess a complex background.

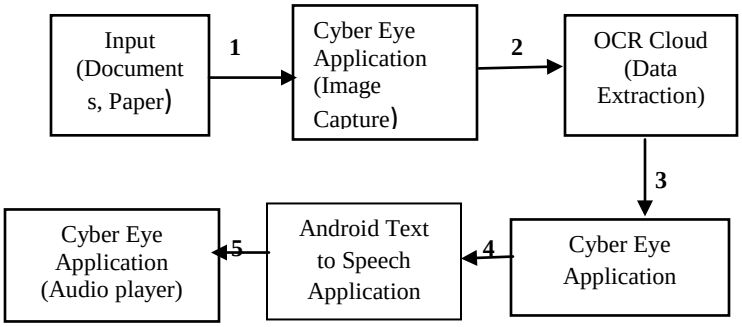
John Andersson, Sebastian Berlin, André Costa, Harald Berthelsen, Hanna Lindgren, Nikolaj Lindberg, Jonas Beskow, Jens Edlund, and Joakim Gustafson [4] have proposed a system make open source text-to-speech available through Wikimedia Foundation's server architecture that utilize the large and active Wikipedia user base to achieve continuously improving text-to-speech, improve existing and develop new crowd sourcing methods for text-to-speech and develop new and adapt current evaluation methods so that they are well suited for the particular use case of reading Wikipedia articles out loud while at the same time capable of harnessing the huge user base made available by Wikipedia. Problem is continuous availability of internet is required which is not possible.

Roberto Netoa, and Nuno Fonsecaa [5] have proposed a system consisted of the construction of an application composed by several parts, integrating the system of image capture by the mobile device, which is used by an OCR framework for recognition of its text, which is then synthesized through a process of TTS. In this only English language is accepted.

Roy Shilkrot, Pattie Maes Jochen Huber, Suranga C. Nanayakkara and Connie K. Liu [6] have proposed finger worn device that assists the visually impaired with electively and efficiently reading paper-printed text. Finger Reader presents a new way for blind people to read printed text locally and sequentially. Problem in this finger reader is, it is not accurate.

3. System Architecture

The application contains a simple user interface that is easy to use by the visually impaired. The smartphone screen is divided into two main menu buttons start camera activity and select from gallery. They are designed to be large enough to cover the entirety of the Android phone's screen and play a sound that informs the user of the button's purpose when the button is pressed.



1. Document photo
2. Upload photo
3. Recognized data
4. Text file
5. Audio result

Fig: System Architecture of the Application

Once the capture button is tapped, a check for

internet connection is done, if successful, the user will be informed that a picture of the text page is being taken and an autofocus capability of the phone camera starts to focus on the text area without any manual adjustment. After a timer of 5 seconds, the picture is taken and is automatically uploaded to the ABBYY OCR Cloud, where it is converted into text, and then downloaded back onto the Android device. The downloaded text is then converted into audio using the Android phone's local TTS engine and then read aloud to the user.

The application only requires an Android phone as its hardware. In order to achieve a faster performance in running the application, we recommend a minimal specification of the device to be 400MHz and 128M RAM. The device must have 5MP as the minimal resolution of the camera in order to have a resolution of the captured image between 150dpi to 600dpi. The application is compatible with all the API levels 15 (Ice-cream sandwich) to 23 (Lollipop). The packages used are: Android Studio (IDE for Android Programming), Android local TTS and ABBYY OCR SDK Cloud. Android's notable features such as open source platform, multiple screens for multitasking, custom ROM, and open source libraries for Text-To Speech Synthesis superseded Android over other OS versions for the work presented here.

4. Testing

The accuracy of the system is very high. The pictures (English) captured and passed over the OCR and TTS conversion process occurs with high accuracy , with only 2 letters being misread because they were underlined (for example, y is miss read as v) or faded (and sometimes E is misread as F). Creating

the audio file takes about some time for English language. The Power Consumption of the system is that the application takes 10.39 MB of memory when installed. To check how much battery, the application uses up, the Smart Manager pre-installed on the Lenovo A6000 is used. It only takes up 1% of battery and a RAM of 1.00GB and CPU usage of 2.15%. The Portability of the system is that the application requires only a smartphone with an internet connection, today's smart mobiles are light in weight with the trend towards smaller and lighter models. The phone used for testing was Lenovo A6000 which only weighs 150 g. The cost of Lenovo A6000 varies depending on where it is purchased from but it ranges from 10000-12000 rupees. However, any reasonably equipped mobile for a cheaper price should be able to run the application. The university's wireless network was also used for this application. Therefore, their costs are not included in the estimate.

5. Result

Mobile application uses OCR cloud for character recognition which is an effective method for visually impaired community.

The system is implemented efficiently and with high performance.

Conclusion

This method is accurate and high resolution camera capture clear pictures. Many languages are used in these techniques like French, English. The future scope of the system can be extended to handwritten data also.

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