

SURVEY: AUDIO READING SYSTEM FOR BLIND PERSONS

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Abstract – Audio Reading System is used to help blind people to read the text based on camera as input device and speaker as output device. The system used the OCR algorithm to extract the text from input image and Text-to-Speech algorithm to convert text into corresponding voice. In this paper, we review newest research of audio reading system. We discuss the hardware and software which is used on system for different types approach. Finally, the result of this paper that is: Raspberry pi, python and tesseract are best tools used in Audio reading system. Also the braille and finger print devices are not efficient and not easy to use.

Index Terms – Audio Reading System, Blind Person, OCR.

I. INTRODUCTION

Information is available on the web, book, newspaper, etc. People can use this information in any form to enhance their knowledge in life. but, the blind people faced challenge to read this information. The rapid development of technology, it has become easy for the blind people to get this information from the web by using Audio Reading System [1].

Audio Reading System consists of three general steps: Firstly, capture image for text want to read it using a camera, then sent it to the processing step. Secondly, processing step where text will be filtered and will be extracted by Optical Character Recognition (OCR) algorithm, and finally, output step used the Text-to-Speech algorithm to convert text into corresponding voice using speaker device [1][2].

Optical Character Recognition (OCR) is one of the important functions that convert the written text or printed text to the editable text. The image which contain the text that wanted to be extracted is input to OCR algorithm to recognize the text

and output the text as editable soft copies. In another word, translation of the character image into character codes, such as ASCII. There are many application of OCR algorithm such as Text-to-Speech, machine learning, and translation [2].

Recent developments in computer systems, camera, and different software such as python language make it easy build audio reading system. Some of these tools: Raspberry pi is a series of small single-board computers, low cost, credit card sized computer and uses python programming [3][4]. Tesseract is an example of OCR algorithm, since 2006 it is developed by Google. it is used to recognition of text characters by a computer. The general steps of OCR algorithm are image scanning of the text, analysis the scanned image, and convert the character image into character codes, such as ASCII [4][5]. GOOGLE Text-to-speech (GTTS) is an example of Text-to-Speech algorithm. it is used to output text as audio using speaker device [6].

There are many research papers about the audio reader system which are different in many approach such as the area used it (book or product name) and tools used. These papers have been published in recent years reviewed small fraction of the System. Therefore, this paper aim to provide a survey of emerging research of Audio Reading System techniques.

The reset of the paper is organized as follows: in section 2 described the Background of the audio reading system. in section 3 discussed the literature Survey of audio reading system. In section 4 showed the discuss section. Finally, concluded this paper in section 5.

II. BACKGROUND

There are some technical systems to help the blind people to read the text. Before describe the literature survey about modern solution of the audio reading system, some previous solution introduces. These systems are:

Braille System: is a tactile writing system used by blind person. blind can read computer screens and other tools supports using braille displays. also they can write it with the original slate and stylus. Braille system consists of 6-pins as 2X3 matrix to represent character. the blind person uses his finger to sense a pins to recognition the character [7][8].

Finger Reader is a device that used by blind person to reading printed text. as well as an aid for language translation. The blind person wears the finger reader device to his finger. The scenario to work this device as the blind use this device to scan the text and get corresponding audio [7][8].

E-Book Reader (Electronic Book Reader) is a software available for pc or phone, which can read the text from their screen to blind person, which helps the blind to read the electronic-book which is showed on the screen device and it use Text-to-Speech tools to speak the text [7].

According to [7] there are some disadvantages in these systems:

- In Braille system, it can induce harm to the surface which would be like scribbling with permanent marker over visual writing, and any injury to the finger would be like experiencing an eye patch on to a seeing person. So, Braille System is slightly, more susceptible to problems preventing any reading.
- In Finger reader the drawback is it used only in English languages.

III. LITERATURE SURVEY

In this section showed overview view for each paper in the audio reader system topic. Then designed the flow chart for each one to show the flow of process from image capture to the audio output. Finally, displayed the summary of hardware and software requirement to build these systems.

In Mallapa D.Gurav and et al [3] (2017) presented system convert captured image for text to audio output. OCR is used in machine process such as text mining to extract the text from image. This paper used OCR algorithm, using raspberry pi device to process the character code in text. Raspberry pi device and tesseract engine algorithm used to recognize character and audio output is listened.

In Adithya Asokan and et al [9] (2017) This system aims to study the image recognition technology (OCR) with speech synthesis (Text-to-Speech) and to develop a low cost system and effective. The system has a small inbuilt camera that capture image to the text printed on a paper, converts it to audio format using Text-to-Speech Tools for reading out the scanned text quickly. Concluded, not only used for save time and energy but also used to make the better life for blind person.

In D. GUNA SEKHAR and et al [10] (2017) this paper proposed an efficient system for blind persons to read printed text by combining image processing algorithms and embedded

systems. Camera acts as main input device in detecting the label image of the product then using Matlab to separates label from image and finally identifies the product name. Also this paper propose an effective motion-based method to define a region of interest (ROI) in the image.

In Anush Goel and et al [2] (2018) automatic document reader for visually impaired people have been presents in this paper based on the Raspberry Pi. It uses the OCR algorithm for the identification of the printed characters using camera devices and computer programming.

In Sonal I Shirke and et al [1] (2018) proposes a portable camera based assistive text reading system to help blind people to read text labels and product name. The system consists of three main components: Firstly, capture image to text which the user needs to read using a camera, then sent image to processing component. Secondly, processing component where text will be filtered and will be recognized by OCR algorithm, and finally, using Text-to-Speech to output the text will as audio. Concluded, this method is more suitable for currency notes.

In Rupali Deshmukh and et al [11] (2018) propose system to help low visual power or blind person to read text and product label. The image which contain the text will be capture then the process step apply to extract text from the image using Matlab program. Finally use audio tools to speak the text. Concluded, this method is extremely efficient for all kinds of products with blur and illumination.

In K. Barathkumar and et al [4] (2019) describe a smart specification for the blind people. The system can perform text detection then produce a voice output. Camera is the main input device of this system to captured the printed text for digitization and using the OCR algorithm to processed the scanned image. Finally, the output of the OCR step will be convert to voice output using Text-to-Speech technology. Concluded, this method can read image clearly with economical device.

In Akanksha Rathi and et al [5] (2019) This paper focus to read names on the products through image capturing. The portable system take the image by Raspberry Pi camera. The Image is fed to input of Raspberry Pi processor to process the OCR. OCR used to convert image containing written text into machine-readable text data. Then the system use Google Text to Speech Converter (GTTS) to convert text entered in to the audio.

in Norharyati binti Harum [12] (2019) focuses on development of Smart Book Reader will help the blind people to read the text and using Internet of Things (IoT) technology. The system is design by utilises IoT technology with the use of an IoT device, infrastructure and service. One of the advantages of this system is user can read both softcopy and hardcopy books which base on the online text to voice tools due it is using the IoT technology. Concluded, this method used IoT to read also softcopy of book with online feature.

in Neha Sahu [13] (2020) design and implementation assistive text reading system for visually impaired people to read the text labels from the Prescription as android application. Through camera the application capture the image of Prescription. Using a motion-based method to define region of interest (ROI) image to isolate the Prescription Image from background. then using OCR algorithm to recognize text character. Finally, using text to speech converter to speak the text. Concluded, by using NLP can overcome some challenge in previous study.

in A. Ravi [7] (2020) presented A smart reader system for Blind people with integration of a complete text read out system with page turning mechanism and dictionary query feature. This project design and implementation a smart reader system when the image book is input to system, the book text is read as sound output using python program and camera device. Concluded, system and page turning is important to all people not only for blind person due it is comfortability system.

in Supriya Kurlekar [6] (2020) In this research, the book image is converted into the audio output through the use of Text-to-speech and OCR technology which help the blind person to read text. This system is developed using Raspberry Pi which again uses PyTesseract library, Python programming and GoogleText-to-speech (GTTS). Concluded, this device can be used as independent device because not require internet connection.

	MATLAB [11]		
7	Raspberry Pi based Smart Reader for Visually Impaired People [4]	Raspberry Pi	Python, Tesseract
8	Portable Camera based Assistive Text and Label Reading for Blind Persons [5]	Raspberry Pi	Python, Tesseract, GTTS
9	Smart Book Reader for Visual Impairment Person using IoT Device [12]	Raspberry Pi	Python, Tesseract
10	PRESCRIPTION READING SYSTEM FOR VISUALLY IMPAIRED PEOPLE USING NLP [13]	Mobile Device	Android Studio
11	SMART READER FOR BLIND PEOPLE [7]	Raspberry Pi	Python, Tesseract
12	Reading Device for Blind People using Python, OCR and GTTS [6]	Raspberry Pi	Python, Tesseract, GTTS

Table 1: Summary of the Hardware and Software Requirements for each system.

No	Title	Hardware	Software
1	B-LIGHT: A Reading aid for the Blind People using OCR and OpenCV [3]	Raspberry Pi	Python, Tesseract
2	Reading Assistance for Blind [9]	ATmega328	Matlab
3	Camera Based Text and Product Label Reading from Handheld Objects for Blind Persons [10]	arm-7 micro controller	Matlab
4	Raspberry Pi Based Reader for Blind People [2]	Raspberry Pi	Python, Tesseract
5	Portable Camera Based Text Reading of Objects for Blind Persons [1]	Raspberry Pi	Python
6	Text Recognition of Product for Blind Person using	Raspberry Pi	Matlab

Raspberry Pi

The Raspberry Pi [14] is a series of small single-board computers, low cost, credit card sized computer and uses python programming. Raspberry Pi is a very powerful computer which was invented to help the beginner to be professional [15][16].

There are many programming languages can be implementation the Raspberry Pi such as BASIC, C, C++, JAVA, Perl and Ruby, but the python programming language is the main language which fully support by raspberry pi company and there are many libraries to easy implementation and efficiency [15][16].

Raspberry Pi is founded by United Kingdom-Raspberry Pi to helping in teaching the computer science and explore computing in the developing countries by providing low cost computation board [17].

Raspbian is the best Operating System from all other operating systems of the raspberry pi. Raspbian is the official operating system of the Raspberry Pi. So, the Raspbian one most people will want to start with. Raspbian is Linux-based operating system version and built specifically for the Raspberry Pi board and utilities that make your Raspberry Pi run. Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware [18].

Tesseract

The most popular Open source OCR engine is Tesseract [19] with page layout analysis and flexible module features. Which created in 1985 by Hewlett-Packard and later sponsored by Google [20][21]. Tesseract is one state-of-the-art solution OCR engine, considered to be one of the best OCR engines available [22].

Tesseract is now with v4.0 that still under development stage by Google company which include traditional and a new Long Short Term Memory (LSTM)-based engines. Strengths and weaknesses of the mentions engines are different depending on the use scenarios. Tesseract OCR Engine significantly reduces errors created in the process of character recognition [20][23][24].

Architecture of Tesseract, the activity of the tesseract engine is to recognize the words which can be performs by two stages: Firstly, words recognize is done, which try to get the word from input images. The acceptable word will pass to Adaptive Classifier and will be treated as training data. In the second stage, words not recognized will be handled again. After that a fuzzy space will be resolved by Tesseract. A small and capital text must be located and checked by alternative hypothesis for x-height [25].

IV. DISCUSSION AND CONCLUSION

In the previous section, talked about recent papers from 2017 into 2020. The aims, main steps and technology used are the aspects describe for each paper. Then we summarized the hardware kit used and software tools such as program language and library.

In this section and after compared between these papers, the main things should be discussing:

- Hardware Usage: there are many hardware tool kits such as raspberry pi, Arduino. Each one has cons and pros according to specification. In audio reading system the raspberry pi is a best one because has camera quality and high processor.
- Program language: there are many program languages such as Python, C++, Matlab. The python program language is best one in this system because compatible with raspberry pi and faster time execution.
- Software library: python is full support by many companies and especially raspberry pi and google. The Python-tesseract (PyTesseract) and GTTS is an example of library which support by Google.

We conclusion that the previous devices such braille and finger print (as mention in background section) are not efficient and not easy to use, so the audio reader system is important to solve the blind people problem and help him in life. According to Table 1, The Raspberry pi, python and tesseract are best tools used in audio reading system.

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