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Smart Reader for Blind with Auto Page Turn

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Abstract *-In an abstract either forward or backward mode, the computerized page-flipper flips the page of books, periodicals, or three-ring notebooks that have been bound. This electromechanical technology allows someone who is limited to using the outside world to communicate through a head switch installed on a wheelchair for independent reading of any text. This presence OCR performs the automatic turning of numerous pages of a book according to the user's wishes, which iscontrolled through voice commands, and also seeks to develop a book reader module, which includes text extraction and segmentation, as well as speech conversion.*

Keywords *– Page Turner, Assistive Technology, Conversion from text to speech, speech to text, and image to text, Raspberry PI.*

I. Introduction

Texts can be found everywhere, but they can't be read by visually impaired people. They have a special type of letter code called Braille, but these letter codes aren't available for all documents and books, making it challenging for those who are blind to read and comprehend the concept of a document. This hurdle can be overcome by adopting the OCR idea, which involves using image processing to extract text from a page. It can used to translate pictures having the characters into a standard readable format. There is a great barrier for the visually impaired persons to read and understand the concept of documents. Around the world WHO has estimated 285 million people to be visually impaired. 90 % of them were living in developing countries. To access the information in a text a person needs to have vision.

Blind people can read by touching the letters and words on a specially developed reading device, which is a sheet with braille text printed on it. However, not all documents and books have these letter codes. As a result, it became extremely difficult for visually challenged people to read and comprehend papers. They can, however, use their hearing abilities to obtain information by listening to the speech. One of the most essential page turning robots for physically challenged disabled persons is the paper voice to test command [1]. Speech is the most efficient medium for human communication. This project seeks to use Character Recognition Algorithm to automate page turning in either direction or convert text picture to audio output.

This article's research is a part of a "National Science Foundation." project in which student engineers from universities around the United States design and build gadgets for people with disabilities [2]. For people who struggle with dexterity when flipping pages, this switch-activated page turner is perfect. Individuals with physical limitations, patients who have spent the weekend undergoing medical treatments, and the elderly are all included in this non-exhaustive list. Around 6.8 million Americans aged fifteen and older have trouble grasping objects, and 15.2 million have trouble holding or lifting objects weighing ten pounds or more, according to the US Census Bureau's Americans with Disabilities Data institute on disability and rehabilitation research. The automatic page changer includes Arduino AT mega 320P, Servo Motors and Raspberry Pi.

II. Literature Survey

A smart reader based on Raspberry Pi for blind people is described in a paper by L Latha, V Geethani, M Divyadharshini, andP Thangam titled “A Smart Reader for the Blind”[3]. It extracts text from photos using Optical Character Recognition (OCR). It also includes a library and a TTS (text to speech) engine. It facilitates information access for people who are blind or visually impaired. "Smart Text Reader from Image," by J. N Balarama Krishna and Ms.J.Geetha, is a paper by J. N Balarama Krishna and

Ms.J.Geetha. Using OCR and OpenCV with Raspberry PI 3" describes a smart reader that employs The Raspberry Pi's Text to Speech Synthesizer (TTS) and Optical Character Recognition (OCR) [4]. Image and audio processing units are included in the gadget. The paper "A clever Reader for Visually Impaired People" by Ram Nivas Duraisamy and Sathya Manoharan is based on a comparative investigation. This reader has three modes of operation: acquisition, text conversion, and speech conversion. It is a cost-effective model, with results that are comparable to those of the MATLAB image processing model [5].

- An essential method in the creation of any smart reader for the blind is optical character recognition (OCR).
- Voice command systems can improve the performance of any tool created for individuals who are blind.
- When the advantages of OCR and a voice command system are combined, the proposed model for assisting visuallyimpaired persons becomes more user pleasant.

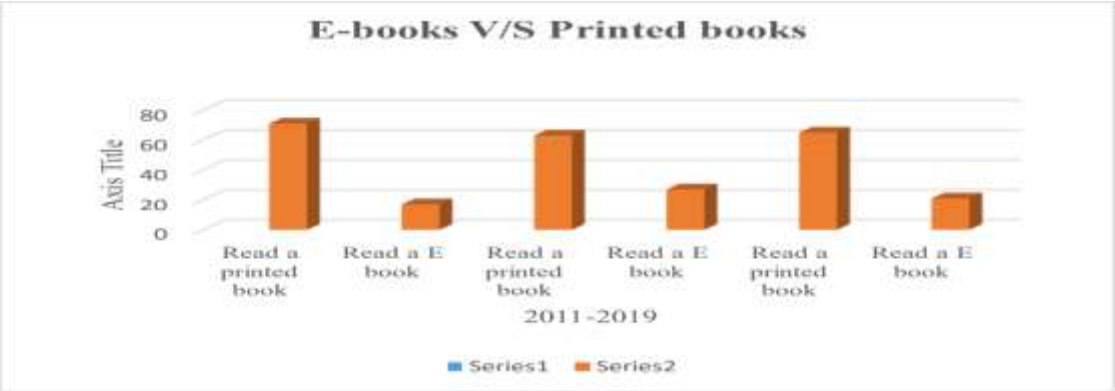

Figure 1. E books v/s Printed books.

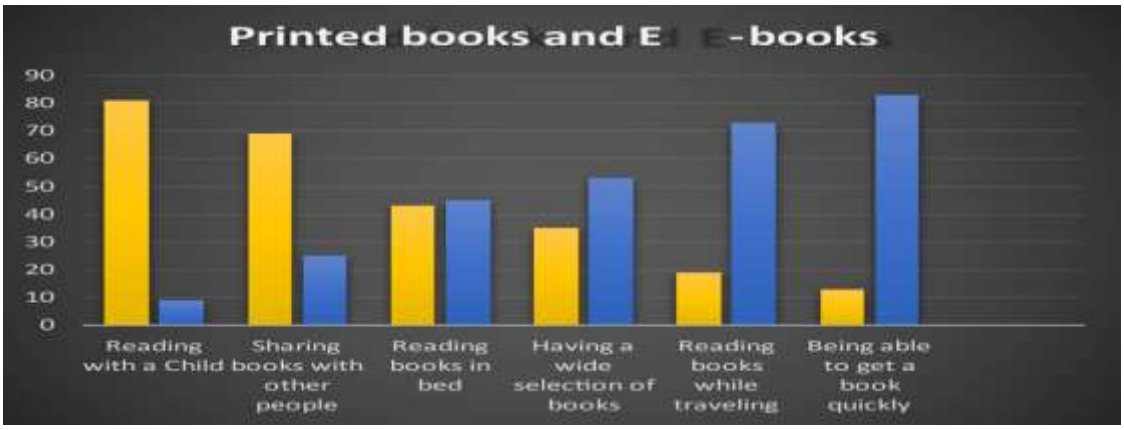

Figure 2. Printed books and E books

In Figure 1 & Figure 2 , we can see that number of people who read Printed books and E-books. From the fig 1. shows the E- books and Printed books. In the year from 2011-2019 there is increase in printed books only but the E-books has the minimun percentage of average. The E-books has the very low percentage.The number of people reading E-book is very low.

Till now the E-book is very used for blind people and visullay imparid people. Figure 2. Shows Printed books has the very high percentage Reading with the child. E-book has the very high percentage being to get a book quickly.

III. Problem Statements

For persons who are visually impaired, there are several types of entertainment available, including television, computers, and all electronic devices, in addition to the serene joy of reading a good book. For persons who are unable to move their upper extremities, a voice-activated automated page turner

[6] is available. Books can be used for a variety of objectives, including offering an escape from reality and satiating a hunger for information. People with disabilities should be able to read without being constrained to the few titles offered as E-books or recordings. There is a need for an economical, functional, and accessible page-turner, according to many patients, careers, and healthcare professionals. This includes the Medical Director of Rehabilitation and the In-patient Therapy Supervisor at Kent Country Memorial Hospital, both of whom have expressed the necessity for a functional page-turner. Furthermore, Marybeth, a Rhode Island resident who uses an electric wheelchair and has weak motor control thinks that the currently available automatic page-turners are either too complicated, too expensive, or just plain ineffective. She is a speech-language pathologist who has unsuccessfully tried both manual and automatic page-turners. The user frequently holds a stick in their mouth or clips it to their hand. While using manual page-turners, which are rather widespread. Their proper use necessitates a high level of dexterity. In contrast, the automatic page-turner market has only two products, both of which are quite expensive ($2,000–$3,000), making them unaffordable for the majority of disabled people. For devices that turn pages, there are several page-long patents in the US. But it's obvious that a lot of them were.

IV. Objectives

- To develop an automatic page turner with voice commands.
- To develop book reader module which extracts the text from a document and converts to speech.
- To adjust the speed of speech of output.
- To assist old aged (with higher vision problems) & blind people.

V. Methodology

Wiping arm was controlled by a timing belt. They can be powered by any 12V source, even the batteries from an electric wheelchair. The book is fastened with the spine parallel to the lifting arm's axis. To accommodate books of various sizes, the motor and lifting arm assembly move up and down. A lifted page is caught and turned to the opposite side of the book by a wiping arm set up on a track parallel to and below the book rest. The design's sideways motion is controlled by a motorized timing belt, and the base is composed of the lightweight plastic Lexan. The base is mounted on a sturdy, movable arm that is easily adjustable to ensure that the user is reading the book in a comfortable position. A wheelchair-mounting clamp is in the works. A series of actions controlled by a microprocessor are started by pressing a single switch. The lifter arm rotates downward in an arc. As it rotates from its vertical rest position to the page, the adhesive pad is kept parallel to the book by a swivel. By using a slip clutch, the lifter arm makes contact with the book and stops rotating. This happens once enough force has been exerted to ensure adhesion. The lifter arm moves up and down the pages as it spins. Once the paper fold is caught, peeled away from the rotating adhesive pad, and turned, the wiping arm goes from left to right or right to left. Consistent adhesion is ensured by the swiveling adhesive design, which maximizes surface area and pressure. The motor reverses and the wiping arm returns to its right-hand rest position when it engages a limit switch when it reaches the end of its track. It is now the end of the cycle.

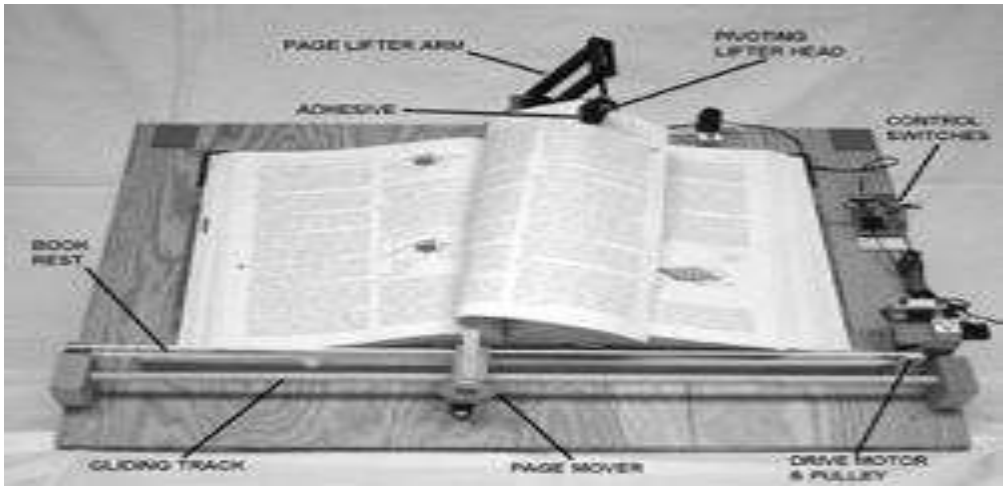

Figure 3. Alpha Prototype Image for an Automated Page-Turner.

The Alpha prototype, which shows the wiping arm's capacity to raise a page, remove the glue, and rotate it either way. The use of a commercially available washable glue, which can be cleaned with water after numerous applications and reused after it dries, contributed significantly to the original design in addition to the improvements to the existing art that were already highlighted. Despite having a low stress strength, this glue possesses a good shear strength. The lifter arm spins in an ascending arc while holding the page in shear. The adhesive pad turns as the wiping arm pulls on it, and the pages peel off easily.

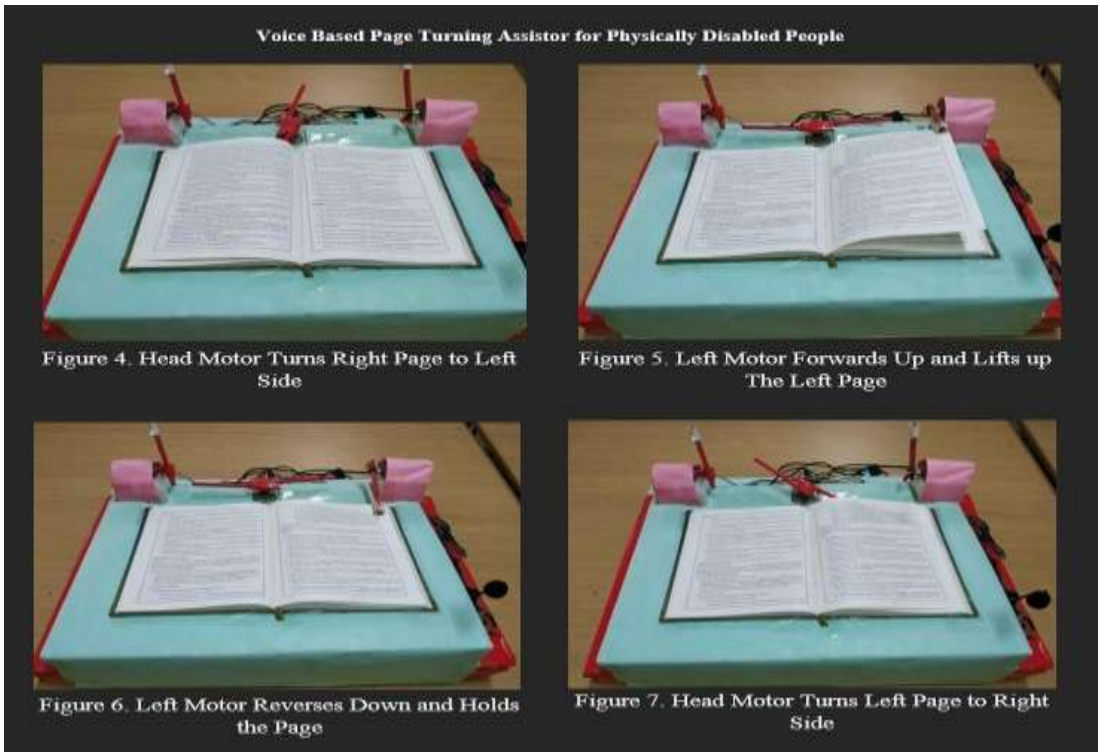

Figure 4,5,6,7 Represents how books turns the page.

Overcomplexity and the resulting coordination issues between processes plague the majority of existing designs. Unfortunately, just two models are now available, both of which are far too pricey for most consumers. A more cheap device would be in high demand. The group's goal is to create the most basic device feasible, with a focus on price and ease of use.

Reading a book is a simple but satisfying pastime. The inability to live a regular and independent life is one of the most frustrating aspects of being injured or incompetent. This page-turner will provide children with another simple joy that televisions and computers cannot replace. Our goal with this gadget is to meet, the lifter arm spins in an ascending arc while holding the page in shear. As indicated in the table, the suggested To turn to the corresponding page, a page turner has two instructions and four phases. A three-motor system is used to solve the issues posed by visually impaired people in accessing enormous amounts of information. Two of the motors are arranged horizontally near the edge of the screen. This device can read printed or written material in real time for its operator. It is cost-effective and combines the advantages of optical character recognition (OCR) with voice-activated technologies. This page automatically Turner is designed for a client who enjoys reading but can only interact with the outside world using head switches or device mounted switches. This website Any type of reading material, including bound books and three-ring binders, can have their pages turned by a motor known as a Turner. A header motor is set vertically and rotates the pages from left to right or right to left. Figure 8 depicts the methodology used in this study.

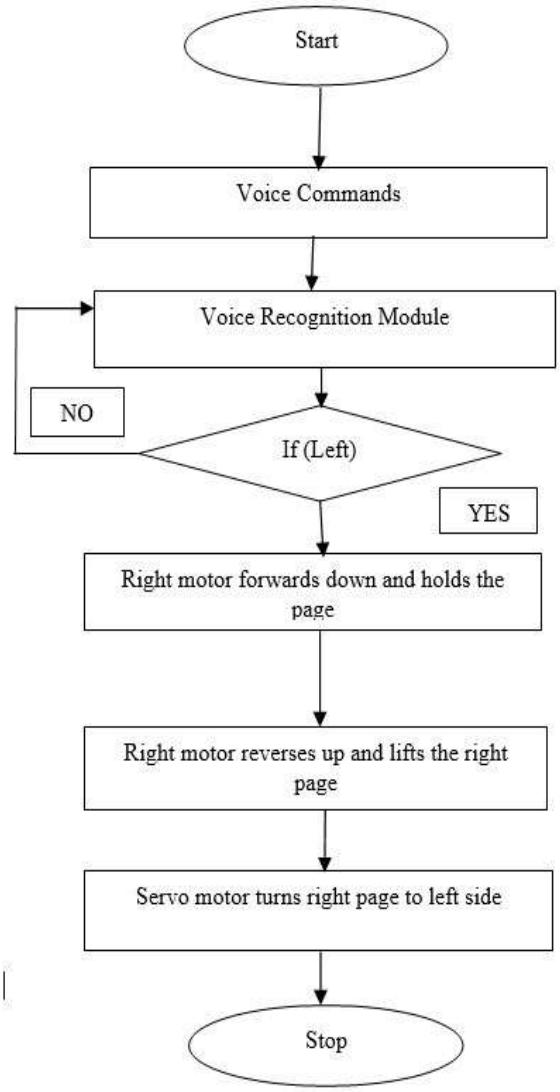

Figure 8. Methodology followed in this work

VI. Results and Discussion

The suggested page changer requires four steps and two instructions to move to the appropriate page. There is a three-motor system; two of them are positioned horizontally at the edge of the book's corner to touch and raise up the page, and the third, unusual motor is positioned vertically where it serves as the header motor and rotates the pages from right to left or left to right. The steps fallowed during the page turner is shown in Table 1.

Table 1. Steps fallowed during page turner.

Steps	**Turner on the Right**	**Turner on the left**
Step 1	Turn Right	Turn Left
Step 2	The left page is touched bythe page-turner handle	Right page is touched bypage-turner handle
Step 3	Lift the left page with the page-turner handle	Lift the right page with the page-turner handle
Step 4	A servomotor rotates the page from left to right	A servomotor rotates the page from right to left

- Turn next page - It will turn to next page.
- Turn previous page - It will turn to previous page.
- Reset - It will reset the motors, to place the book.
- Set book - It will engage the handles, to hold the book.
- Repeat page - The text is once again read by the Text to Speech Convertor.
- Change to switch mode - It is used to switch to manual mode where switches are used to turn pages.
- Repeat paragraph - The paragraph is once again read by the Text to Speech Convertor.

VII. Conclusion

For those who are physically impaired, the functional model of a page-turning aid is an excellent application are unable to move their hands but yet want to read books. It avoids additional assistance and strains when turning pages because it employs voice instructions as input. This model was put to the test in a variety of situations, including It was the best alternative for people with disabilities who could read a book utilizing voice instructions page reading in terms of price, size, efficiency, simplicity, and operation understandability for illiterate people. This study presents a simple architecture for creating a voice-controlled smart reader for visually impaired people. This model will be cost-effective and efficient. Notes from class are kept in a binder. The page Turner can also flip pages forward in the book and reverse also.

VIII. Acknowledgement

We would want to take this moment to thank everyone who helped us complete our Mini-Project. I truly appreciate Mr. Mahendra H. N., our project guide, for his unwavering assistance, wise direction, encouraging words, and gracious collaboration throughout the mini-project work. I owe her a debt of gratitude for his assistance with my project assignment.

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