

Voice Based Page Turning Assistor for Physically Disabled People

Durga K Prasad Gudavalli, M. Sai veerraju, I.Swetha Monica

Abstract: Book reading of physically disabled people is dependent on each page turn and they have to put more effort than normal people. To make page reading comfortable for disable people we proposed a solution in the form of voice assisted page turner, which uses voice recognition module as its input, Arduino as controller and motor mechanism set as output unit to turn required pages. When user speaks his required (direction in which page has to be turned) page name in front of micro phone of voice recognition module, the controller takes it as input and operates motor mechanism set to turn corresponding page. Hence the paper proposed is an excellent opportunity for people who could not move their hands and wish to read books is a simple and low cost solution.

Index Terms: Head Motor, Left Motor, Right Motor, Voice Command and Voice Assisted Page Turner.

I. INTRODUCTION

Physically disabled or elderly people face so much difficulty in satisfying their basic needs like book reading and so they require the support of others in to turn pages. Some devices are available in the market to turn pages, like manually operated page turners and automatic page turners-manual page turner consists of a stick which is held by using hand or is kept in mouth. The stick has a rubber tip which helps in sliding the pages of the book. This device is inconvenient to user as it needs the usage of mouth and hands which is very painful as it may hurt the corners of the mouth and also causes a lot of salivation. Automatic page turner uses motors that can be controlled and powered by using controllers and electrical power supplies [7].

Paper voice command page turning robot for physically challenged people [1], is a method for page turn using voice commands as input, where we used two DC motors in T-Shaped mechanism setup fitted one on another to turn required pages, One of the authors K. Padma Vasavi proposed a paper "voice activated automatic page turner for people who are deprived off their upper extremities" [2] is a device which helps the user to turn the pages of a book to left or right depending on the requirement. This device can be operated both in voice activation mode and silent mode; where user can comfortably use this device at any place and can turn the pages one by one.

The Voice based applications are only solution for the people who have physical disability and many researchers

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[3], [4], [5] worked out on voice based applications successfully in various fields however the cost of voice controlled smart applications [8] are expensive and are unavailable for the people in cost.

The proposed solution voice based page turning assistor for physically disabled people aims at low cost and portability in use which should be operated at effort less for all kinds of disable people. The remaining paper is arranged as follows; section-II describes the proposed methodology, section-III describes the working, section-IV gives experimental results and section-V concludes the paper.

II. PROPOSED METHODOLOGY

Hardware construction of Voice Activated Page Turning Assistor is shown in Fig.1 with detailed description of each part. There are three sections which include; input with Voice Recognition Module, output with Motor Mechanism Set with required motor drivers and controller which is of Arduino Micro Controller.

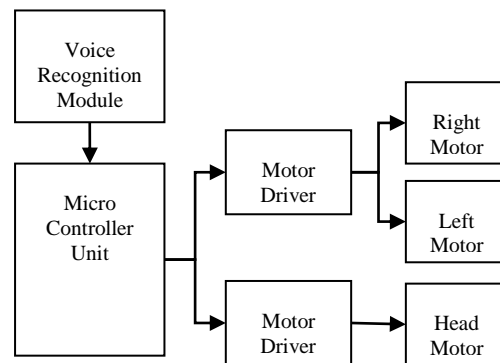


Fig.1: Block Diagram of Proposed Methodology

A. Voice Recognition Module (VR3)

The Elechouse Voice recognition VR3 module operates on 4.5-5.5volts, having less than 40mA as rated current and 3.5mm mono channel Micro Phone connector with Micro Phone Pin Analog Interface to receive the voice commands. It can record and store up to 60 voice commands in a single module with different voice frequencies from different persons. Hence we can provide specific work to each and individual voice frequencies, here in our solution we have recorded and stored two Voice Commands: 'Right' for turning the Left Page to Right Side and 'Left' for turning the Right Page to Left Side.

B. Micro Controller Unit

Arduino UNO is a micro



controller board developed based on ATmega328P datasheets and it has an open source IDE to write a program to control our proposed solution page turner. It is a 20 pin digital I/O module out of which 6 pins are PWM digital I/O and 6 pins are analog I/O. The micro controller Arduino plays a vital role in our proposed solution, which takes user voice commands through voice recognition module in the serial communication mode and operates the motor mechanism set to turn required page as per the code written in the Arduino.

C. Motor Driver

L293D is a motor driver used as current driving unit in our working model, which amplifies current signal corresponding to the requirement of load on DC motor, the micro controllers output current is limited up to 40 milli amperes but the motors which we used in our paper takes upto 600 milli amperes of current based on load requirement. To run motor mechanism set in sufficient mode we need an external power supply along with reference signal form micro controller is required and is available in the driver L293D.

D. DC Motor

The DC geared motors can have the feature of uni directional and bidirectional rotation motors with the speed of 40-60 rpm and are used as page turners in our solution. The right and left motor shafts connected with weight less gum tap handle to stick and lift up the page, the head motor shaft is connected with a balanced stick to turn a lifted page. The overall mechanism of three motor set is completely controlled by micro controller in uni directional and bi directional form as we written in program to turn pages based on voice commands in voice recognition modules.

III. WORKING

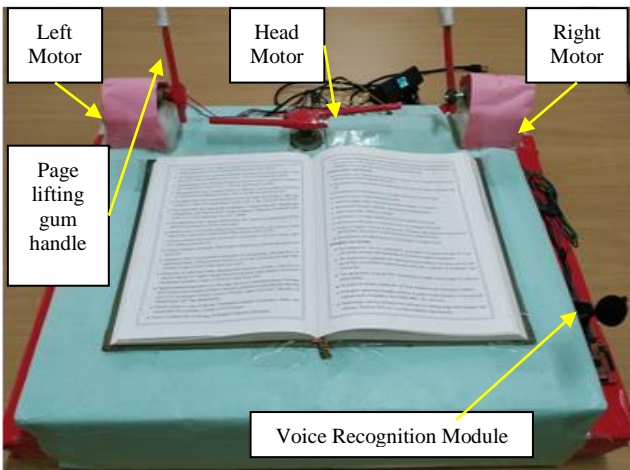


Fig.2: Working Model of Proposed Solution

The proposed model of Voice based Page Turning Assistor for physically disabled people is shown in Fig.2 and the components used in hardware is arrow marked with yellow colored identification to represent their individuality in working. As it works based on voice commands, it is usually operated on two modes for right and left in turning of pages. The control flow charts and their detailed explanations are given in below discussions.

A). To Left Turn:

Flow chart for page turn from right side to left side is shown in Fig.3. when user speaks out his required page name of left command in front of micro phone of voice recognition module it checks whether the given voice command is correct or incorrect, if it's a proper command and matched with pre stored command in its entity sends an information or flag message to the micro controller unit to operate the motor mechanism set for turning of right page to left side. The motor mechanism set is of three motors will operate based on micro controller direction and are clearly explained in the results section.

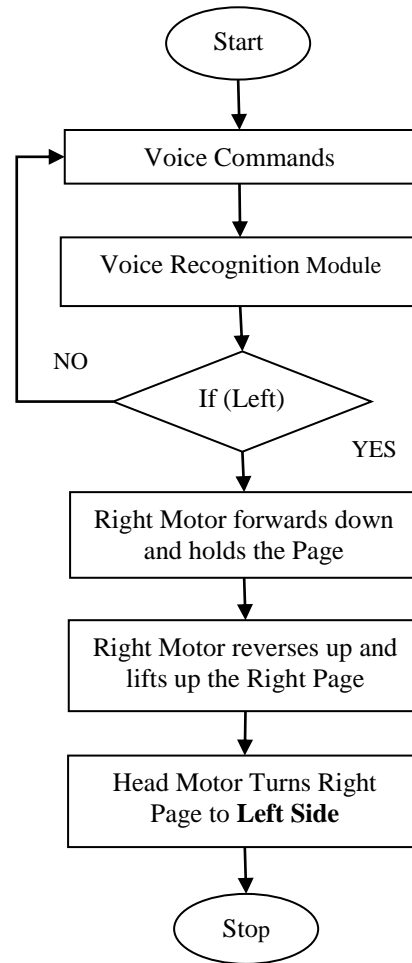


Fig.3: Control Flow Chart of Left Page Turn

B). To Right Turn

Flow chart, to turn a page from left side to right side is shown in Fig.4. The left sided page is shifted to right side with the help of our proposed solution, when user speaks out his voice command in front of micro phone of voice recognition module turns page form left to right as left page turn which is already discussed above but the operation is in reverse direction.

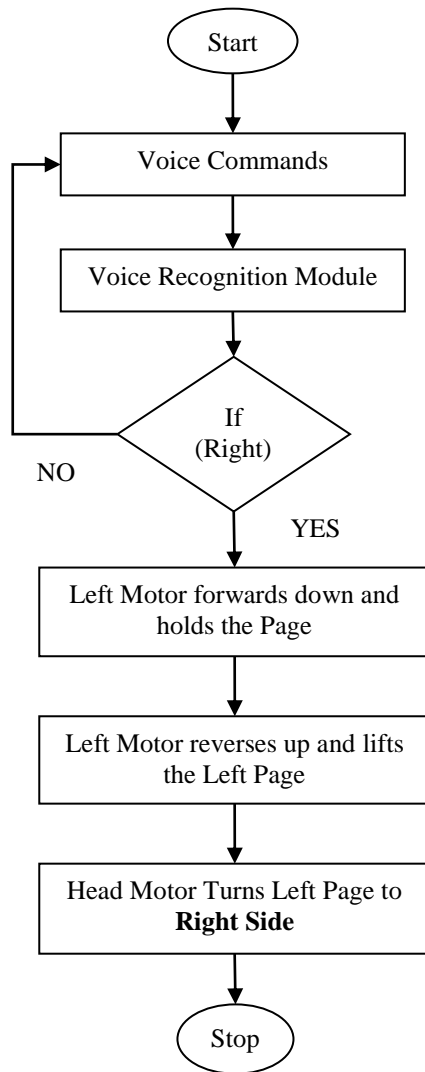


Fig.4: Control Flow Chart for Right Page Turn

IV. EXPERIMENTAL RESULTS

The proposed page turner has two commands and four steps to turn to corresponding page as shown in table.1. There is a three motor mechanism where two of them are placed horizontally at the edge of the corner of the book to touch and lift up the page, and another motor which is a peculiar one is placed vertically where it is a header motor and turns the pages from right to left or left to right

Table: 1.

	Right Page Turn	Left Page Turn
Step-1	Right command	Left command
Step-2	Page flip handle touches on left page	Page flip handle touches on right page
Step-3	Page flip handle lift up the left page	Page flip handle lifts up the right page
Step-4	Head motor turns left page to right side	Head motor turns right page to left side

A. Left Turn Results

The left command response is given to the controller unit through the voice recognition module and the controller will operate motor mechanism set to turn the required page.

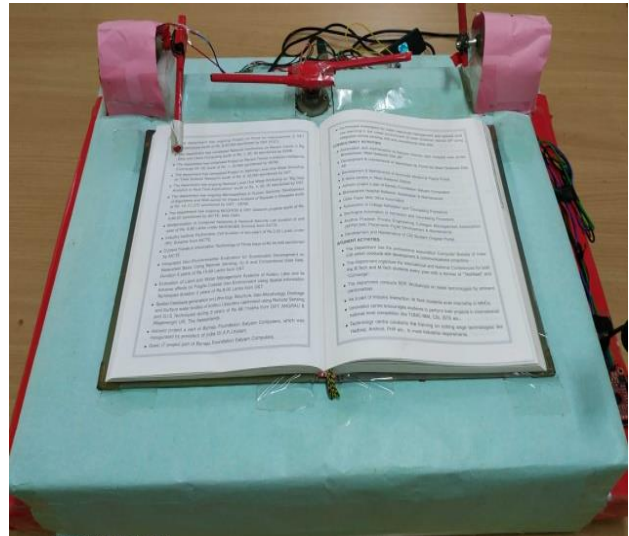


Fig.4.1: Right Motor forwards down and holds the Page

Fig.4.1.shows a page lifting handle of right motor forwarded down and touching the surface of the right page, now it holds the page along with its handle of right motor.

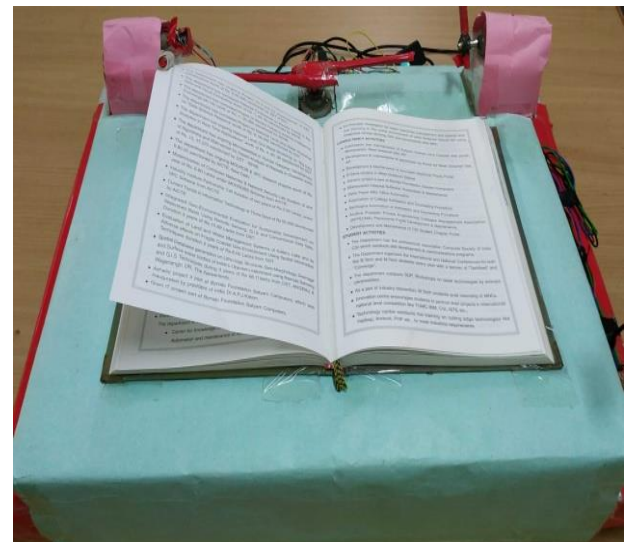


Fig.4.2: Right Motor reverses up and lifts the Right Page

The right motor which is already forwarded down to touch the page that is reversed up and the page is lifted up along with its handle of right motor as shown in Fig.4.2.

Now the header motor as shown in Fig.4.3.has pulled the page from right motor handle and turned it into the opposite side of its vicinity. as well as the page is successfully placed at left side position and then the header motor will come to its original position to take next action.

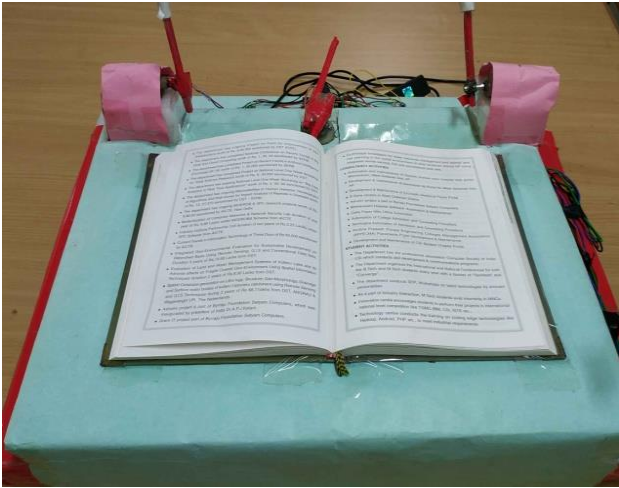


Fig.4.3: Head Motor Turns Right Page to Left Side

Right Turn Results

The experimental result for the right page turn is as follows.



Fig.4.4: Left Motor Reverses Down and Holds the Page

As shown in Fig.4.4.the left motor reverses down and gently touches on surface of the left page and holds the page.

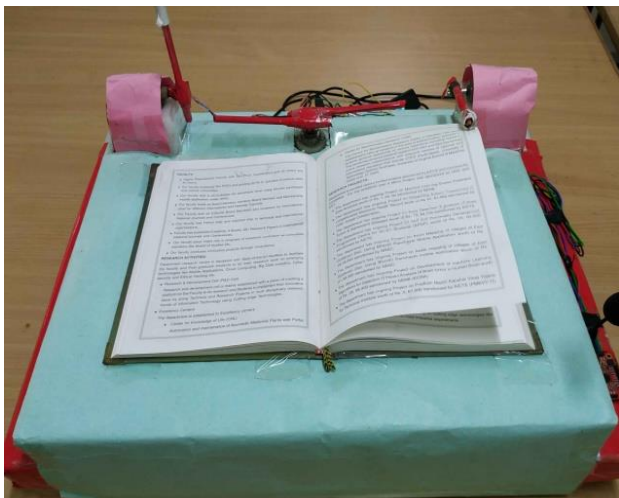


Fig.4.5: Left Motor Forwards Up and Lifts up The Left Page

The page flipping handle of left motor forwarded up along with left page and gently removes the left page after some time delay as shown in Fig.4.5.



Fig.4.6: Head Motor Turns Left Page To Right Side

As shown in Fig.4.6. The lifted page has dropped to opposite side of its vicinity using header motor in anti clockwise direction.

V. CONCLUSION

The working model of page turning assistor for physically disable people is an excellent application that who could not move their hands and wish to read books. Since it uses voice commands as input, it avoids other support and strain in turning pages. This model was tested in various cases; such as price, size, efficiency, simplicity, and understandability of operation for illiterate people and it proved to be a best choice for differentially abled who could read a book by using voice commanded page reading.

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Durga k prasad gudavalli has received his M.Tech in the stream of power electronics and drives from K.I.E.T. College under the University of J.N.T.U.K, currently working as an assistant professor in S.R.K.R.Engineering college, published 12 research articles in various international conferences and journals including IEEE and Elsevier, member Web of Science, Prathibha Purashkar awardee from state govt of A.P for best performance in intermediate education.



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