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Book Flipping and Scanning Machine

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ABSTRACT: In recent years, there is a great demand for digitizing a huge number of books. A new approach for meeting this demand is called Book Flipping Scanning, is proposed. In this method a new style of scanning books in which all pages of a book are captured with camera while a page is continuously flips with the help of motors and mechanical arrangement without stopping at each page. it acts as a bottleneck in the development of high-speed book digitization. Against this background, this paper proposes a newly designed high-speed, high-precision book scanning and flipping machine. Our machine turns the pages using vacuum cleaner and page turner. Vacuum generates suction and lift the page and turn it by using a wooden scale arrange in mechanical arrangement. This design enables high-speed performance of turning the page after that image is captured by camera and it is stored in connected computer. This stored image is then converted into pdf by using Matlab. The machine can scan the page with approximate three to four minutes. Then after the first page next pages will take some less time to scan the pages three to two minutes. First page will need more time as it will store the image before that it will generate the new folder and save. ARM 7 is used processing the machine.

KEYWORDS: page turner, camera, Arm 7, matlab.

I. INTRODUCTION

Portable tablet computers and smart phones are widely used, and different services depend on digital and sharing of a mass amount of data are being developed. Along with this technology and trend, particularly in the form of books, is fetching demand and book digitization is developing fast in whole world. High-speed book digitization is vital technology which put a firm impact in many fields, like storing documents. A vital technology that made important growth under this situation, called Book Flipping Scanning, has been introduced. This is a new method of scanning books in which all pages of a book are captured while pages are continuously flipped automatically through the page turner without stopping at each page. Many systems introducing this concept are introduced and developed to reach the different requirements in different markets, a high-speed camera system and a portable system using a single camera. This paper introduces a new book-page turner machine that provides three demands—high speed, accuracy, and automatic operation—so that an innovative high-speed book digitization technology based on Book Flipping Scanning. This machine is able of working at high speed, increasing the performance of old technologies. Also, for getting full image of paper we will keep this book in plane surface. ARM 7 is used for turning on motors to turn the pages and run the machine. Programming is done in MATLAB for converting the stored image in PDF. Image is stored in computer. The interfacing of computer and machine is done by ARM 7.

II. RELATED TECHNOLOGY FOR OPERATION OF MACHINE.

There are three important factors to work the machine properly.

1. Mechanical arrangement : 20MB camera is placed on model to take images of book. Motors are placed to drag the rod upward the rod will be placed with vacuum cleaner which will blow the air to lift the page up next rod is used from left to right the rod is used to slide from left to right by using motor. And again the upward rod comes down to pull the next page. The pneumatic valve is used in vacuum cleaner to maintain the pressure in vacuum cleaner.

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2. Speed : The time required to process the single page turning , scanning (imaging),converting to PDF by using MATLAB needs four to five minutes for first page because it will make a new folder to save the data, after that it will take 2 to 3 minutes to process the pages.
3. Hardware and Software : The ARM7 is used for processing the hardware. Motors are interfaced to arm7. The com port is used to connect the hardware to laptop or computer.LCD is used for displaying project name and steps.16*2 lcd is used. MATLAB is used for image processing. It converts the stored image into PDF. The jpeg ,png files can be converted to PDF.

III. BLOCK DIAGRAM OF MACHINE

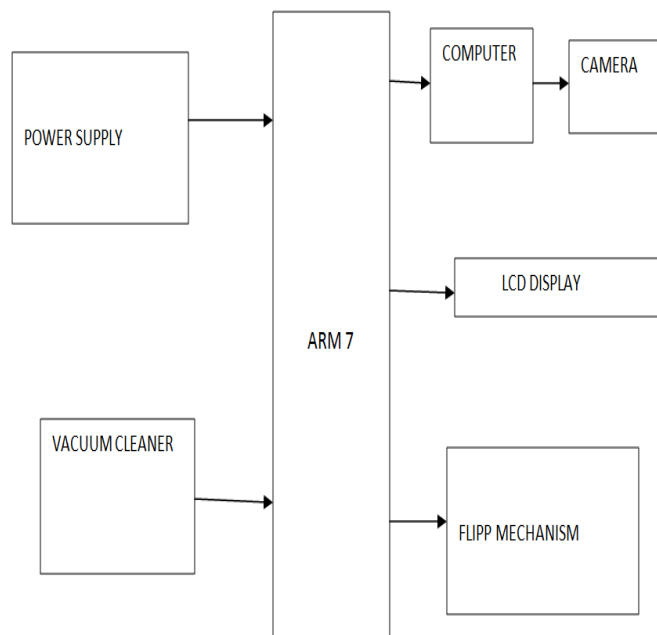


Fig .1 Basic block diagram

IV. TESTING OF DIFFERENT BOOKS BY USING DIFFERENT PAGES.

Different books like different thickness of pages books are tested. The different books like (basis weight: 65 g/m²; thickness: 61 μ m; size; total number of pages:150) and thick paper (basis weight: 122gm/m²; thickness:140 μ m; size; total number of pages: 221), respectively.The purchased books were a hardback book (ISBN: 97894130621410; size: 21.8 cm \times 14.6 cm; total number ofpages: 206) and a paperback pocket edition (ISBN: 578-4121501950; size: 7.4 cm \times 10.8 cm; total number ofpages: 162). We recorded the flipping of pagesand visually checked the page numbers originally printed inthe books in order to detect which pages were flipped or not. Ifthe all four corners of a page were observed at the same timein a captured image, we noticed that flipping and scanning is successful.

Results: The results for the four books.

The median speed and the median success rate for thethin-paper book were 10pages/15min and 100 %. For remaining books, the turning speed and output rate were over10 pages/20min and over 97%. Hence we got the correct results for this machine prototype.

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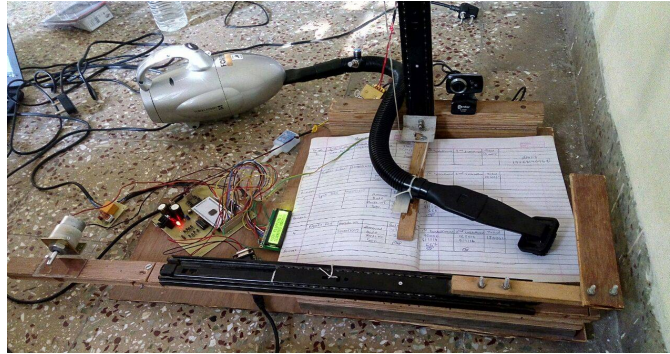


Fig . 2 Prototype of low cost solution

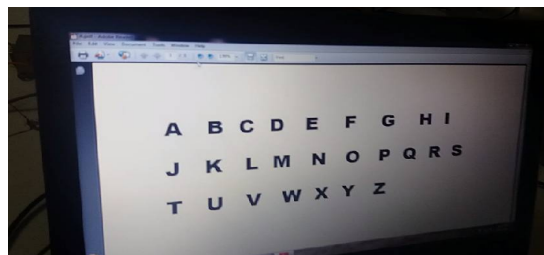


Fig 3. Scanned result

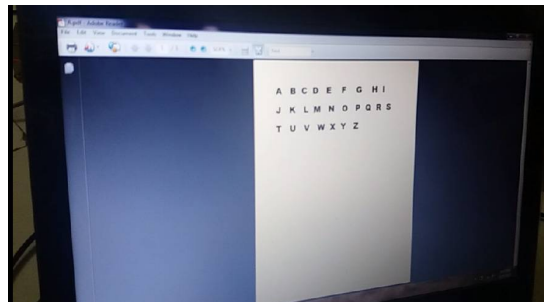


Fig 4. PDF converted.

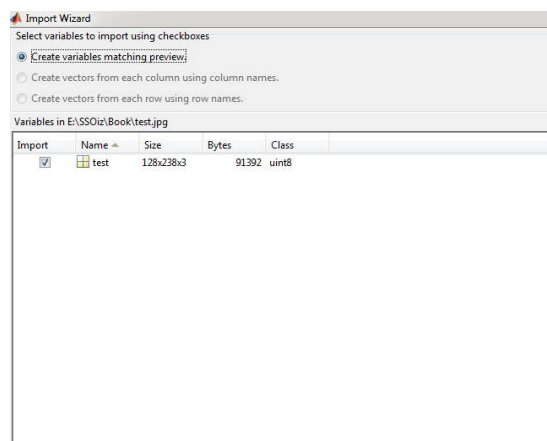


Fig 5. Memory required for one page.

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V. CONCLUSION

The introduced machine is dependent on turning pages by using mechanical model which is very simple and low cost model. Using vacuum we can generate suction and lift the page upwards and by using wooden rods we can flip the page and drag the page from left to right. Experimental results show that our machine achieved 100 % output in page flipping at a speed of 10 pages/15min in the case of a book consisting of paper of average thickness. Also, we received a 100 % output with a book having thinner paper and over 97 % output with a book having thicker paper. We confirmed that our proposed machine is a promising technology for flipping and scanning machine. Other than that we are converting the stored image into PDF using MATLAB.

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