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OCR Based Hands-Free Text Entry Using LabVIEW

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Abstract ---- Advancements in Technology aim in reduction of Human efforts to a greater extent. The objective of the project is to design a Hands-Free Text Entry System using LabVIEW. In order to assist physically handicapped persons (Bilateral Amputees in specific), a simple system is designed. Unlike previous systems which used a virtual keyboard and a webcam to detect the movements of user, we are using webcam to identify and compose the characters printed on a Sheet of paper into a String. A LASER pointer is mounted on top of camera to guide the user towards the required character. This paper contains two parts, Optical Character Recognition and composing the string obtained into a file. The OCR is developed using NI Vision Assistant for LabVIEW software-developing tool.

Keywords -- LabVIEW; OCR; NI Vision Assistant.

1. INTRODUCTION

Nowadays Computers are widely used everywhere. They can be used for reading and composing mails, browsing the Internet, managing incoming and outgoing calls etc. They can also be used for special applications like controlling an Electronic Wheelchair, monitoring a patient's Heartbeat. Thus the dexterity to use a computer is of huge importance, specifically for individuals with disabilities, where the computer is the only gateway to the outside world sometimes. Unfortunately, the standard way of operating a computer, i.e., with the help of a keyboard and a mouse, is incompatible for someone who cannot reliably use hands or arms. Thus, developing hands-free alternatives, especially for text entry, is not only a very promising task, but also a plain necessity in our modern society.

2. OPTICAL CHARACTER RECOGNITION (OCR)

Optical Character Recognition (OCR) is the electronic or mechanical interpretation, reading of images of Handwritten, typewritten or printed text (usually captured by a scanner or tablet) into machine-editable text. OCR is a major field of research in pattern identification, Artificial Intelligence and Machine Vision. An OCR system enables you to take a book or a magazine article, feed it directly into an electronic computer file, and then edit the file using a word processor.

All OCR systems comprise of an optical scanner for reading text, and affable software for analyzing scanned data. Most OCR systems use a hodgepodge of hardware and software to recognize characters, although some systems do it entirely through software. An advanced Roman OCR system can read text in large varieties of fonts, but they still have difficulties with handwritten text.

This paper describes OCR based text entry system to produce a '.txt' file output. It is designed to help handicapped people in typing related works. The system is implemented on LabVIEW platform. The Algorithm of our process can be simply given as:

1. Image Acquisition followed by detection, recognition and confirmation of required character.
2. Writing the Character into a string.
3. Repeating steps 1 & 2 till the completion of our task i.e., writing a paragraph or a sentence.
4. Composing the data present in the string to a '.txt' file.

3. RELATED STUDY

We have studied number of possible Hands-Free text entry methods which include Successive division of Virtual Keyboard by observing the motion of user's head until a single character is detected[2], Scanning image of a hand-written or a printed paragraph and partitioning it from a paragraph to a single character[3].
we also studied a method in which character is detected depending on user's head movements[4]. Our study also includes Text Recognition from images [6], Automatic Number Plate Recognition for Vehicle Identification [5]. We have also referred "The LURD-Writer" method [1].

4. PROPOSED MODEL

Our proposed model comprises of Camera/Webcam attached to a head-band which can put on and removed easily by the user. It employs a laser pointer mounted on the webcam for navigating user towards the character & can be controlled easily with minor head movements. The character recognition is achieved by using data received from Webcam.

Fig 1: Our Proposed model

5. STRUCTURE OVERVIEW

Our proposed model's Overview can be easily understood through the following block diagram.

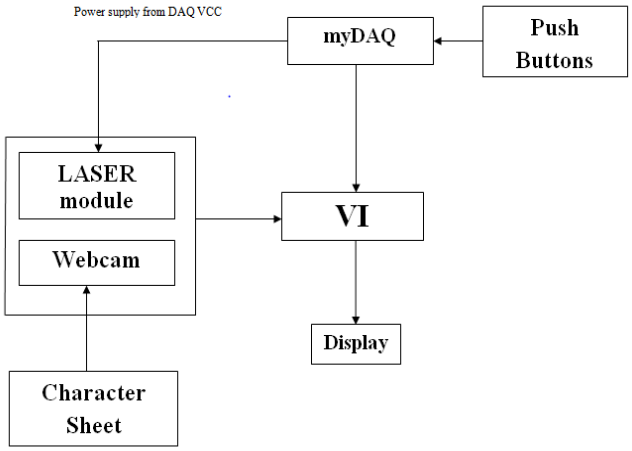

Fig 2: Overview of our proposed model

Webcam continuously monitors the Visual Character Sheet. Through LASER pointer the user will be able to guide the Webcam towards the required character. myDAQ is used to provide Power supply to the LASER pointer.

The user can see the character, which the camera is focusing, on the display. Once the required character is confirmed, the user can now have the access to store it into the string with the help of push buttons. Push buttons provide input to the myDAQ and this data is transferred to the VI which contains our logic.

Upon receiving the input from pushbuttons, the character which is present on the display at that moment is composed into a string. Replicating the above process, the user can enter new characters into string.

Each new character thus entered is concatenated with the previous string. Once the task of entering characters is complete, the data present in the string is composed into a file (preferably '.txt' file).

6. SOFTWARE IMPLEMENTATION

The task of Detection and Recognition of character and composing them into a string followed by composition into a file is achieved by a series of commands created in LabVIEW. The software architecture is mainly divided into 4 steps:

IMAGE ACQUISITION

This step involves continuous monitoring of visual sheet by the Webcam.

CHARACTER DETECTION AND RECOGNITION

In this step, by default, the software detects and recognizes all the characters which were monitored using Webcam. In order to detect only a specific character, we have to instruct the software to detect the character present in a specific region only. That specific region is called Region of Interest (ROI). Only the character present within the ROI is Detected and recognized by the VI.

The Detected characters need to be recognized by comparing them with a specific pattern. This pattern is provided by the 'OCR Read Character Set File'. It reads, compares the detected character with that of OCR file created by the Vision Assistant.

WRITING CHARACTERS INTO A STRING

Initially, it is checked whether Caps lock is turned on or off, depending on which, either Uppercase or Lowercase character is written into string. Each recognized character, is sequentially concatenated into a string.

WRITING DATA INTO A FILE

Once the required task is completed, the data written in the String is composed into File. New file is created or existing file is opened. Data is composed into File using and after composition is done, file is closed using.

7. WORKING

The working of our proposed model is better understood from the below flowchart.

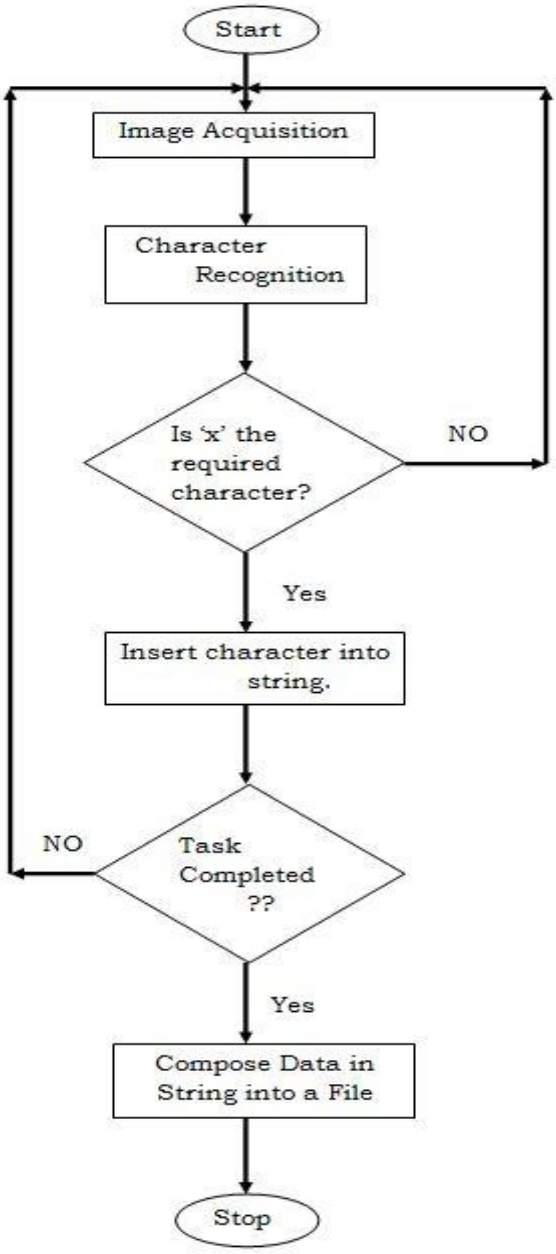

Fig 3: Flowchart

The Webcam continuously monitors the character sheet. Once the character detection and recognition is done, it is checked, whether the recognized character is the desired character or not. If yes, then that character is entered into string. If no, then the whole process of Image Acquisition and Character recognition is repeated until desired character is obtained. The same process is repeated until the required task of writing a sentence or a paragraph is completed.

7. RESULTS AND DISCUSSION

Each and every part of software and hardware is successfully tested and integrated to obtain the required design as per our plan. Our proposed model has successfully detected and identified the characters and we were able to type paragraphs also.

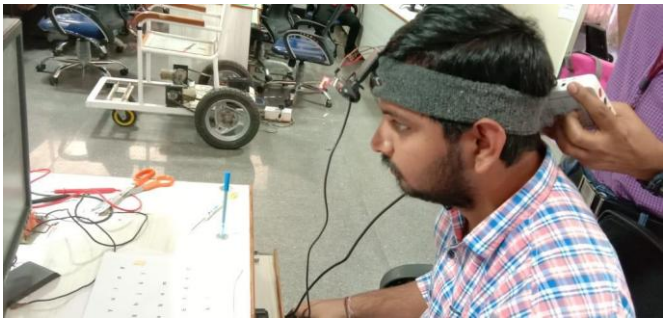

Fig 4: Experimental Setup

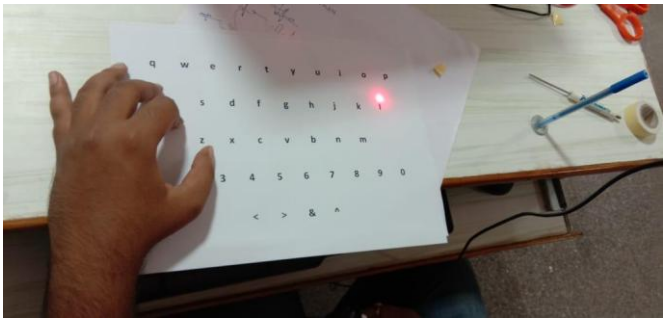

Fig 5: LASER pointing on Character Sheet

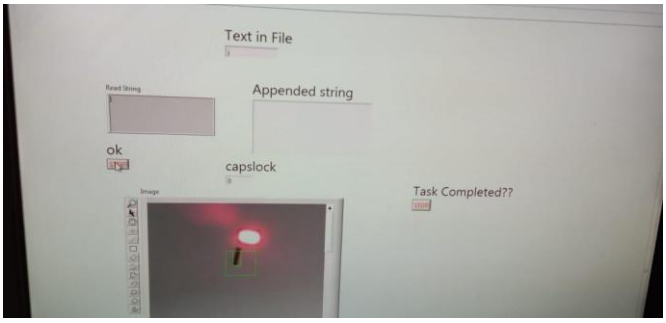

Fig 6(a)

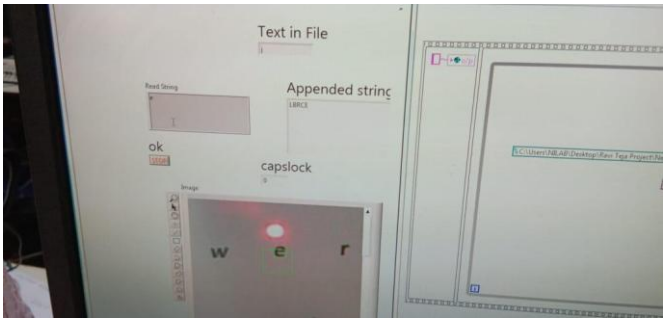

Fig 6(b)

Fig 6(a), 6(b): Character Detection and Recognition

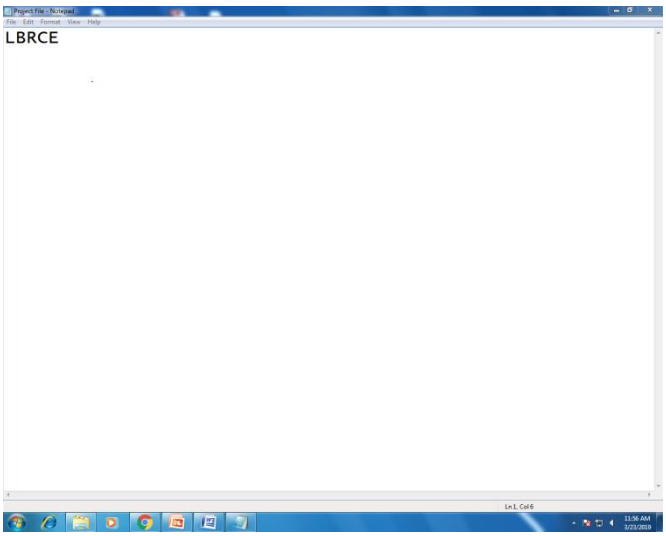

Fig 7: Data Composed in the File

8. CONCLUSION

Thus, Hands-Free Text Entry System has been designed and successfully implemented. This system is developed on LabVIEW platform. Further improvements like recognizing characters under lowlight conditions, Identifying characters in different orientations can also be done. By adjusting the ROI, spacing between the characters in Character sheet can be reduced. This system can assist Physically Handicapped people in tasks which involve typing. Upon further improvements, a sophisticated design like Google Lens can be designed which is more convenient and comfortable for the users.

REFERENCES

[1] Torsten Felzar, Rainer Nordmann "Alternative Text entry using Different Input Methods" Proc. 8th International ACM SIGAACCESS conference on Computers and Accessibility.
[2] Attieh Arab, Marall Fakoor, Ehsan Arbabi, Rehaneh Daneshman, "A Low Cost Hands-Free Typing System for Disabled People," 2012b19th Iranian Conference of Biomedical Engineering(ICMBE).
[3] S. K. Singla, R.K. Yadav, "Optical Character Recognition Based Speech Synthesis System".
[4] O.Krejcar, "Handicapped People Virtual Keyboard Controlled by Head Motion Detection," International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT), pp 1-7, Oct. 2011.
[5] Qadri, M.T., & Asif, M, 2009, "Automatic Number Plate Recognition System for Vehicle Identification using Optical Character Recognition," Proc. International Conference on Education Technology and Computer, 2009, Singapore, IEEE.
[6] Pratik Madhukar Manwatkar, Shashank H Yadav, "Text Recognition from Images", Proc. 2015 International Conference on Innovations in Information, Embedded and Communication Systems (ICIECS).
[7] http://zone.ni.com/reference/en-XX/help/370281AD-01