International Journal of Research in Advance Engineering, (IJRAE)
Vol. 1, Issue 4, April-2015, Available at: http://www.knowledgecuddle.com/index.php/IJRAE

An innovative approach towards Virtual Pen with real-time OCR feature

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***Abstract*— Here I am proposing an approach towards virtual pen which can be used for any device like laptop, pc, mobile tablet or any industrial machine. Also it's having facility of OCR (optical character recognition). Microcontroller on pen will decide when user is writing on paper. Camera attached to PC will detect x and y coordinates of tip of pen, so it will be able to trace what user is writing.**

***Keywords*— OCR, Camera, Virtual Pen, Microcontroller, PC, tablet.**

I. INTRODUCTION

The developing project is an approach towards virtual pen which can be used for any device like laptop, pc, mobile tablet or any industrial machine. Also it's having facility of OCR (optical character recognition). This is used for teaching virtual classroom.

There are many projects aiming to create a relationship between physical and digital workspaces. The Digital Desk [4, 7] provides an environment in which physical paper gains electronic properties, while physical objects can be used to operate electronic documents. There are also systems, such as Live Paper [6], that add digital information to enrich the interaction with physical artifacts like paper. Many research projects have specifically attempted to support architects and designers within the early stages of the design process. Electronic Paper [1] explores augmented reality based approaches for supporting early stages of design. Luminous Table [3] combines and integrates two dimensional drawings, physical models and digital models to support the urban design process. On the other side applications such as SKETCHPAD+ [5], focus on creating 3D scenes in a natural and intuitive way on systems that only offer 2D interactions.

II. RELATED THEORY

Use of embedded system and image processing are together to get more accurate results. OCR facility gives editable text so complete written document can be translated to any language.

A. OCR(Optical Character Recognition)

Optical character recognition (**OCR**) is the mechanical or electronic conversion of images of typewritten or printed text into machine-encoded text. It is widely used as a form of data entry from printed paper data records, whether passport documents, invoices, bank statement, receipts, business card, mail, or other documents. It is a common method of digitizing printed texts so that it can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as machine translation, text-to-speech, key data and text mining. OCR is a field of research in pattern recognition, artificial intelligence and computer vision.

Early versions needed to be trained with images of each character, and worked on one font at a time. Advanced systems that have a high degree of recognition accuracy for most fonts are now common. Some systems are capable of reproducing formatted output that closely approximates the original page including images, columns, and other non-textual components.

eISSN: 2395-1648

There are two basic types of core OCR algorithm, which may produce a ranked list of candidate characters.

Matrix matching involves comparing an image to a stored glyph on a pixel-by-pixel basis; it is also known as "pattern matching", "pattern recognition", or "image correlation". This relies on the input glyph being correctly isolated from the rest of the image, and on the stored glyph being in a similar font and at the same scale. This technique works best with typewritten text and does not work well when new fonts are encountered. This is the technique the early physical photocell-based OCR implemented, rather directly.

Feature extraction decomposes glyphs into "features" like lines, closed loops, line direction, and line intersections. These are compared with an abstract vector-like representation of a character, which might reduce to one or more glyph prototypes. General techniques of feature detection in computer vision are applicable to this type of OCR, which is commonly seen in "intelligent" handwriting recognition and indeed most modern OCR software. Nearest neighbor classifiers such as the k-nearest neighbors algorithm are used to compare image features with stored glyph features and choose the nearest match.

Software such as Cuneiform and Tesseract use a two-pass approach to character recognition. The second pass is known as "adaptive recognition" and uses the letter shapes recognized with high confidence on the first pass to recognize better the remaining letters on the second pass. This is advantageous for unusual fonts or low-quality scans where the font is distorted (e.g. blurred or faded).

*B. **ARM Controller***

We use ARM Cortex M3 for taking image and controlling purpose.
Key features of the Cortex-M3 core are:

- ARMv7-M architecture
- Instruction sets
- Thumb (entire)
- Thumb-2 (entire)
- 1-cycle 32-bit hardware multiply, 2-12 cycle 32-bit hardware divide, saturated math support
- 3-stage pipeline with branch speculation
- 1 to 240 physical interrupts, plus NMI
- 12 cycle interrupt latency
- Integrated sleep modes
- 1.25 DMIPS/MHz
- 90 nm implementation
- 32 µW/MHz
- 0.12 mm^2

Silicon options:

- Optional Memory Protection Unit (MPU): 0 or 8 regions

III. METHODOLOGY

1. Here we are using USB webcam with 640 by 480 resolutions as source of input.
2. Matlab code will trigger the camera and will capture the photo.
3. This photo will be converted from RGB into HSV colour space. Hue plane of HSV colour space contains all the colour information. So by putting some predefined thresholds we can segment some particular colour of pen tip.
4. Apex point of pen nib is located and code will wait to receive data from microcontroller.
5. If key attached to microcontroller is pressed by micro-controller accordingly 1/0 will be sent to pc by serial communication.

eISSN: 2395-1648

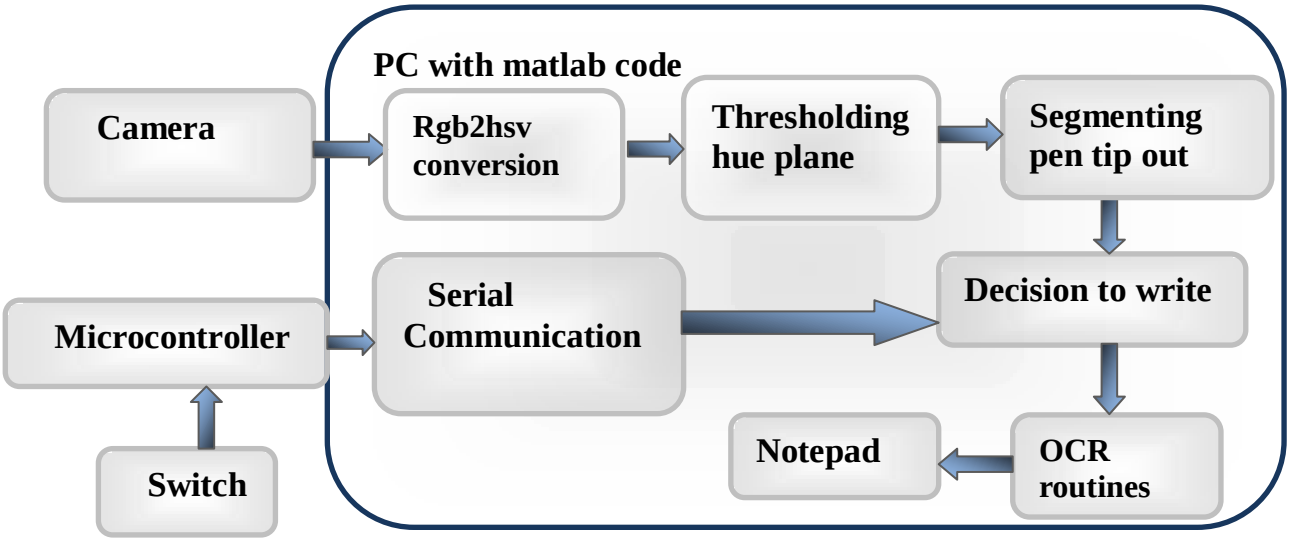


Fig.1: Block diagram of Microcontroller for OCR

IV. PREPROCESSING

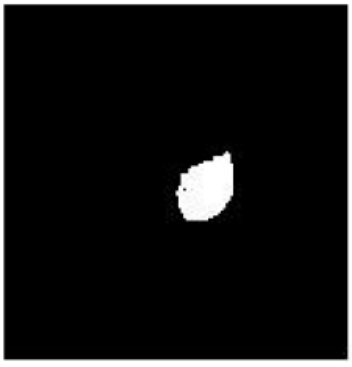
Preprocessing is very much required task to be done in hand gesture recognition system. We have taken prima database [1] which is standard database in gesture recognition. We have taken total 25 signs each sign with 40 images. Preprocessing is applied to images before we can extract features from hand images. Preprocessing consist of two steps

• Segmentation

• Morphological filtering

Segmentation is done to convert gray scale image into binary image so that we can have only two object in image one is hand and other is background. Otsu algorithm [2] is used for segmentation purpose and gray scale images are converted into binary image consisting hand or background. After converting gray scale image into binary image we have to make sure that there is no noise in image so we use morphological filter technique. Morphological techniques consist of four operations: dilation, erosion, opening and closing.

Unsegmented image of gesture “a”



Segmented image of gesture “a”

eISSN: 2395-1648

Unsegmented image of gesture "b" Segmented image of gesture "b"

Fig. 2: Segmentation of gray scale gesture image of gesture "a" and "b"

Segmented image of gesture "a" Morphlogical Filtered image of gesture "a"

Segmented image of gesture "b" Morphological Filtered image of gesture "b"

Fig. 3: Morphological Filtered image of gesture "a" and "b"

V. CONCLUSIONS

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eISSN: 2395-1648

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ACKNOWLEDGMENT

The heading of the Acknowledgment section and the References section must not be numbered. Causal Productions wishes to acknowledge Michael Shell and other contributors for developing and maintaining the IEEE LaTeX style files which have been used in the preparation of this template. To see the list of contributors, please refer to the top of file IEEETran.cls in the IEEE LaTeX distribution.

REFERENCES

[1] S. M. Metev and V. P. Veiko, *Laser Assisted Microtechnology*, 2nd ed., R. M. Osgood, Jr., Ed. Berlin, Germany: Springer-Verlag, 1998.

[2] J. Breckling, Ed., *The Analysis of Directional Time Series: Applications to Wind Speed and Direction*, ser. Lecture Notes in Statistics. Berlin, Germany: Springer, 1989, vol. 61.

[3] S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, "A novel ultrathin elevated channel low-temperature poly-Si TFT," *IEEE Electron Device Lett.*, vol. 20, pp. 569–571, Nov. 1999.

[4] M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, "High resolution fiber distributed measurements with coherent OFDR," in *Proc. ECOC'00,* 2000, paper 11.3.4, p. 109.

[5] R. E. Sorace, V. S. Reinhardt, and S. A. Vaughn, "High-speed digital-to-RF converter," U.S. Patent 5 668 842, Sept. 16, 1997.

[6] (2002) The IEEE website. [Online]. Available: http://www.ieee.org/

[7] M. Shell. (2002) IEEEtran homepage on CTAN. [Online]. Available: http://www.ctan.org/tex-archive/macros/latex/contrib/supported/IEEEtran/

[8] *FLEXChip Signal Processor (MC68175/D)*, Motorola, 1996.

[9] "PDCA12-70 data sheet," Opto Speed SA, Mezzovico, Switzerland.

[10] A. Karnik, "Performance of TCP congestion control with rate feedback: TCP/ABR and rate adaptive TCP/IP," M. Eng. thesis, Indian Institute of Science, Bangalore, India, Jan. 1999.

[11] J. Padhye, V. Firoiu, and D. Towsley, "A stochastic model of TCP Reno congestion avoidance and control," Univ. of Massachusetts, Amherst, MA, CMPSCI Tech. Rep. 99-02, 1999.

[12] *Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification*, IEEE Std. 802.11, 1997.