

An Online Embedded Handheld Writing System by Finger Writing in the Air

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Abstract

Objective/Background: Nowadays many writing systems are operated with physical touch of human fingers. The main objective of this paper is to transmit data by writing in the air using human figure. **Methods/Statistical Analysis:** In this work a novel method is proposed, based on the finger tip movements (gestures) captured by camera, using open CV math libraries the system translates the threshold image into time-series acceleration signals and feature vectors which recognizes characters or digits written in the air. **Findings:** Based on the color transformation the data is displayed in any of RGB colors on LCD display and displayed data transmits to the Mobile or Laptop through the corresponding IP addresses. **Application/Improvement:** It is used as a space pen, security purpose for creating the digital signatures in space.

Keywords: Acceleration, Handheld, Space pen, Threshold, Vectors

1. Introduction

With the brisk movement of gadgets, for occasion, PCs and phones, the centrality of Human-PC Interest (HCI) has been making to overhaul the relationship amongst contraptions and clients with ultra low power microcontroller¹. With movements in the dealing with execution and memory of PCs, much speedier and fundamentally more straightforward reaction to information signals has possessed the capacity to be conceivable, and unmistakable sorts of data contraptions and systems have thusly been proposed for all the more convincing affiliation.

As PCs get dynamically arranged in our regulated lives, HCI has changed into a key extent of examination. Moreover, as the examination hoists, HCI is winding up being powerfully nearer to how individuals talk with each other². Developments over snaps or catch squeeze, that is. HCI itself has increased some bewildering ground. From the reasonable yet effective solace and mouse, to joysticks and gamepads. From wired contraptions that most great

our degree of change, to remote ones with infrared backing³. In any case one thing remained a normal obstruction - all these require the utilization of an advancement handheld equipment gadget.

In our application, clients can utilize the fingers to draw letters and numbers discernible all around, which are then recorded and the embellishment case is duty to an altogether impelled penmanship attestation structure, which gives the vital yield⁴. This is finished by first isolating the hand, and along these lines the fingertip, from whatever is left of the body and a for the most part messed foundation. Once saw, the course of the hand and fingertip is then taken after and recorded, and it is this which is responsibility to the penmanship attestation structure.

2. Literature Survey

There are a couple writing structures existed for making. In any case, those all frameworks work by physical touch of human fingers.

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The present structures are:

- Digital Pen.
- Keyboard.
- Virtual Keyboard.
- Touch Screen Devices.

2.1 Digital Pen

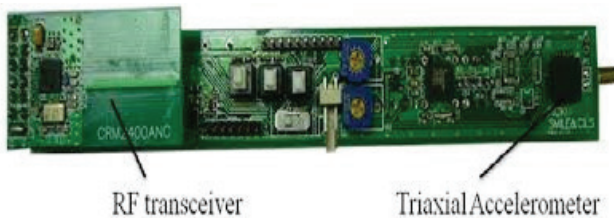


Figure 1. Internal structure of digital pen.

The digital pen is one of the usage of HCI strategy. The digital pen shown in figure 1 includes a little scale controller, triaxial accelerometer, RF transmitter and gatherer which is utilized for distinguishing and collecting hand minutes when shaping and development heading⁵. By utilizing this digital pen individuals can make digits or with the assistance of hand signs and the extending rates of hand minutes measured by the triaxial accelerometer, that cognizant hand advancements are transmitted to the PC.

2.2 Keyboard

Keyboard can be planned by the switch improvement. PC alphanumeric consoles routinely have 80–110 in number switches as shown in Figure 2, one for every key.



Figure 2. Keyboard peripheral.

The decision of switch headway sways key reaction the positive criticism that a key has been squashed and set out to all parts of the segment expected that would push the best way to deal with enter a character dependably. More cutting-edge console models use mixes of different advances to accomplish more detectable cost hold stores.

2.3 Virtual Keyboard

The virtual keyboard utilizes light to expand a console onto surface and vanishes when not being used.



Figure 3. Structure of virtual keyboard.

The Virtual keyboard as shown in Figure 3 includes a projector and 3D camera by utilizing a pre-arranged reference format we can recognize the hand range⁶. This structure utilized as a bit of gaming applications and 3D master minds etc. The virtual keyboard technology contains sensor module, IR light source and case projector.

2.4 Touch Screen Devices

Touch screen is in like way an information gadget which is utilized as a bit of electronic contraptions.



Figure 4. Touch screen.

We can work or control the gadget by going data through vital signs by touching the screen with fingers. There are specific sorts of touch screens they are ordinary, some touch screens work just with amazingly secured gloves, some touch screens like as shown in Figure 4 utilize an astounding pen to make⁷. The touch screens generally utilized as a bit of mobile phones

we can utilize the touch screen to respond to what is showed up and to control how it is showed up; for instance, zooming to expand the substance size. The touch screen empowers the client to team up especially with what is showed up, instead of utilizing a mouse, touchpad⁸. Occurrence of touch screen contraptions are mobile phones, PCs, ATM machines, voting frameworks and in gaming structures.

3. Proposed System

The all existed frameworks work with physical touch of human fingers. In the proposed structure we show another made work framework that makes the characters or numbers with finger writing in air. The block diagram appeared in underneath Figure 5 contains a web camera, raspberry pi processor and display unit

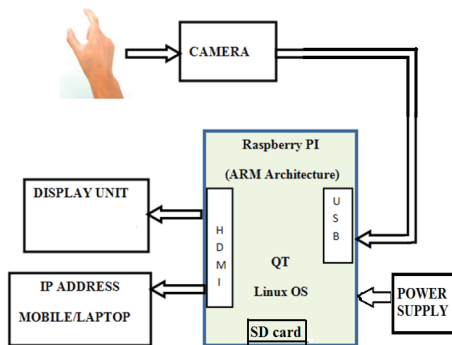


Figure 5. Proposed block diagram.

3.1 Camera

In this work the USB video camera is used which acquires the photographs steadily to processor through USB cable. The web camera has the determination 500k pixels⁹⁻¹⁰.



Figure 6. USB video camera.

Figure 6 shows the USB video web camera which includes a state of meeting, a photograph sensor, strengthen hardware. Picture sensors can be CMOS or CCD, the past being otherworldly for effortlessness cameras, however CCD cameras does not have any kind of effect clearly outperform as in CMOS-based cameras.

3.2 Raspberry Pi

The raspberry pi is a more diminutive than normal PC which is shaped in a solitary board with all the urgent segments. The Raspberry Pi has a Broadcom BCM2835 Structure on a Chip (SoC), which intertwines an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was at initially transported with 256 megabytes of RAM, later moved to 512 MB^{11,12}. It prohibits a specific hard plate or strong state drive, yet utilizes a SD card for booting and enduring stockpiling. The mother board of Raspberry pi is as shown in Figure 7 which does not contain its own specific presentation unit, HDTV shows or screens.



Figure 7. Raspberry pi board.

The raspberry pi board incorporates one Ethernet port, 4 USB spaces, HDMI port, 40 GPIO pins [10]. The raspberry Pi strengthens linux working framework and it underpins arranged tongues like c, c++, python, java.

3.3 Display Unit

HD TVs and different LCD screens can be connected utilizing a full-assess “male” HDMI join, and with a calm connector if DVI is utilized. HDMI shapes 1.3 and 1.4 are fortified and an understanding 1.4 association is supported. The Raspberry Pi yields sound and video by technique for HMDI, yet does not bolster HDMI information.

4. System Mechanism

The proposed framework part begins from establishment Linux working structure. After establishment of OS the open CV libraries likewise are introduced⁸. Figure 8 shows the working processing flow diagram.

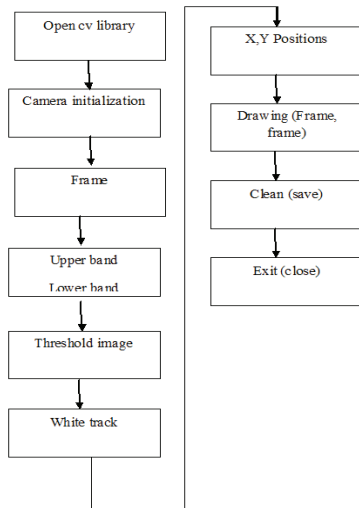


Figure 8. Processing flow diagram.

Regardless the camera introduced it captures the video after initialization. It sends the video to raspberry pi processor in the form of frames. In each edge it track the finger moving affirmation by setting the upper band and lower band limit for yellow shading. By utilizing this we change over the lodgings into edge pictures. It changes over the yellow shading into white shading and then transforms in the RGB colours.

5. Experimental Results

The online embedded presented handheld framework transmits unmistakable data by writing in air using human finger. The outcomes of this system are as shown in below figures.



Figure 9. Initial state of hand held device.

Figure 9 shows the initial condition of the system. When power is ON, immediately camera initializes automatically and ready to captures the video regarding the figure movement.



Figure 10. Writing data with finger in front of camera.

Figure 10 shows writing mechanism in which the character, digit or text is writing by finger in air in front of the camera. Based on the figure tip movement camera acquires the video and converts in to image



Figure 11. Character displayed on monitor.

Figure 11 shows the text displayed on computer. In the wake of making the characters, they are showed up on the screen which is associated with the HDMI port in Raspberry Pi.



Figure 12. Online Transfer of data to another computer.

Figure 12 shows the online transfer of data to other system. In the wake of showing the yield the spared pictures are to be transmitted to other flexible workstation or PC through LAN.

6. Conclusion

This work exhibits another creation of writing system. In this work firstly the movement of finger tip is tracked and converted in the form of video lodgings and after that shading subtraction is finished. It doesn't require pen, glove, and key pad to enter characters. This can be acknowledged by utilizing open CV with C++ language. It is handheld and ease gadget.

7. References

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