

A Novel Based Study on Virtual Keyboard and Mouse

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Abstract—This paper deals with the growth of human interaction with the digital world. In the area of text entry, it is becoming difficult for users to carry and interact with the slew of portable gadgets. To overcome this problem, we implement a virtual Keyboard and Mouse using Image Acquisition Toolbox in MATLAB. The Virtual Keypad and Mouse is an adaptation of the 6th sense technology developed by Pranav Mistry. Image Processing Technique is an important basis for the implementation of this technology. This system will replace a physical Keyboard or Mouse with a customizable Keyboard or Mouse printed on our hand skin whose 'keystrokes' are read and translated to real input. This task presents an implementation of customizable virtual keyboard which appoints fingertips of user as the intuitive input device by image processing made as on a one of its kind MATLAB program. In virtual environment, instead of using conventional Keyboard and Mouse, virtual Keyboard and Mouse is the intuitive, immersive and cost-efficient HCI device.

Keywords: HCI, Computer Vision ,Image Acquisition Toolbox, BW Scale

1. INTRODUCTION

The importance of human computer interaction is going to be increased day by day. Most of the mobile phones are using technology named as touch screen technology. This technology is very expensive enough to be used in desktop system [1]. Computer vision techniques can be an alternative way for creating a virtual human computer interaction device such as keyboard and mouse using a webcam[1].To interact with computer and develop a virtual human computer interaction device, an object tracking application is used. For using human hand as an input device, this approach enables us to give inputs, instructions and commands to the computing device[2].This paper presents an implementation of virtual keyboard and mouse which takes human hand as input device using image processing by MATLAB program.

The scope of this project includes detection of pointer using defined input information for controlling computer functions like dial pad control, power point slide control, mouse control click and motion, media player control without any physical touch with the screen. The device consist of software like MATLAB R2013b, Image Acquisition Toolbox, Web-cam. The main technology is used for capturing the human hand's movement by webcam for giving input commands to the system. This processing is done by using Image Acquisition Toolbox in MATLAB R2013b.Since physical contact is not a requirement of the system, this system is specially designed for disabled computer users and for users operating in hostile and sterile environment [5].

The paper is organized as follows: In section 2, the literature survey is described, including all the software components and techniques used in the system. Section 3 describes introduction tools and further section 4 states flow chart. In section 5, working and continues with result as well as conclusion section.

2. LITERATURE SURVEY

Many researchers have tried to control mouse movement using video devices in the human computer interaction and robotics fields. All of them used different methods to perform the action licking event. One approach, by Erdem et al, to control the motion of the mouse he used fingertip tracking. When a user's hand passed over the region, a click of the mouse button was implemented by defining a screen such that a click occurred [1]. Another approach was developed by Chu-Feng Lien. He used only the finger-tips to control the mouse cursor and click. His clicking method was based on image density, and required the user to hold the mouse cursor on the desired spot for a short period of time [1]. Paul et al, used still another method to click. They used the motion of the thumb (from a 'thumbs-up' position to a fist) to mark a clicking event thumb. Movement of the hand while time [1].A color pointer has been used for the object recognition and tracking. Left and the right click events of the mouse have been achieved by detecting the number of pointers on the image. The shape of the hand may

be analyzed over time to manipulate an onscreen object in a way analogous to the hand's manipulation of paper on a desk. Such an approach may lead to a faster, more natural, and more fluid style of interaction for certain tasks. Furthermore, the system was able to ignore background noise very well—mostly came from light reflection. When there were objects that had color similar to skin color, both spatial and temporal filtering helped erode these detected regions, therefore reducing the number of false positives [1]. In the study of a laser-based light tracking system that does not require any special device or instrument and can operate in real-time on a commodity PC with low-cost cameras and laser. Specifically, the system can track the tip positions of the laser light that fall on the index finger for each hand, assuming that a calibrated camera is viewing the hands placed in front of it. Laser Control with a MATLAB program that using a webcam detects when a laser pointer is in a specified hotspot and then does the equivalent of pressing a specified keyboard key. Thus we can control Media Portal or applications through the hot grids. The hotspots can be set by the user as well as the actions taken [2].

A vision-based hand tracking system that does not require any special device or instrument and can operate in real-time on a commodity PC with low-cost cameras. Specifically, the system can track the tip positions of the thumb and index finger for each hand, assuming that a calibrated camera is viewing the hands placed in front of it. The motivation for this hand tracker was a desktop-based two-handed interaction system in which a user can select and manipulate 3D geometry in real-time using natural hand motions. It has the ultimate potential to become transparent user interface for accessing information about everything around us [4]. A new method for fingertip detection using HSV Color model on Keypad image. First take any color image, then separate the R, G, and B component. These components are converted into H, S and V component. Then after applying thresholding algorithm to differentiate the object from background. Finally, merged the final result of HSV and keypad image. The method is applicable on static image only but this process also possible in real time. Here we have discussed a fast and efficient method for fingertips detection. The paper gives the survey of various virtual keyboard and is designed for detecting the fingertips with virtual keyboard image using HSV color model [6].

3. INTRODUCTION TO TOOLS

3.1 Image Processing with Toolbox

In imaging science, image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, a series of images, or a video, such as a photograph or video frame. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. In modern sciences and technologies, images also gain much

broader scopes due to the ever growing importance of scientific visualization.

Image Processing Toolbox and MATLAB provide a desirable environment to execute ideas and create unique solutions for MATLAB Toolbox used in our project:

- Image Acquisition Toolbox
- Image Processing Toolbox

3.1.1 Image Acquisition Toolbox

Image Acquisition Toolbox™ provides functions and blocks that enable you to connect industrial and scientific cameras to MATLAB® and Simulink®. It includes a MATLAB app that lets you interactively detect and configure hardware properties. The toolbox enables acquisition modes such as processing in-the-loop, hardware triggering, background acquisition, and synchronizing acquisition across multiple devices.

3.1.2 Image Processing Toolbox

Image Processing Toolbox™ provides a comprehensive set of reference-standard algorithms, functions, and apps for image processing, analysis, visualization, and algorithm development. You can perform image analysis, image segmentation, image enhancement, noise reduction, geometric transformations, and image registration. Many toolbox functions support multicore processors, GPUs, and C-code generation. Image Processing Toolbox supports a diverse set of image types, including high dynamic range, gigapixel resolution, embedded ICC profile, and tomographic.

3.2 Web cam



Fig. 3.2 Web cam

Web cam is used to capture and recognizes an object in view and tracks the user's hand gestures using computer vision techniques. As input, it sends the data to system. The camera acts as digital eyes seeing what the user sees. It also tracks the movement of hand and human body.

4. FLOW CHART

Most of the image processing techniques involve treating the image as two dimensional signal.[1]The camera captured the images by the MATLAB program that help in detection of

motion. The results of this processing can be used in numerous security applications such as Spy robots, fire alarm, person finder etc.

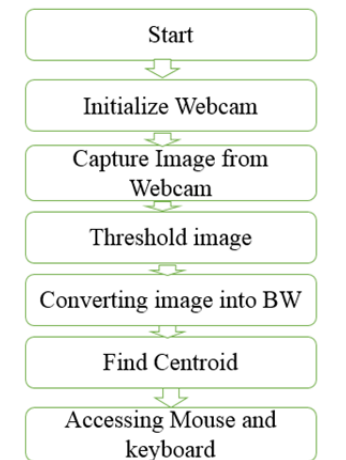


Fig. 4.1: Flow chart

5. WORKING

The pictures are continuously received from the Webcam which acts as input .As the related work requires, the images converted into GRAY scale and then BW through MATLAB commands. The choice of algorithm depends on environment in which the system is required to operate. [2]The choice of hardware to capture the users is a defining element of the reliability of the final system.

- Image acquisition setup: It consists of a web camera with suitable interface for connecting it to PC.
- Processor: It consists of personal computer or a dedicated image processing unit.
- Image analysis: Certain tools are used to analyze the content in the image captured and derive conclusions e.g. MATLAB R2013b.
- Machine control: After processing, some conclusions have to be made in order to initiate control actions. In our case control actions are desktop control via mouse control.

Firstly, Initialize the webcam and capture the image. Then, we convert the colored image into GRAY scale and then GRAY scale into BW scale using image processing toolbox .Later, by using image segmentation and morphology commands, we arranged the pixels values and clear the boundary of image. In image segmentation, thresholding is their gray scale value. If thresholding value is greater than pixels intensity, then corresponding pixels is black in image and vice versa. Thus, binary image contains only white and black pixels which indicate that it keep only essential part of the image and removes noise section. Thus, target is white and surrounding is black.

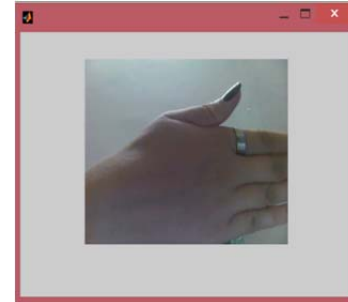


Fig. 5.1: RGB Input Image

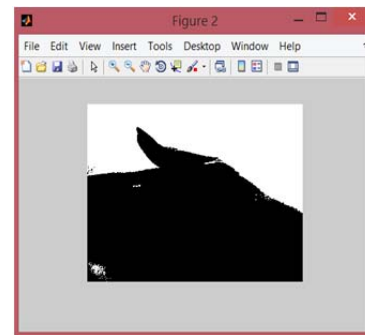


Fig. 5.2: BW Image

The User has to click different posture of hand by using Webcam from which the centroid point is calculated. After calculating the points, Mouse movement control will be executed in front of Webcam. Left click will be executed by using index finger in front of webcam. Right click will be executed by using middle finger in front of Webcam. Thus with combination of mouse movement control, left click and right click control we can control the whole desktop thus making our project functionality as wide as actual mouse control. The same process is going to be processed in case of keyboard.



Fig. 5.3 Virtual Keyboard

In this paper, only static background conditions were discussed. One major problem of having a mobile input device is that of dynamic scene. We are currently working on methods of automatically updating the reference frame if the movement of background is detected. Furthermore, for the

comfort of user's wrist and elbow, generally virtual keyboard systems are developed based on 2D flat keyboard area. However, with the depth information supplied by the range camera, our system could be extended to 3D keyboard without any actual typing surface, which is also the direction for our future study.

6. CONCLUSION

A virtual keyboard and mouse system based on skin recognition is presented. Keystroke events are accurately tracked independently on the user. No training is required by the system that automatically adapts itself to the background conditions when turned on. No specific hardware must be worn and in principle no dedicated goggles are necessary to view the keyboard since it is projected onto an arbitrary surface by optical means. The feedback text and/or graphics may be integrated with such projector, thus enabling truly virtual working area. Experiments have shown the suitability of the approach which achieves high accuracy and speed. In general, the surrounding lighting condition would impact the scene segmentation method if based on static reference frame. However, the infrared LED light source and the camera filter is narrow-banded and centered on a wavelength that only few natural light sources would have as their main component. This enables to extract the hand region according to pre-computed reference frame with very low processing complexity.

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