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VIRTUAL KEYBOARD AND VIRTUAL MOUSE

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ABSTRACT
Nowadays, Computing is not limited to desktops and laptops; it has found its way into mobile devices like palm tops and even cell phones. But what has not changed for the last 50 or so odd years is the input device, the good old QWERTY keyboard. Virtual keyboard uses sensor technology and artificial intelligence to let users work on any surface as if it were a keyboard. This paper develops an application to - visualize the keyboard of computer with the concept of image processing. The virtual keyboard should be accessible and functioning. With the help of camera image of keyboard will be fetched. The typing will be captured by camera, as we type on cardboard simply drawn on paper. Camera will capture finger movement while typing. So basically this is giving the virtual keyboard. This paper also presents a vision based virtual mouse that will take finger co-ordinates as input. The mouse will use our finger for recognition of our mouse. While to develop a system that will work as virtual keyboard i.e. with the help of camera image of keyboard will be fetched. The typing will be captured by camera, as we type on cardboard simply drawn on paper. Camera will capture finger movement while typing.

General Terms
Image Processing, Gesture Recognition

Keywords
Artificial intelligence, QWERTY keyword, Virtual mouse interface.

1. INTRODUCTION
Computer technology continues to grow up, the importance of human computer interaction is increasing rapidly which has also found its way into mobile devices like palm tops and even cell phones. But the fact that has not been changed for the last 50 or so odd years is the input device, the good old QWERTY keyboard and the virtual keyboard technology which is the latest development. Virtual keyboard technology is an application of virtual reality. Virtual reality means enabling single or multiple users to move and react in a computer simulated environment. It contains various types of devices, which allow users to sense and manipulate virtual objects.

Computers have undergone rapid miniaturization from being a 'space saver' to 'as tiny as your palm'. Disks and components grew smaller in size, but one component that still remained the same for decades - it's the keyboard. "Many researchers in the human computer interaction and robotics fields have tried to control mouse movement using video devices. However, all of them used different methods to make a clicking event. In our project we are using both virtual keyboard and mouse. In virtual keyboard we are capturing the movement of finger tapping simply on blank paper or card board while in mouse we are capturing the finger movement with the help of camera. Thus virtual keyboard/mouse which makes the human computer interaction simpler being a small, handy, well-designed and easy to use application, turns into a perfect solution for cross platform multilingual text input.

2. Organization of Paper:
While starting with literature survey we will discuss the related work than proposed system with architecture and its test results. Then conclusion derived from the approaches we used and future scope of enhancement. At the end references used for preparing this paper are shown.

3. RELATED WORK
Many researchers in computer science and human computer interaction developed various technologies related to virtual keyboard and mouse. However all of them used different techniques. Approaches related to keyboard, where in Eckert. M [1]developed for the persons with physical impairments with presenting a new middleware for mapping gestures, obtained by a motion sensing camera device. Another approach was developed by Zhang, Yunzhou introduced a method by the use of infrared laser module, keyboard pattern projector, embedded system and a single image sensor where every keystroke can be determine accurately by image processing including morphology principle and ellipse fitting[2].

Approach related to mouse. One approach, by Erdem to, control the motion of the mouse by finger tip tracking. A click of the mouse button was implemented on the screen such that a click occurred when a user's hand passed over the region [3,4]. Another approach was developed by Chu-Feng Lien [5]. He controls the mouse cursor and clicking event by using the finger-tips movement. 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. Paul et al, used some another method to click. He used the motion of the thumb from a 'thumbs-up' position to a fist to mark a clicking event of thumb. By making a special hand sign moved the mouse pointer.

Our project was inspired by a paper of Jun Hu [6].They developed bare-finger touch interaction on regular planar surfaces for e.g. walls or tables, with only one standard camera and one projector. The touching information of finger tips is recovered just from the 2-D image captured by the

camera. We used the concept of camera and image processing but without the help of projector and laser light a simple keyboard is drawn on the paper and the movement of typing is captured by camera same for the mouse the finger movement is captured.

4. PROPOSED METHOD

Virtual Keyboard and Mouse system uses camera, blank paper for drawing the keyboard. This method is easy to use less expensive and even portable such as keyboard. However, the system developed is user friendly.

In previous system the virtual keyboard used projector and camera which used bare-finger touch interaction and the captured 2D image is then recovered. But, due to the use of laser light and projector the battery power is lowered and leads to the limitation. Hence only by using the camera and paper keyboard the virtual keyboard is developed to overcome the drawbacks. The system will work in the following manner shown below respectively,

Mouse:

1. The mouse will be represented by use of our finger for recognition of the cursor moments.

2. A camera will be there to capture live feed of our finger movement on the screen.

3. Hence, In the Image processing, in real time movement of finger will be detected.

4. Those co-ordinates will be taken as the input of the mouse.

Keyboard:

1. The keyboard will be drawn on blank paper.

2. A camera will be there to capture live feed of fingers typing on blank paper with keyboard drawn on it.

3. Hence, with the Image processing, in real time typed words on keyboard will be detected.

4. Those words will be screened on desktop.

5. Function Module and algorithms

BLOB ANALYSIS -Blob Analysis is a fundamental technique of machine vision based on analysis of consistent image regions. As such it is a tool of choice for applications in which the objects being inspected are clearly discernible from the background.

HSV MODEL –SKIN COLOR DETECTION HSL stands for hue, saturation, and lightness, and is often also called HLS. HSV stands for hue, saturation, and value, and is also often called HSB (B for brightness). A third model, common in computer vision applications, is HSI, for hue, saturation, and intensity.

DETECTING BACKGROUND -Given the feed from the camera, the 1st thing to do is to remove the background. We use running average over a sequence of images to get the average image which will be the background too.

BACKGROUND SUBTRACTION- Background subtraction involves calculating a reference image, subtracting each new frame from this image and thresolding the result which results is a binary segmentation of the image which highlights regions of non-stationary objects.

CONTOUR EXTRACTION- Contour extraction is performed using OpenCV's inbuilt edge extraction function. It uses a canny filter. You can tweak parameters to get better edge detection.

CONVEX HULL AND DEFECTS -Convex hull points are most likely to be on the fingers as they are the extremities and hence this fact can be used to detect no of fingers. We are finding the deepest point of deviation on the contour.

FINGRETIP DETECTION - We estimate the locations of the users fingertips (in image-space) based on geometrical features of the contours and regions obtained.
Detect the locations of the user's fingertips.
Detect whether any fingertips are in contact with the tabletop.

TOUCH DETECTION - We are given as input the estimated positions of the users fingertips and must output which of those tips are estimated to be in contact with the keyboard-mat. We used a technique called shadow analysis.

For Keyboard-

Mapping Touch Point To Keystrokes- In this we map touch to keystroke and recognized the character.

Sending Keystrokes -Robot.java class is used to generate native system input events for the purposes of test automation, self-running demos, and other applications where control of the mouse and keyboard is needed. The primary purpose of Robot is to facilitate automated testing of Java platform implementations.

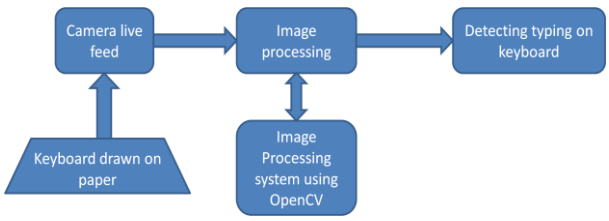
For Mouse-
Tracking And Finger Detection -We are tracking and counting the no of finger.

Gesture Recognition - Click gesture – Single click, Double click, Left Click, Right Click

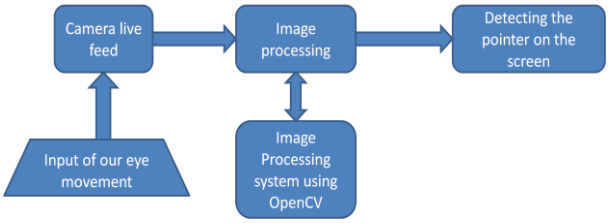
Mouse Keystroke-Send the keystroke to operating system.

6. SYSTEM ARCHITECTURE

A) KEYBOARD



B) MOUSE

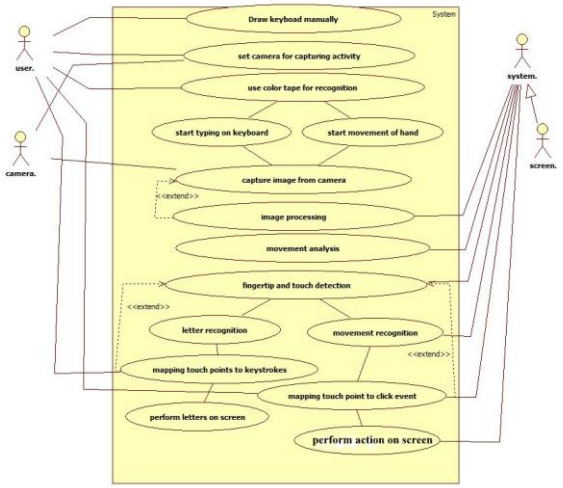


7. Test cases and results

This project would be developed completely using open source software. So, anybody can use and enhance the software further without spending any money. Since all users are familiar with the general usage of computers, no specific training should be required to operate the system.

Our project virtual keyboard and mouse is implemented with the use of following software i.e. Net beans IDE, JAVA JDK 1.6 and above and OpenCV 2.4.10 & OpenCV 3.0.0.

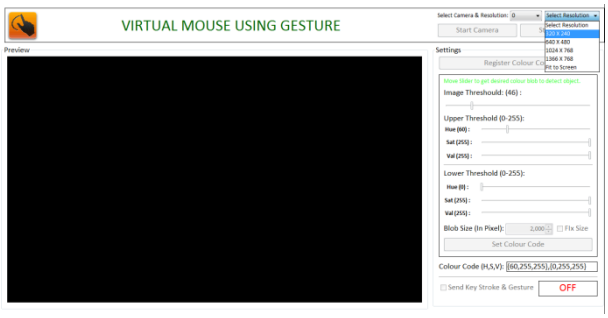
A use case diagram is a type of behavioural diagram defined by the Unified Modelling Language (UML) created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals represented as use cases and any dependencies between those use cases.



The following GUI has been designed for it:-

1) Virtual keyboard

2) Virtual mouse



8. Future enhancement:

Future work of this project includes making the Finger tip detector module invariant to illumination changes and 3D pose estimation of panel which can be used for Augmentation reality of 3D objects. In the future, we will take advantage of the other graphic features (e.g., character shape, icon feature) in the human–computer interface to detect touch events on the projected screen. In the future, we plan to add more features such as enlarging and shrinking windows, closing window, etc. by using the palm and multiple fingers. We can implement the voice recognition keyboard.

9. CONCLUSION

We developed a system to get an input of keyboard drawn on a blank paper and also to control the mouse cursor using a real-time camera. We implemented all mouse tasks such as left and right clicking, double clicking, and scrolling. However, it is difficult to get stable results because of the variety of lighting and skin colors of human races. Most vision algorithms have illumination issues. From the results, we can expect that if the vision algorithms can work in all environments then our system will work more efficiently. This system could be useful in presentations and to reduce work space.

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11. REFERENCES

[1]Eckert, M. Lopez, M. ; Lazaro, C. ; Meneses, J. ; Martinez Ortega, J.F., 2015 Mokey - A motion based keyboard interpreter .Tech. Univ. of Madrid, Madrid, Spain

[2]Su, Xiaolin ,Zhang, Yunzhou ; Zhao, Qingyang ; Gao, Liang ,2015 Virtual keyboard: A human-computer interaction device based on laser and image processing, Virtual keyboard: A human-computer interaction device based on laser and

image processing, College of Information Science and Engineering, Northeastern University, Shenyang, China

[3]Erdem, E. Yardimci, Y. Atalay, V. Cetin, 2002. *Computer vision based mouse*, Proceedings. (ICASS). IEEE International Conference

[4]Vision based Men-Machine Interaction http://www.ceng.metu.edu.tr/~vbi/

[5]Chu-Feng Lien, Portable Vision-Based HCI - A Real-time Hand Mouse System on Handheld Devices.

[6]Jun Hu, Guolin Li, Xiang Xie, Zhong Lv, and Zhihua Wang, *Senior Member, IEEE:*Bare-fingers Touch Detection by the Button's Distortion in a Projector–Camera System