Virtual Mouse and Keyboard

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Abstract—**Virtual Mouse, is an execution of known phenomenon based on the concept of color detection and Hand Action Recognition. In the eld of computer technology development,Virtual Mouse is an idea of implement a user convenient interaction device than a mouse by overcoming the restrictions and enriching the experience of interaction .The main functional aspect of the particular project is to use a regular web cam to sense the movement by the hand on which a colored paper is placed. The cursor is moved as a result of the movement of the color on the nger. A snapshot from the real time video is captured and the ipped image is converted into binary image. The specic color is detected and the gray scale image is converted into binary scale image. The cursor is moved to the centroid of the detected color area.The signal is transmitted between a user and the computer screen by means of the mouse that has been developed by the authors Where the desired instructions are given by means of the movement of the system via the hand of the user and are subsequently recognized by the system and the instruction is executed accordingly.Moreover,the virtual keyboard is designed along with the virtual mouse.Virtual Keyboard also works on the same phenomenon of Virtual Mouse .The entire basis of the prototype is to have an interfacing system that would be operating as a mouse which is used in our daily life. But it is in a total new paradigm keeping the convenience and ease of use in context of the user.It is user convenient and low cost prototype.**

Keywords—*Colour detection, Image acquisition, Image processing, Converting to binary-image.*

I. INTRODUCTION

Nowadays there is rapid development in computer technology, the importance of interaction between computer and human has increased enormously. Nowadays most of the mobile devices are using touch screen technology. However, this technology is still not cheap enough to be used in desktop systems. Creating a virtual human computer interaction device such as mouse or keyboard using a regular web cam and computer vision techniques can be an alternative way for such a requirement. In this paper, a color tracking based virtual mouse application has been designed and implemented using a common web cam. The main motivation of the paper was to create an object tracking application to interact with the computer, and develop a virtual human computer interaction device.

Most of the researchers in the human computer interaction and robotics fields have been trying to control mouse movement using video devices. However, there are many different methods to track the clicking event. We used approach of color tracking that is going to control the motion of the mouse cursor. In general methods, click of the mouse button was implemented when a user's hand passed over the region.
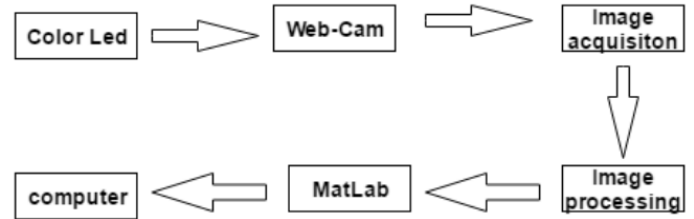

Fig. 1. Block diagram of the proposed virtual mouse and keyboard

Virtual Mouse and Keyboard work on the same phenomenon. In case of virtual mouse, we are marking specific area for mouse pad while in the case of virtual keyboard, we will mark specific co-ordinates of each key on the keyboard. If the Red color is detected in those specific co-ordinates, that particular command is given to the computer for that key.

In this paper, coloured paper has been used for the object recognition and tracking. Left and the right click events of the mouse have been achieved by detecting the allotted colors on the image.

In this paper, we are going to use 2 colours Red and Blue. While red color detection points to the mouse cursor and blue color points to the right and left clicks.A specific region is allocated for the mouse pad i.e, coordinates of the mouse pad are noted. So, the virtual mouse will only work in the allocated area. Similarly,in virtual keyboard each key is allocated specific coordinates. So, the key will be pressed only if the color is detected in those specific coordinates.

II. IMAGE ACQUISITION

Interior structure of object is built in photographic images by using image acquisition. the processing, compression, storage, printing, and display of images are often dealt by image acquisition.

waves whose attenuation is variable, as they pass through or reflect off objects, that conveys the information that constitutes the image is a classifying factor for digital imaging. The information carried by an image is converted into digital signals that are processed by a computer and outputted as visible image, A portion of visible light spectrum allows Digital imaging. digital imaging is possible for X-rays. For example, radiography, fluoroscope. digital imaging are also possible for gamma rays.

III. IMAGE PROCESSING

Image Processing is processing of images using mathematical operations by using any form of signal processing for
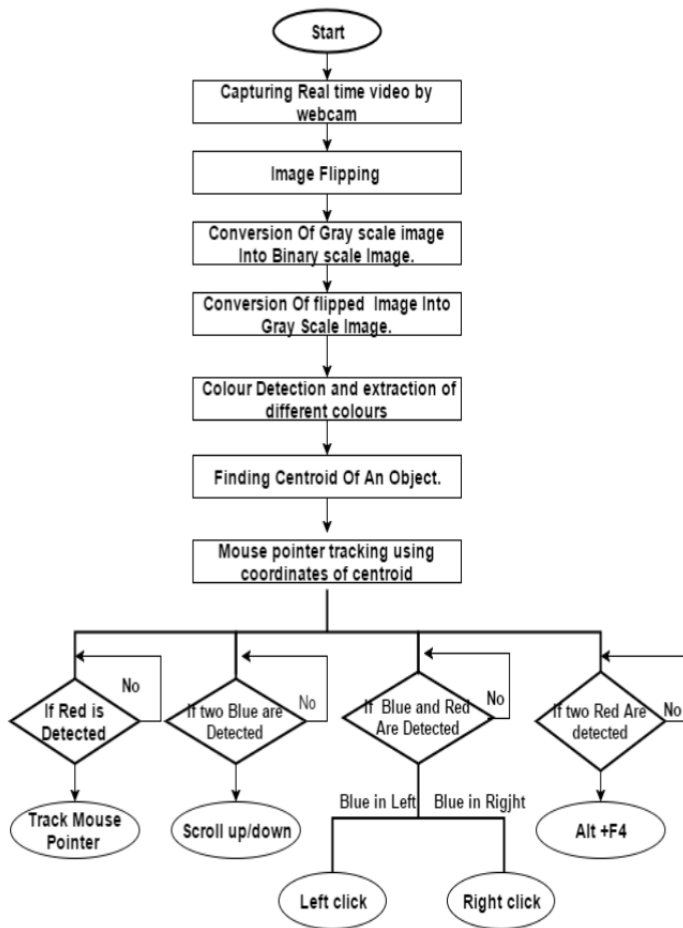
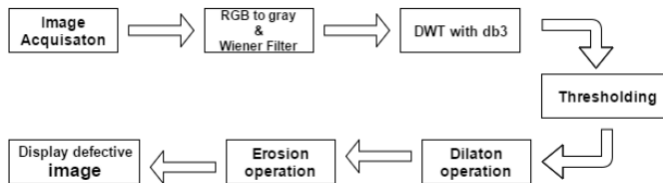Fig. 2. Flow chart of proposed virtual mouse and keyboard

Fig. 3. Flow chart of proposed virtual mouse and keyboard

Fig. 4. Detection of Red Colour and its coordinates
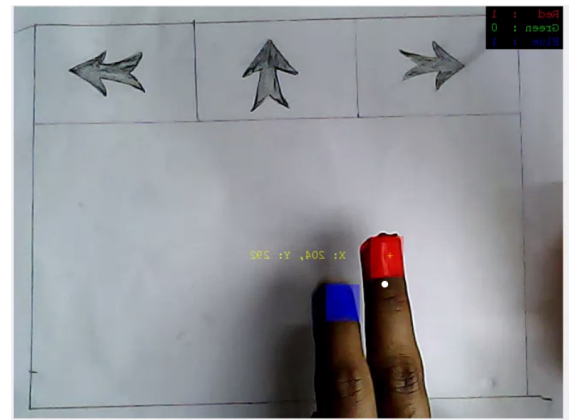
Fig. 5. Detection of Blue and Red Colours along its coordinates

which the input is an image, a series of images, or a video, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Images are also processed as three-dimensional signals where the third-dimension being time or the z-axis.

A. Image Enhancement

The main objective of image enhancement is to improve the subjective quality of the image for better human interpretation. Removing the noise or increasing the contrast of the image are some of the techniques of image enhancement.In computer gr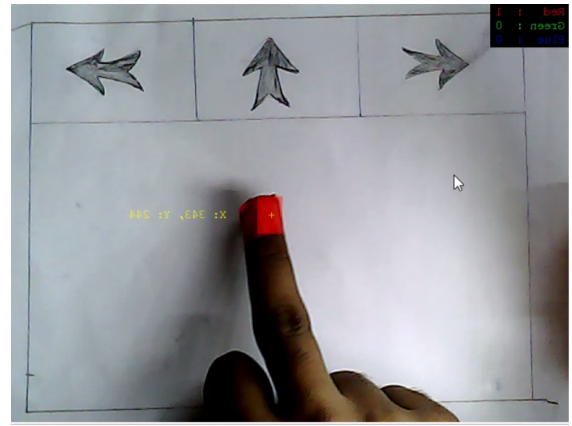aphics, the process of improving the quality of a digitally stored image by manipulating the image with software is image enhancement.

B. Image Restoration

Image Restoration is the operation of taking a corrupt/noisy image and estimating the clean, original image. Corruption may come in many forms such as motion blur, noise and camera mis-focus. Image restoration is performed by reversing the process that blurred the image and such is performed by imaging a point source and use the point source image, which is called the Point Spread Function (PSF) to restore the image information lost to the blurring process.

C. Morphological processing

Collection of non-linear operations related to the morphological of features in an image are called Morphological image processing.Morphological operations are more suitable for binary images as they depend only on relative ordering of. Absolute values of pixels for a greyscale image can be completely neglected while morphological operations are being performed on them .

TABLE I.   EXPERIMENTALLY CALCULATED DELAY VALUES
(A) USERS (B) TIME DELAY FOR LEFT CLICK
(C) TIME DELAY FOR RIGHT CLICK (D) TIME TAKEN FOR CURSOR

(a)Users	(b)Left Clicking in sec	(c)Right Clicking in sec	(d)Cursor in sec
User 1	0.73	0.62	1.10
User 2	0.56	0.59	0.92
User 3	0.81	0.69	1.30
User 4	0.91	1.01	0.95
User 5	0.64	1.13	0.76
Average	0.73	0.80	1.006

(a)Users	(b)Keyboard clicks in (10 sec)
User 1	9
User 2	8
User 3	9
User 4	7
User 5	8
Average	8.2

IV. CONTROLLING MOUSE

A. Moving Mouse Cursor

We are using the movement of red color as the mouse controller to position our mouse cursor along the screen. Red colour will map the cursor to appropriate position and the movement of the colour influences the position of mouse cursor along the screen. We have allotted a specific region on the paper for the movement of the cursor. Image is converted into Grey-scale image and then to binary image.Now centroid of all contagious areas is calculated and now mouse is moved to centroid of polygon made by centroids. The processing time of each function in algorithm to move cursor, sometime takes more time than it should take in real time.There is also a problem of retrieving red color from back- ground which might cause some distortions in positioning of the mouse cursor.So, we used image enhancement techniques like using a filter to remove noise,sharpen and brighten the image.

B. Right and left clicking

The movement of the red color defines the movement of the mouse pointer and the occurrence of blue color in the image defines the click. If blue colour is to the left of red then left click operation happens. If blue colour is to the right of red colour then right click operation happens.

C. Scrolling up and down

Detection of 3 red colours performs the scroll up operation. Detection of 2 red colours perrforms scroll down operation.

TABLE 2. Commands (a) S.no (b) colors detected by the program (c) Function executed

(a)S. no	(b)Colors detected by the program	(c)Function executed
1	Red	For Moving Cursor
2	Red + Blue at Left	Left Click
3	Red + Blue at Right	Right Click
4	Two Blue Up	Scrolling Up
5	Two Blue down	Scrolling Down
6	Two Red	Alt+F4

It needs lot of computation to scroll using our mouse because it should repeatedly calculate the distance between red and blue and also the centriod of binary image to po- sition the mouse.So ,It will be easier to the user to have a scrolling option using some other pattern.

TABLE 4: Experimentally calculated clicks (a)users (b) clicks per 10 sec

So using the Jrobot in matlab we have set up an option for scrolling up and down.Image needs two blue contagious objects to enable scrolling option.Scrolling up and and down are dependent on both the current position and previous positions of the blue objects.if we find the Y-axis coordinates getting decreased then the virtual mouse will start scrolling down in the other hand if we find the Y-axis getting increased then the mouse will start scrolling to the top. the scrolling will stop when the total number of blue color objects get reduced to 1.

V. EXPERIMENTS AND OBSERVATIONS

A. Experiment 1: Delay Values

We are evaluating the performance of designed mouse by calculating the delay time for a particular operation.We have tested it in a few aspects.In first aspect we measure the time taken by the cursor to reach top left corner to bottom right corner. In the second aspect time required to show the drop down menu after clicking the icon is noted that is time taken for a left click. In the third aspect ,time taken to open a folder that is time taken for a right click.

B. Experiment 2: Rate of clicks

We are evaluating the performance of designed keyboard by calculating the number of keyboard strokes for a given time.In this experiment number of keyboard strokes in 10 seconds is calculated repeatedly for five times.Through the result obtained, average number of keyboard strokes in 10 seconds is 8.

VI. DISCUSSIONS

In this paper,the problem with the virtual mouse using finger as discussed and to eradicate this problem we came with Leds.But in case of Leds, if a high voltage was given to the Leds the color of the Leds varies slightly.So,we may face color recognition.In order to fix this problem we will focus more light on the Leds,so that we dominate the color of the Led.So,that we can fix this illumination problem.As we are capturing snapshot from the real-time video it may delay in few seconds,so the mouse cursor will move suddenly in a small range. So virtual mouse cant satisfy more accuracy.As we are using x and y co-ordinates to identify the location of the colored object ,we will face a big problem if the position of the web-cam changed slightly.So,to fix this problem we should fix the webcam in such a position that it covers the virtual mouse and keyboard.We can create new key board shortcuts as per our wish by using different colors at a time as shown in the table(1).We can create as many shortcuts that makes keyboard more efficient and easier to user.In table(2) the delay times are different from different users because the imaging capturing may vary from one frame to other.So,the delay time

vary slightly from one user to other.The delay time may vary from one system to another system also because it might run slower on some of the certain Desktops or Laptops with low specifications such as the computational capabilities.This delay time is because it a lot of complex calculations will involve in a small amount of time.However,a standard computer or desktop has minimum computational requirements,the delay time may be decreased slightly.

VII.   APPLICATIONS

This project aims to increase human computer interaction. It has huge scope in gaming. The gaming industry is moving towards gestures and movement to control characters in games. Also, this brings ease to the user in performing day to day operations like scrolling up/down.

VIII.   SUMMARY AND CONCLUSION

This paper concludes by developing a virtual mouse and keyboard using image processing techniques like object tracking using a camera. Our system is developed in Matlab using image accusation toolbox. As an object blue,green,red colors are very well detected by the camera. Therefore, motion tracking of the objects worked very well. System, sometimes fails to detect the objects due to very low brightness around the camera. Mouse cursor is very sensitive to the slightest movement of the camera. These reasons badly affect the control over the system. There are some complex algorithms to overcome these problems but, run time of the system might be longer than the real time. We can implement the keyboard and virtual mouse effectively and accurately by implementing the program on some computers with excellent computing values.

ACKNOWLEDGMENT

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