HCI SYSTEM WITH HAND GESTURE

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Abstract - *Hand gesture recognition are often used as associate interfacing medium between the computer and human victimization totally different hand gestures to manage the PC. During this planned system, a true time vision-based hand gesture interaction that depends upon finger gestures victimization colour markers is intended. The target is to develop a Machine Learning application by that one will communicate with any digital device with less hardware needs and victimization an indoor camera that act as a detector to capture the gestures. The system are enforced victimization the python and OpenCV. The hand gesture is that easiest and natural approach of communication. The output of the camera is displayed on the monitor. Shape and position info concerning the gesture are gathered victimization detection of colour. The most aim is to make a framework with low price and effective gesture interpretation system that uses laptop vision to analyse totally different sets of gestures or actions done victimization the human fingers. This application is employed to perform mouse events like moving the pointer, drag and drop, choosing and keyboard events like typewriting. The code are developed in Python. Recognition and create estimation during this system are user freelance and strong as we are going to be victimization color tape (Red, inexperienced and blue) on our finger to perform actions.*

Key Words: *Hand gesture, Human Computer Interaction (HCI), Colour Detection, Web camera, Background Subtraction, colour strips*

I. INTRODUCTION

Since the PC technology continues to mature, the importance of human laptop interaction is hugely increasing. Today most of the mobile devices are employing a bit screen technology. However, this technology remains not low-cost enough to be utilized in desktop systems. Making a virtual human laptop interaction device like mouse or keyboard employing a digital camera and laptop vision techniques are often another approach for the bit screen. During this study, finger trailing based mostly a virtual mouse application has been designed and enforced employing a regular digital camera. The motivation was to make associate object trailing application to act with the PC, and develop a virtual human laptop interaction device.

II. RELATED WORK

"Many researchers within the HCI fields have tried to manage mouse and keyboard movement victimization video devices. However, all of them used totally different strategies to form a mouse to perform the actions. One approach, by Erdem et al, used tip trailing to manage the motion of the mouse. A click of the push was enforced by shaping a screen specified a click occurred once a user's hand omitted the region. Another approach was developed by Chu-Feng Lien. He used solely the finger-tips to manage the mouse pointer and click on. His clicking technique was supported image density, and needed the user to carry the mouse pointer on the required spot for a brief amount of your time. Paul et al, used still another technique 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 whereas creating a special hand sign enraptured the mouse pointer." In this study, a colour pointer has been used for the item recognition and trailing. Left, and therefore the right click events of the mouse is achieved by sleuthing the amount of tips about the image.

III. INTRODUCTION TO TOOLS

3.1. Introduction to Anaconda

Anaconda is a free and open-source distribution of the Python and R programming languages for scientific computing (data science, machine learning applications, large-scale data processing, predictive analytics, etc.), that aims to simplify package management and deployment.

3.2. Image Processing with Anaconda

This Webcam is used to capture and recognises an object in view and tracks the user's hand gestures using computer-vision based techniques. It sends the data to the computer. The camera, in a sense, acts as a digital eye, seeing what the user sees. It also tracks the movements of the thumbs and index fingers of both of the user's hands. The camera recognizes objects around you instantly.

3.3. COLOUR STICKER

This digital camera is employed to capture associated recognizes an object visible and tracks the user's hand gestures victimization computer-vision based mostly techniques. It sends the info to the PC. The camera, in a sense, acts as a digital eye, seeing what the user sees.

a) OpenCV b) PyAutoGUI

OpenCV: OpenCV (Open source computer vision) is a library of programming functions mainly aimed at real-time computer vision. OpenCV is written in C++ and its primary interface is in C++, but it still retains a less comprehensive though extensive older C interface. There are bindings in Python, Java and MATLAB/OCTAVE.

PyAutoGUI: Cross-platform GUI automation for human beings. PyAutoGUI is a Python module for programmatically controlling the mouse and keyboard.

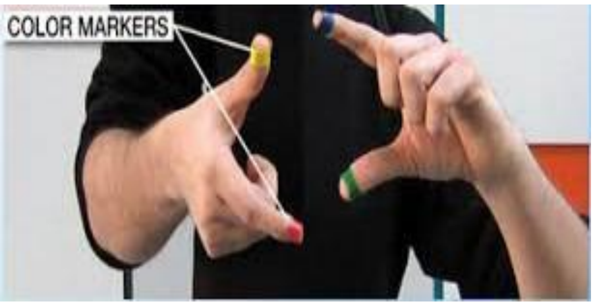

Fig. 3.1 Color Makers

3.4. WEBCAMERA

Fig. 3.2 Web Camera

Colour stickers which are at the user's fingers. Marking the user's fingers with red, green, and blue tape helps the webcam recognize gestures. The movements and arrangements of these Markers are interpreted into gestures that act as interaction instructions for the projected application interface.

IV. INTRODUCTION TO THE SYSTEM

In our work, we've tried to manage mouse pointer movement and click on events and keyboard activities employing a camera supported colour detection technique. Here real time video has been captured employing a Web- Camera. The user wears coloured tapes to produce info to the system. Individual frames of the video are individually processed. The process techniques involve a picture subtraction rule to observe colors. Once the colors are detected the system performs varied operations to trace the pointer and performs management actions, the main points of that are provided below.
No further hardware is needed by the system apart from the quality digital camera that is provided in each notebook computer.

Following are the steps in our approach:

- Capturing real time video victimization Web-Camera.
- Processing the individual image frame.
- Flipping of every image frame.
- Conversion of each frame to a grey scale image.
- Colour detection and extraction of the different colours (RGB) from flipped grey scale image
- Finding the region of the image and calculating its centroid.
- Tracking the mouse pointer using the coordinates obtained from the centroid.
- Simulating the left click and the right click events of the mouse and keyboard activities by assigning different colour pointers.

4.1. CONVERSION OF FLIPPED IMAGE INTO GRAY SCALE IMAGE

As compared to a coloured image, computational complexity is reduced in a grey scale image. Thus, the flipped image is converted into a grey scale image. All the necessary operations were performed after converting the image into grey scale.

4.2. CAPTURING THE REAL TIME VIDEO

For the system to figure we want a sensing element to discover the hand movements of the user. The digital camera of the pc is employed as a sensing element. The digital camera captures the important time video at a hard and fast frame rate and backbone that is decided by the hardware of the camera. The frame rate and backbone is modified within the system if needed.

4.3. FLIPPING OF IMAGES

When the camera captures a picture, it's inverted. This means that if we have a tendency to move the color pointer towards the left, the image of the pointer moves towards the proper and vice-versa. It's like a picture obtained once we interchange front of a mirror (Left is detected as right and right is detected as left). To avoid this downside, we want to vertically flip the image. The image captured is associate RGB image and flipping actions cannot be directly performed thereon. So, the individual color channels of the image square measure separated then they're flipped singly.

FLOWCHART: -

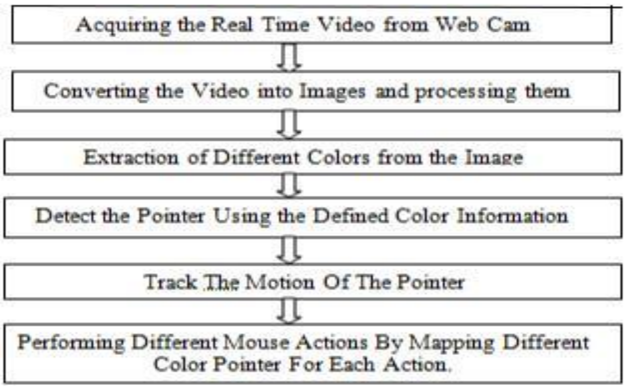
Acquiring the Real Time Video from Web Cam
Converting the Video into Images and processing them
Extraction of Different Colors from the Image
Detect the Pointer Using the Defined Color Information
Track The Motion Of The Pointer
Performing Different Mouse Actions By Mapping Different Color Pointer For Each Action.

Fig. Basic Flow Chart

4.4. COLOUR DETECTION

The red, inexperienced and blue color object is detected by subtracting the flipped color suppressed channel from the flipped Gray-Scale Image.

This creates a picture that contains the detected object as a patch of grey enclosed by black area.

4.5. CONVERSION OF GRAY SCALE IMAGE INTO BINARY SCALE IMAGE

To convert the grey scale image to binary scale image we use OpenCV built in "*threshold"* function has been used. Function can be used as;

thresh= cv2.threshold(img,127,255,cv2.THRESH_BINARY)

where ; it converts the grayscale image I to a binary image. The output image BW replaces all pixels in the input image with luminance greater than level with the value 1 (white) and replaces all other pixels with the value 0 (black). Specify level in the range [0,1]. This range is relative to the signal levels possible for the image's class. Therefore, a level value of 0.5 is midway between black and white, regardless of class.

In our study, the threshold 0.15 gave the best result for the large range of illumination change.

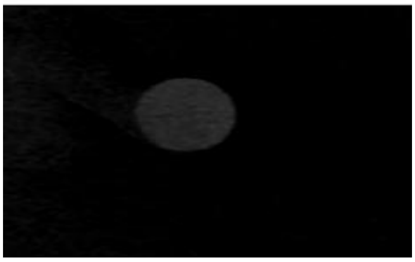

Fig. Grey Image

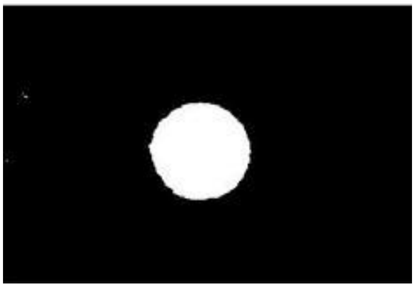

Fig. Binary Image

4.6. FINDING CENTROID OF AN OBJECT AND PLOTTING

For the user to control the mouse pointer it is necessary to determine a point whose coordinates can be sent to the cursor. With these coordinates, the system can control the cursor movement.

An inbuilt function in MATLAB is used to find the centroid of the detected region. The output of function is a matrix consisting of the X (horizontal) and Y (vertical) coordinates of the centroid.

V. PROBLEMS AND DRAWBACK

The system might run slower on certain computers with low computational capabilities because it involves a lot of complex calculations in a very small amount of time. However a standard PC or laptop has the required computational power for optimum performance of the system.

VI. CONCLUSION

We developed a system to manage the mouse pointer employing a time period camera. We enforced all mouse tasks like left and right clicking, double clicking, and scrolling. This system is based on computer vision algorithms and can do all mouse tasks. This technology has wide applications within the fields of increased reality, special effects, computer gaming, prosthetics, and biomedical instrumentation. Our motive was to form this technology within the most cost-effective doable method and additionally to form it beneath a regular OS.

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