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Hand Gesture Recognition System as Virtual Mouse for HCI

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Abstract: ***The technique of interaction between human and computer is evolving since the invention of computer technology. The mouse is one of the invention in HCI (human computer interaction) technology. Though wireless are Bluetooth mouse technology is invented still, that technology is not completely device free. A Bluetooth mouse has the requirement of battery power it requires extra power supply. Presence of extra devices in a mouse increases the difficulty level of more hardware components. The proposed mouse system is outside this limitation. This paper proposes a virtual mouse system using colored hand glove based on HCI using computer vision and hand gestures. Gestures captured with a webcam on processed with color segmentation, detection technique and feature extraction. The user will be allowed to control some of the computer cursor functions with a colored glove on the hand. Primarily, a user can perform with their fingers, scrolling up or down using their hands in different gestures. This system captures frames using a webcam or built-in cam it is based on the camera quality. So the usage of colored glove mouse system eliminates device dependency in order to use a mouse.***
Keywords: HCI(human computer interaction), colored hand glove , gestures.

I. INTRODUCTION

Human computer interaction (HCI) is a field in which computer scientists study novel ways in which humans can interact with computers naturally. the most widely popular topics in this field is hand gesture recognition, where hand movements are used to control computers. With the advancing technologies, the applications such as image processing and Human Computer Interaction (HCI) have become the areas of research. A virtual mouse with HCI will be a substitute for hardware mouse or touchpads. Here we capture the hand gesture by a webcam for Human computer interaction. This software mouse system can perform all mouse operations such as left and right clicks, double clicking, scrolling. Since HCI and image processing are the popular areas of research, many people have presented different approaches for mouse movement using hand gestures.

Image processing is used to perform operations based on an image, in order to get read that image or to extract some useful information from image and work with that information to perform mouse operations. This is a type of processing in which input image and output will be image, characteristics or features with that image.

There are different types of methods used in image processing, analogue and digital image processing.

Analogue image processing can be used for hard copies like prints and photographs. Image analysts use various fundamentals and methods of interpretation while using these visual process to capture images. Digital image processing satisfy in manipulation of the digital images by using computers. The process that all types of data have while using digital are pre-processing, enhancement, display and information extraction of data from image.

It is used to perform all mouse operations based on number of defects..

II. LITERATURE SURVEY

Paper [1]: This paper is an approach for Human computer Interaction(HCI) to communicate between human and computer, we have tried to control the mouse cursor movement and click events of the mouse using hand gestures to perform some basic operations of mouse on basis of hand moments. Hand gestures were acquired using a camera based on color detection. This mainly focuses on the use Web Camera to communicate with device in a cost effective manner.

Paper [2]: In this paper using morphological operations we prepare the hand gesture image which can be used to recognize the correct hand gesture. The implemented to detect the center of hand gesture by removing the unwanted objects, noise and black holes if any in a fixed true color image whose background is uniform in the image.

Paper [3]: One of the systems has used specialized gloves having 10 sensors for hand body language recognition and three machine learning algorithms were developed with the help of following classifiers: probabilistic neural network, support vector machine and k-nearest neighbor algorithm.

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Paper [4]: They proposed a paper that explores 3 different techniques for hand gesture recognition. They presented a new approach called “Curvature of Perimeter” with virtual mouse as its application The system presented, uses only a webcam and algorithms which are developed using computer vision, image and the video processing toolboxes and Mat lab.
Paper[5]: In this proposed method, hand gesture recognition algorithm is implemented using MATLAB. The hand movements are captured using Webcam. Then region growing segmentation followed by morphological operations is applied to segment the hand region. Then, The centroid of the palm region is calculated and the finger tips are then detected using the convex hull algorithm to perform mouse operations.

III. TOOLS AND LIBRARIES USED

A. Python

Python is a general purpose programming language started by Guido van Rossum, which became very popular in short time mainly because of its simplicity and code readability. It enables the programmer to express his ideas in fewer lines of code without reducing any readability. Compared to other languages like C/C++, Python is slower. But another important feature of Python is that it can be easily extended with C/C++. This feature helps us to write computationally intensive codes in C/C++ and create a Python wrapper for it so that we can use these wrappers as Python modules. This gives us two advantages: first, our code is as fast as original C/C++ code (since it is the actual C++ code working in background) and second, it is very easy to code in Python.
This is how OpenCV-Python works, it is a Python wrapper around original C++ implementation. And the support of Numpy makes the task more easier. Numpy is a highly optimized library for numerical operations. It gives a MATLAB-style syntax. All the OpenCV array structures are converted to-and-from Numpy arrays. So whatever operations you can do in Numpy, you can combine it with OpenCV, which increases number of weapons in your arsenal. Besides that, several other libraries like SciPy, Matplotlib which supports Numpy can be used with this. So OpenCV-Python is an appropriate tool for fast prototyping of computer vision problems.

B. OPENCV

OpenCV is an open-source, computer-vision library for extracting and processing meaningful data from images. That meaningful data might include finding all or parts of objects, recognizing all or parts of objects, tracking the movement of (parts of) objects in 2D or 3D between successive images, determining the 2D or 3D shape of objects from one or more images, and associating image data with a categorical meaning, such as mapping a handwave to the category "goodbye." Developed by an Intel research group (of which I'm a member),
OpenCV is freely available at http://www.intel

.com/research/mrl/research/cvlib/. In this article, I'll provide an overview of OpenCV and present an example of gesture recognition for conducting music using the library.

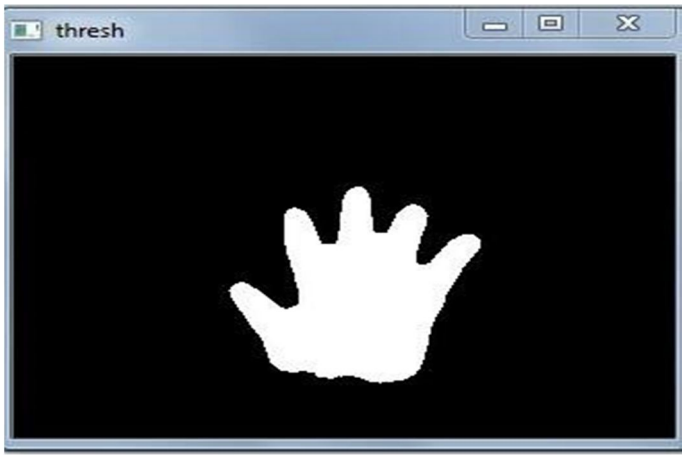
C. Tkinter

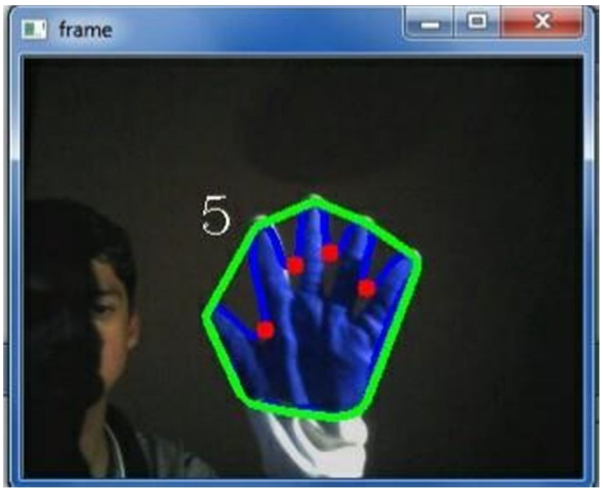
The Tkinter module (“Tk interface”) is the standard Python interface to the Tk GUI toolkit from scripts (formerly developed by Sun Labs). Both Tk and Tkinter are available on most Unix platforms, as well as on Windows and Macintosh systems. Starting with the 8.0 release, Tk offers native look and feel on all platforms.Tkinter consists of a number of modules. The Tk interface is provided by a binary extension module named _tkinter. This module contains the low-level interface to Tk, and should never be used directly by application programmers. It is usually a shared library (or DLL), but might in some cases be statically linked with the Python interpreter.The public interface is provided through a number of Python modules. The most important interface module is the Tkinter module itself. To use Tkinter, all you need to do is to import the Tkinter module: import Tkinter Or, more often: from Tkinter import *
The Tkinter module only exports widget classes and associated constants, so you can safely use the from-in form in most cases. If you prefer not to, but still want to save some typing, you can use import-as: import Tkinter as Tk

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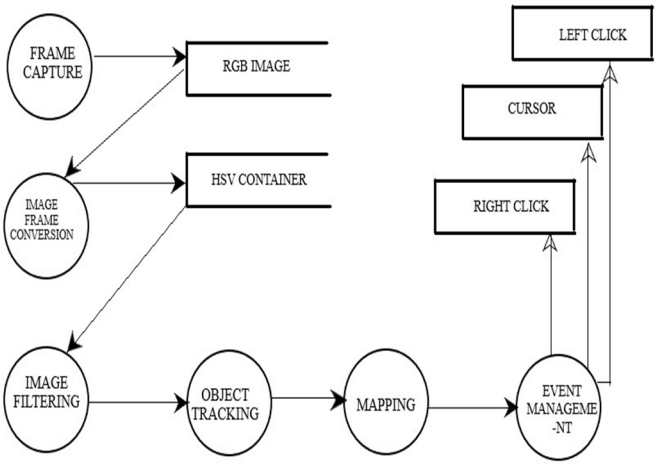
IV. RESULTS





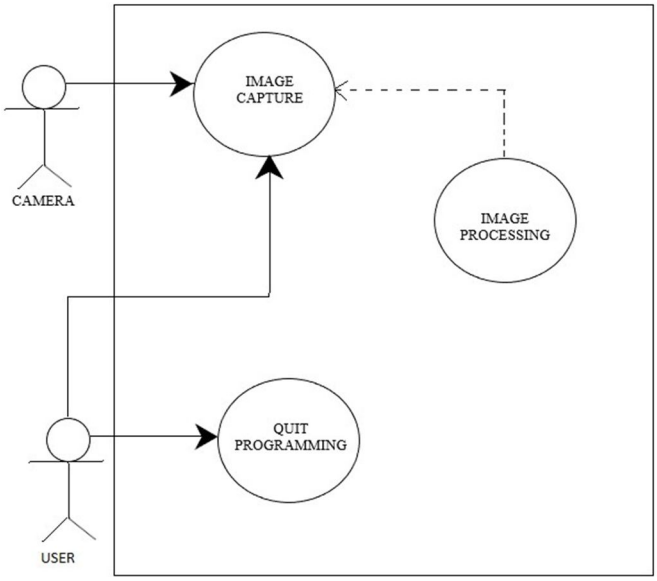
This is hand glove recognition system as virtual mouse for hci used for mouse operation with hand glove.

V. DATA FLOW DIAGRAM



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A. Use Case Diagram



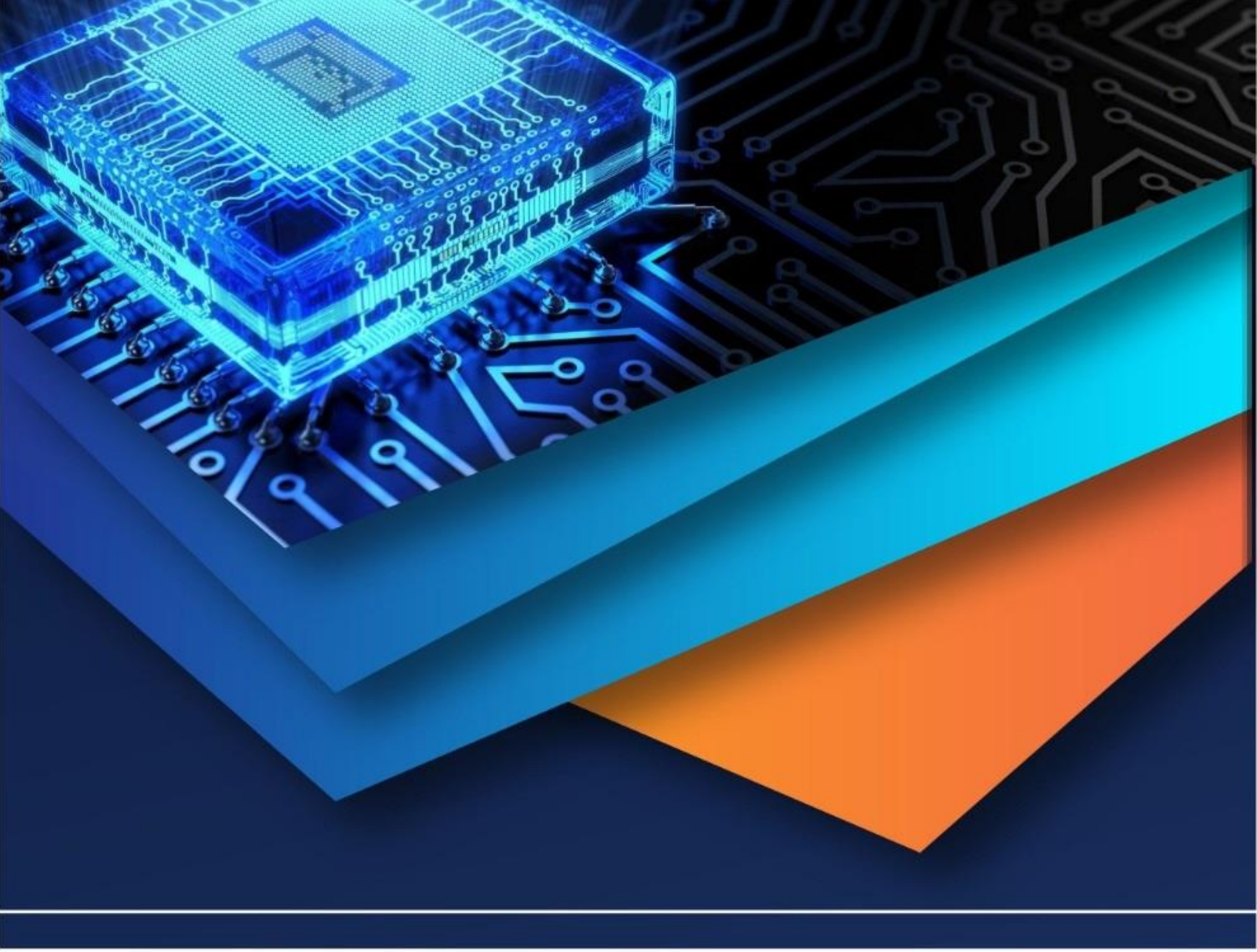
VI. CONCLUSION

In this paper, object tracking using color detection based virtual mouse application has been developed and using a webcam. The system has been implemented in PYTHON with the help of OpenCV library files. In conclusion, the physical mouse will be replaced by a virtual non-physical mouse in the Human Computer Interactions (HCI), where every mouse movements can be executed using hand. This paper develop a color recognition program with the need of replacing the physical mouse not sacrificing the accuracy and efficiency, it is able to recognize RGB movements, combinations, and translate them into actual mouse functions to perform operations. The system is used to control the mouse cursor and implement its function using a real-time camera and capture images in regular interval of time. Using hand gestures many users can handle applications from distance without even touching it and this Overrules the touch technology as it is less expensive. We implemented mouse movement, and other mouse operations. We can expect that if the algorithm can work well in all environments then our system will work more efficiently. The case study depicts that, hand gestures enables the Humans to control the PowerPoint presentation through distance without using any hardware device in between. The main intention to create this technology provides the cheapest system which works fine in a standardized operating system and easy to use.

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