Hand Gesture Recognition for Framework Navigation and Control
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Abstract:
The topic of task is a mouse recreation framework which plays out all the capacities performed by your mouse comparing to your hand developments and signals. Essentially, a camera catches your video and relying upon your hand signals, you can move the cursor and perform left snap, right snap, drag, select and look all over. The predefined motions utilize just three fingers set apart by various hues.

Keywords: Python, OpenCV, PyAutoGUI.

I. INTRODUCTION
The project is developed aiming to better the process of human-computer interaction. It aims to provide the user a better understanding of the system and to let them use alternate ways of interacting with the computer for a task. The task here is to regulate the mouse even from a distance just by using hand gestures. It uses a program in python and various libraries like PyAutoGUI, Numpy and image processing module OpenCV to read a video feed which identifies the users’ fingers represented by three different colors and track their movements. It retrieves necessary data and implements it to the mouse interface of the pc consistent predefined notions. The project are often useful for various professional and non-professional presentations. It can also be used at home by users for recreational purposes like while watching movies or playing games.

II. APPLICATION
A Hand Gesture Recognition System recognizes the Shapes and or orientation counting on implementation to task the system into performing some job. Gestures is a form of nonverbal information. A person can make numerous gestures at a time. As humans through vision perceive human gestures and for computer we need a camera, it’s a topic great interest for computer vision researchers like performing an action based on gestures of the person.

A. Virtual presence:
Sometimes during a situation like machine, electricity failure, emergency hostiles condition or some remote areas which are inaccessible to humans, it could very dangerous for human operators to be physically appear to operate the machines or in the working conditions. So, we can take help of the telepresence where telepresence is the area of intelligence.

B. Maintaining the Integrity of the Specifications
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III. ALGORITHM
In order to reduce the effects of illumination, the image can be converted to chrominance color space which is less sensitive to illumination changes. The HSV color space was chosen since it was found to be the best color space for skin detection. The next step would be to use a method that would differentiate selected color pixels from non-color pixels in the image (color detection). Background subtraction was then performed to remove the face and other skin color objects in the background.

The algorithms’ work flow for the entire system is shown in Figure below:
controlling the mouse movements.

• The contour of the hand was also used for gesture recognition. The system can be broken down in four main components, which are:

i. Color detection

ii. Color Contour Extraction

iii. Hand Tracking

iv. Gesture Recognition

v. Cursor Control

We applied multivariate Gaussian distribution to recognize hand gestures using non-geometric features. The input hand image is segmented using two different methods: skin color based segmentation by applying the HSV color model and clustering based thresholding techniques. Some operations are performed to capture the shape of the hand to extract hand feature; the modified Direction Analysis Algorithm is adopted to find a relationship between statistical parameters (variance and covariance) from the data, and used to compute object (hand) slope and trend by finding the direction of the hand gesture, as shown in Figure:

![Figure 4.1. Computing hand direction](image)

Then Gaussian distinction is applied on the segmented image, and it takes the direction of the hand as shown in the following figure:

![Figure 4.2. Gaussian distribution applied on the segmented image](image)

From the resultant Gaussian function the image has been divided into circular regions in other words that regions are formed during terrace shape so on eliminate the rotation effect. The shape is split into 11 terraces with a 0.1 width for every terrace. Nineteen terraces are resultant from the

**0.1 width division which are:** (1-0.9, 0.9-0.8, 0.8-0.7, 0.7-0.6, 0.6, 0.5, 0.5-0.4, 0.4-0.3, 0.3-0.2, 0.2-0.1), and one terrace for the terrace that has a value smaller than 0.1 and the last one for the external area that extended out of the outer terrace. An explanation of this division is demonstrated in the following figure.

![Figure 4.3. Terraces division with 0.1 likelihood](image)

Each terrace is divided into 8 sectors which named as the feature areas, empirically discovered that number 8 is suitable for features divisions, to attain best capturing of the Gaussian to fit the segmented hand, re-estimation are performed on the shape to fit capturing the hand object, then the Gaussian shape are matched on the segmented hand to prepare the final hand shape for extracting the features, the following figure shows this process:

![Figure 4.4. Applying the trimming process on the input image, followed by scaling normalization process.](image)

Camera was used to acquire the input image, a filter for skin
IV. RESULT

All the basic movements and gestures have been covered in the image below. These are basic functionalities that any Mouse or Track-pad of a system covers. Hence we have successfully tried and tested all of these functionalities.

V. CONCLUSION

The vision based cursor control using the hand gesture system was developed in Python language, using the open-CV library. The system could control the movement of a Cursor by tracking the users’ hand. Cursor functions were performed by using different hand gestures. The system has the potential of being a viable replacement for the computer mouse, however due to the constraints encountered; it cannot completely replace the computer mouse. The major constraint of the system is that it must be operated in a well-lit room. This is the main reason why the system cannot completely replace the computer mouse, since it is very common for computers to be used in outdoor environments with poor lighting conditions. The accuracy of the hand gesture recognition could have been improved, if the Template Matching hand gesture recognition method was used with a machine learning classifier. This would have taken a lot longer to implement, but the accuracy of the gesture recognition could have been improved. It was very difficult to control the cursor for precise cursor movements, since the cursor was very unstable. The stability of the cursor control could have been improved if a Kalman filter was incorporated in the design. The Kalman filter also requires a considerable amount of time to implement and due to time constraints, it was not implemented. All the operations which were intended to be performed using various gestures were completed with satisfactory results.

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VI. REFERENCES


