Realtime Method For Hand Gesture Recognition

Recognition using contour detection

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Abstract:

In this Project we try to control our media player using hand gestures with the help of OpenCV and Python. Computer applications require interaction between human and computer. This interaction needs to be unrestricted, and it has made it challenging to traditional input devices such as keyboard, mouse, pen etc. Hand gesture is an important component of body languages in linguistics. Human computer interaction becomes easy with the use of the hand as a device. Use of hand gestures to operate machines would make interaction interesting. Gesture recognition has gained a lot of importance. Hand gestures are used to control various applications like windows media player, robot control, gaming etc. Use of gesture makes interaction easy, convenient and does not require any extra device. Vision and audio recognition can be used together. But audio commands may not work in noisy environments.

INTRODUCTION:

In this project, we are developing an enhanced media player which plays and pauses the video by detecting the users face looking at screen or not and also the field of computer vision-based hand gesture interfaces for Human-Computer Interaction (HCI). System will continuously monitor whether the user is looking at the screen or not using a web camera. If it detects then the video will play without any interruption. Along with these, the web camera will also detect the users hand gestures which can be used for performing various events like increasing or decreasing the volume, changing to next video or previous video, etc. If the system could not detect user's face, then the video will be stopped immediately. Currently we propose to build prototype for exploring the use of marking menus in gesture-based interaction for controlling the Media player.

PROBLEM STATEMENT AND EXISTING METHODOLOGY:

With the development of ubiquitous computing, current user interaction approaches with keyboard, mouse and pen are not sufficient. Due to the limitation of these devices the useable command set is also limited. Direct use of hands can be used as an input device for providing natural interaction.

This Many various systems have been developed that are being controlled by gesture. These systems consist of games, sign language recognition, all these systems can be controlled by facial gestures, hand gestures can also control mouse. A system was developed in 2012 that recognizes seven various hand gestures consists of various gestures such as up, and down, right, and left, cross and round. Three various modules were built in this system to recognize various hand gestures.

Signals by MEMS 3-axes accelerometers have been given as input to the system. The gesture of the hand in three perpendicular directions has been detected by 3 accelerometers and been transmitted to the system by Bluetooth. Segmentation algorithm has been applied and finally the gestures are recognized and compares with the gesturers already been saved in the system.

People get daily information about news weather etc with the use of the internet. To get these above information people must use mouse and keyboard which can be prevented by this system. An article has been presented in 2011 by Ginu Thomas, A Review of Various Hand Gesture Recognition Techniques in which he compared the results achieved by several hand gesture recognitions techniques present. The various techniques used are edges method, and pixel by pixel comparison, orientation histogram. A database has been used that store various static hand gestures inputs. These inputs were the subset of ASL i.e., American sign languages. Filtering of the input image has been done to remove the noise present in the input image and then segmentation was done to the input image to analyse it. The input image was then converted into feature vector and then it was compared with the stored, trained set of hand gestures.

A system developed by Anupam Agrawal in 2010 had various used hand gestures to operate the VLC media player application. The K nearest neighbour algorithm has been used to recognize the various hand gestures. A VLC media player system that has been controlled by various hand gestures consists of play, and pause, Full screen, and stop, increase volume, and decrease volume features.

PROPOSED SYSTEM:

In this work, we present a novel real-time method for hand gesture recognition.

Convert frames into HSV

Create mask on the basis of color and filter actual color

Invert pixel value and then enhance the result for better output

Find Contours for specific colored object

Find Max area contour and draw it on live feed

LITERATURE SURVEY:

Literature Survey

SR.NO.	PAPER TITLE AND AUTHOR	PUBLISHER	METHODOLOGY	LIMITATION
1.	Enhanced Look Based Media Player with Hand Gesture Recognition Harshada Naroliya,Tanvi Desai,Shreya Acharya,Varsha Sakpal	IRJET	Face And Hand Gesture Recognition	Immutable to different distractions like glasses, facial hairs, styles
2.	Controlling Multimedia Application Using Hand Gesture Recognition Neha S Rokade,Harsha R Jadhav,Sabiha, U ma Annamalai	IRJET	Controlling Multimedia Operations	Delay while displaying the result
3.	Real-Time Hand Gesture Recognition Using Finger Segmentation Zhi-hua Chen, Jung-Tae Kim, Jianning Liang, Jing Zhangand Yu-Bo Yuan1	Hindawi Publishing Corporation	Hand Gesture Recognition using finger segmentation	If there are multiple objects with colour similar to that of skin this degrades the result and the system is no more accurate
4.	Construct Dynamic Graphs for Hand Gesture Recognition via Spatial-Temporal Attention Yuxiao Chen, Long Zhao, Xi Peng, Jianbo Yuan, Dimitris N. Metaxas	University of Delaware, USA	Hand Gesture Recognition via Spatial-Temporal Attention	More processing and hardware acceleration is required.

METHODOLOGY:

Step 1:
Import Libraries and capture camera

First, we take capture the video from camera which is the input that we take for the process. We used different libraries for this project. Some of the libraries that are used are as follows:

- cv2 is used for reading and writing for the file

- NumPy is used for mask and the dimensions we get from HSV images

- Pyautogui lets your Python scripts control the mouse and keyboard to automate interactions with other applications.

- Time library is used for real time access

Step 2:
Convert Frame Into Hsv

OpenCV usually captures images and videos in 8-bit, unsigned integer, BGR format. In otherwords, captured images can be considered as 3 matrices, BLUE, RED and GREEN with integer values ranges from 0 to 255.BGR image is formed.

In the above image, each small box represents a pixel of the image. In real images, these pixels are so small that human eye cannot differentiate Usually, one can think that BGR colorspace is more suitable for color-based segmentation. But HSV color space is the most suitable color space for color-based image segmentation. So, in the above application,

We have converted the color space of original image of the video from BGR to HSV image. HSV color space is consists of 3 matrices, 'hue', 'saturation' and 'value'. In OpenCV, value range for 'hue', 'saturation' and 'value' are respectively 0-179, 0-255 and 0-255. 'Hue' represents the color, 'saturation' represents the amount to which that respective color is mixedwith white, and 'value' represents the amount to which that respective color is mixed with black.

Step 3:

Track hand on color basis

It is at the tip of 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 areinterpreted into gestures that act as interaction instructions for the projected application interfaces.

Step 4:

Create mask on the basis of color and filter actual color

Color masking gives you fine control of updating pixel values on the screen.
Here, we want to work on the green & red colors for palm and edges of whole hand respectively and add some saturation and contrast to them, without affecting any of the othercolors in the image. The process of filtering is also known as convolving a mask with an image. As this process is same of convolution so filter masks are also known as convolutionmasks, and it used for edge detection and sharpness.

Step 5:

Invert pixel value and then enhance the result for better output

The Invert command is used to invert color values in pixels in grayscale, RGB or RGB images. The Invert command is available in two forms: Invert and Invert At. Invert simplyswitches 0 to 255 and 255 to 0 and likewise switches mirror-fashion all values in between.

The principal objective of image enhancement is to process a given image so that the result ismore suitable than the original image for a specific application. It accentuates or sharpens image features such as edges, boundaries, or contrast to make a graphic display more helpful for display and analysis.

Step 6:

Find Contours for specific colored object

Using contour detection, we can detect the borders of objects, and localize them easily in animage. It is often the first step for many interesting applications, such as image-foreground extraction, simple-image segmentation, detection and recognition.

Step 7:

Find Max area contour and draw it on live feed

Contour analysis is a commonly used method for fingertip detection, which achieves the location of fingertip based on geometric features of contour To detect the Whole object maxarea function is used and it is shown on live feed on interface

Step 8:

Find Convexity detect for counting Values and Apply Cosinemethod

The convex detect is defined as the difference   between gesture convex hull and contour, they are contained in the convex hull but not hand area. Cosine Similarity is a measurement that quantifies the similarity between two or more vectors. The cosine similarity is the cosine of the angle between vectors. The vectors are typically non-zero and are within an inner product space.
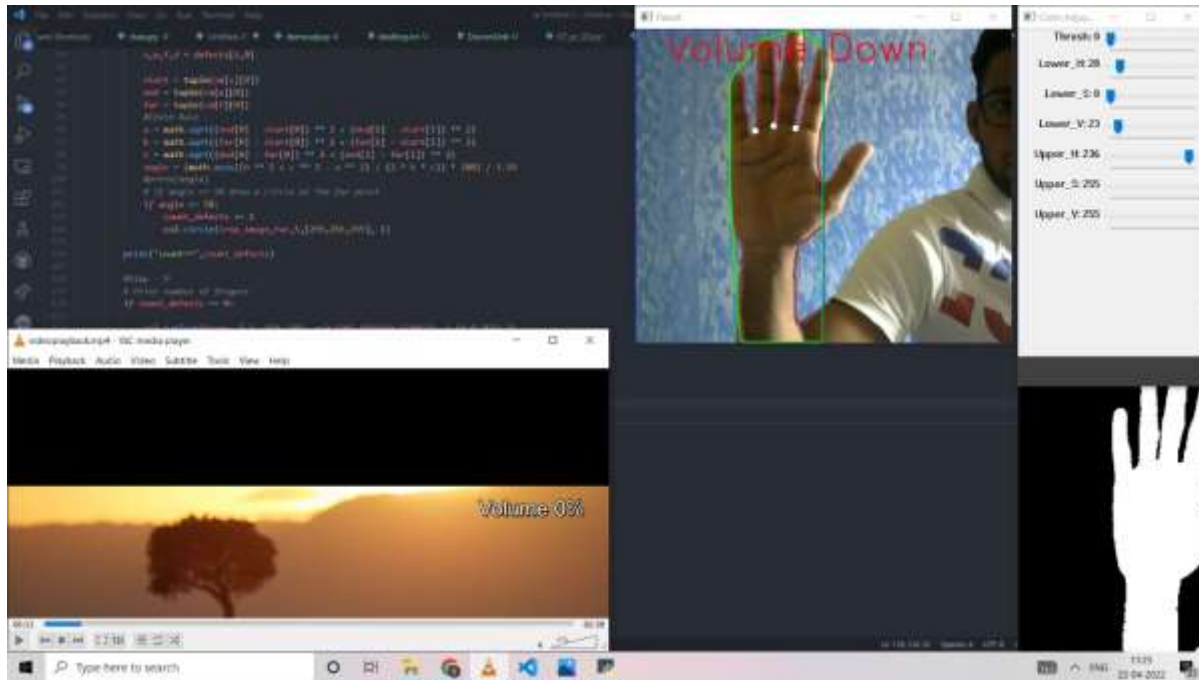
Step 9:

Bind hand gestures with keyboard keys

keyboard keys functions are bind with the gesture types for truly contact less operation.

 FLOWCHART:
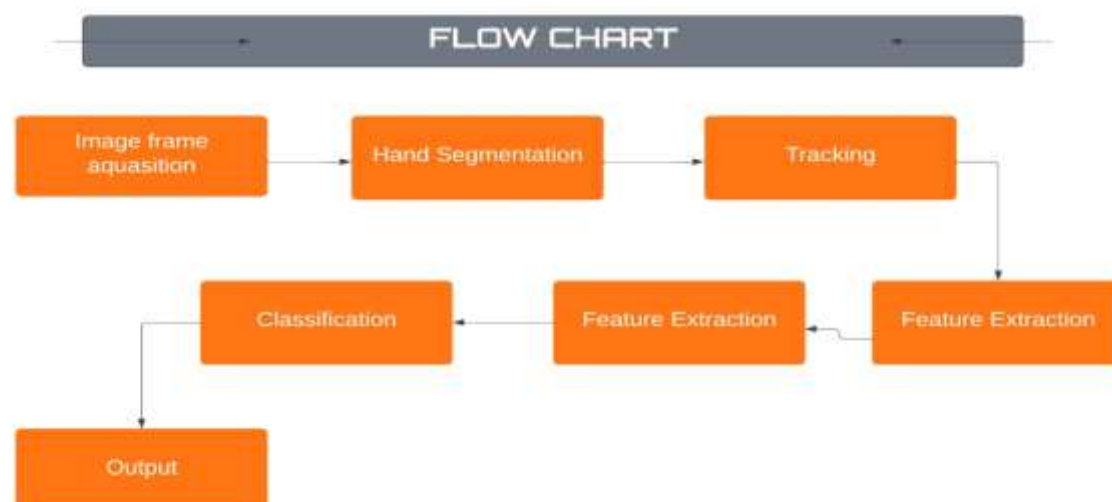
OUTPUT:

Tools Used

Hardware

Minimum requirements needed to install, and run are as followed:
i. Operating system- Windows 7,8,10
ii. Processor- dual core 2.4 GHz (i5 or i7 series Intel processor
iii. or equivalent AMD)
iv. RAM-4GB

                    OR

Television with a webcam

Software: -
1 Open CV
2 Visual Studio version (16.7)

Conclusion:

In this project we aim to help the user get better experience of using advance media player. We are doing this by using hand gestures recognition and face detection for controlling features of the media player such as playing the video and pausing when the user is not looking at the screen and controlling functions as volume up and volume down, playing nextand previous video.

References:

1.　"Controlling Multimedia Applications Using Hand Gesture Recognition" by Neha S.Rokade, Harsha R. Jadhav, Sabiha A. Pathan, Uma Annamalai.

2. "OpenCV-Python Tutorials Documentation" by Alexander Mordvintsev & Abid K.

3.　"Enhanced Look Based Media Player with Hand Gesture Recognition" by HarshadaNaroliya, Tanvi Desai, Shreeya Acharya, Varsha Sakpal.

4.　Viola and Jones, "Rapid object detection using a boosted cascade of simple features",Computer Vision and Pattern Recognition, 2001

5.　A Vision based Hand Gesture Interface for Controlling VLC Media Player, Siddharth Swarup Rautaray, Indian Institute of Information Technology, Allahabad, Anupam Agrawal,Indian Institute of Information Technology, Allahabad.