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CURSOR MOVEMENT BY HAND GESTURE

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ABSTRACT

The paper proposes hand tracking based a virtual mouse application, which can be implemented using a regular webcam. Our method is to use a camera and computer vision technology, such as image segmentation and gesture recognition, to manage mouse tasks (left and right clicking, double-clicking, and scrolling) and we show how it can perform everything current mouse devices can.

KEYWORDS: - Cursor Control(CC), Hand Gesture Recognition, Human Computer Interaction.

INTRODUCTION

Computer technology has enormously grownup over the past decade and has become a necessary a part of everyday live. the first accessory for Human Computer Interaction (HCI) is that the mouse. The mouse isn' t appropriate for HCI in some reality things, like with Human Machine Interaction. There are several researches on different ways to control the Personal Computer mouse for HCI. the foremost natural and intuitive technique for HCI, that's a viable replacement for the Personal Computer mouse is with the utilization of hand gestures.

This project is thus geared toward investigation and developing a computer management system using hand gestures. Most laptops these days are equipped with webcams, that have recently been employed in security applications utilizing face recognition. so as to harness the total potential of a digital camera, it may be used for vision based mostly CC, which might effectively eliminate the necessity for a mouse or mouse pad. The utility of a digital camera may be greatly extended to different HCI application like a signal language database or motion controller. Over the past decades there are vital advancements in HCI technologies for gaming functions, like the Microsoft Kinect and Nintendo Wii. it's a tool that acknowledges hand gestures and might be used to virtually control a computer or laptop. In short, it provides a virtual screen with that we are able to interact with the Personal Computer. however the specified hardware for creating a tool on these lines wasn't feasible, in terms of budget and timeframe provided. So, we tend to decided to make an introductory software implementation of the device which would eventually act as a virtual mouse.

LITERATURE SURVEY

Description of Related Theory

There are generally two main approaches for Hand Gesture Recognition for HCI(Human Computer Interaction),first is hardware based and second is vision based. One of the hardware based approach, proposed by Quam(1990), which uses data glove to achieve the gesture recognition. This method requires the user to wear bulky data glove which makes some gestures difficult to perform. Vision based HCI can be classified into two categories, Color marker based approach and color marker less approach. The color marker based approach requires the user to wear color markers or gloves, while the color maker less approach doesn't required that.

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Microsoft applied for patent based on Gesture and Voice recognition system:-
Microsoft engineers have applied for two patents detailing the Architecture to control the personal computer using hand gestures and voice commands. Earlier Microsoft showed controlling device by muscle movement and now they are interested in gesture and voice based system. There basic plan is to use voice, gesture, mouse or keyboard as inputs to a computer. Microsoft engineers talk about using both voice and gesture together to control various actions on the personal computer. To determine when to consider movement as input the system depends on the volume area around it. The person who plans to interact with the computer has to be within the engagement volume before the system kicks in and starts considering the movement as input. When you make a gesture the screen will recognize it and show you options on the screen like move, close, scroll and flick.

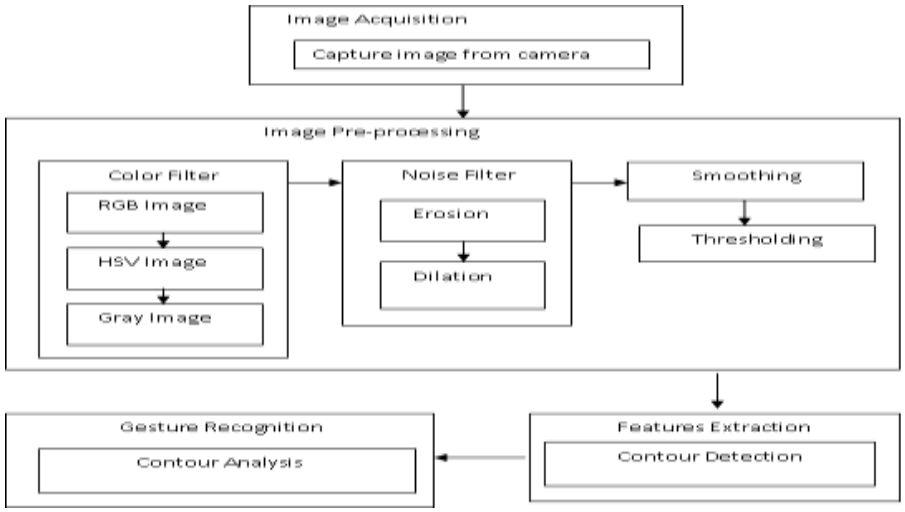
Kinect for Xbox 360 will be using gesture and voice commands:-
Kinect is a controller free gaming experience for the Xbox 360 video game platform. Microsoft says that may be later it will be supported by personal computer via Windows 8. It is based around a webcam-style add-on peripheral for the Xbox 360 console. It allows users to regulate and interact with the Xbox 360 without the need to touch a game controller through a user interface using gestures, spoken commands or given objects and pictures. The project is aimed toward broadening the Xbox 360's audience beyond its typical gamer base. Kinect is scheduled to launch worldwide starting with North America on November 4, 2010.

A Gesture-Based control for Handheld devices using Accelerometers:-
The department of Information and Communication in Korea presented this paper to demonstrate how the signals from an accelerometer can be processed to accurately recognize user gestures after applying a small movement to a handheld device. For gesture-based control to be effective in hand-held devices the overheads involved in recognizing gestures should be minimal and the gestures should be accurately recognized in real operational environments.

PROPOSED SYSTEM

The proposed system is vision based, that uses image processing techniques and inputs from a computer or laptop camera. The input frame would be captured from the digital camera and system is broken down into four stages, skin detection, hand contour extraction, hand the skin region would be detected victimization skin detection. The hand contour would then be found and used for hand trailing and gesture recognition. Hand trailing would be used to navigate the Personal Computer pointer and hand gestures would be used to perform mouse functions like right click, left click, scroll up and scroll down. The scope of the project would thus be to design a vision based CC system, which can perform the mouse function previously expressed. The following figure shows the system architecture of the proposed system.

Figure : System Architecture for Cursor Movement By Hand Gesture



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METHODOLOGY

In Methodology, the method used in each component of the system will be explained separately. The system can be broken down in four main components. This section is separated into the following subsections:

Skin Detection

Skin detection can be defined as detecting the skin color pixels in an image. It is a fundamental step a wide range of image processing application such as face detection, hand tracking and hand gesture recognition. Skin detection using color information has recently gained a lot of attention, since it is computationally effective and provides robust information against scaling, rotation and partial occlusion. Skin detection using color information can be a challenging task, since skin appearance in images is affected by illumination, camera characteristics, background and quality. so as to cut back the results of illumination, the image can be converted to a chrominance color space, which is less sensitive to illumination changes. A chrominance color space is one where the intensity information (luminance), is separated from the color information (chromaticity). In the proposed method, the HSV color space was used with the Histogram- based skin detection method. The HSV color space has three channels, Hue (H), Saturation(S) and Value (V). The H and S channels hold the color information, while the V channel holds the intensity information. The input image from the camera would be in the RGB color space, thus it would have to be converted to the HSV color space using the conversion Formulae. Using a small skin region, the color of this region is converted to a chrominance color space. A 32 bin histogram for the region is then found and is used as the histogram model. Each pixel within the image is then evaluated on how much likelihood it has to a histogram model. This method is also called Histogram Back Projection. The result would be a gray scale image (back projected image), wherever the intensity indicates the chance that the picture element may be a skin color pixel. This method is adaptive since the histogram model is obtained from the users skin, under the preset lighting condition.

Hand Contour Extraction

After getting the skin segmented binary image, following step is to perform edge detection to get the hand contour within the image. There are many edge detection strategies like, Laplacian edge detection, canny edge detection and border finding The OpenCV function cvFindContours() uses a order finding edge detection technique to search out the contours within the image. the main advantage of the border finding edge detection technique, is that each one the contours found within the image is keep in an array. this implies that we are able to analyze every contour within the image individually, to determine the hand contour. The canny and Laplacian edge detectors are able to realize the contours within the image, however don't provide us access to every individual contour. For this reason the border finding edge detection technique was used in the planned design. Within the contour extraction method, we have a tendency to have an interest in extracting the hand contour in order that form analysis can be done on that to determine the hand gesture. the little contours can be considered noise and should be ignored. the idea was made that the hand contour is that the largest contour thereby ignoring all the noise contours within the image. This assumption may be void, if the face contour is larger than the hand contour. to solve this drawback, the face region should be eliminated from the frame. the assumption was made that the hand is thesolely moving object within the image and also the face remains comparatively stationary compared to the hand. this implies that background subtraction may be applied to get rid of the stationary pixels within the image, together with the face region. this is often implemented within the OpenCV function named "BackgroundSubtractorMOG2".

Hand Tracking

The movement of the pointer was controlled by the tip of the finger. so as to spot the tip of the finger, the centre of the palm should first be found. the strategy used for locating the hand centre was adopted from and it has the advantage of being straightforward and easy to implement. The shortest distance between every point inside the inscribed circle to the contour was measured and the point with the largest distance was recorded as the centre. the space between the center of hand and the hand contour was taken as the radius of the hand. The hand centre was calculated for every consecutive frame and using the hand centre, the tip of the finger would

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be known and used for hand tracking. the strategy used for identifying the index and also the different fingers are described within the following section.

Gesture Recognition

The gesture recognition technique used in the proposed design is a combination of two methods, proposed by Yeo and also the method proposed by Balazs. The convexity defects for the hand contour must first be calculated. The convexity defects for the hand contour was calculated using the OpenCV inbuilt function "cvConvexityDefects". The parameters of the convexity defect (start point, end point and depth point) are keep in a sequence of arrays. when the convexity defects are obtained, there are two main steps for gesture recognition:

1. Finger tip identification
2. Number of fingers.

Cursor Control

Once the hand gestures are recognized, it'll be an easy matter of mapping totally different hand gestures to specific mouse functions. It seems that controlling the Personal Computer cursor, within the C/C++ programming language is comparatively simple. By including the User.lib library into the program, the "SendInput" function can allow control of the Personal Computer cursor.

CONCLUSION

The system control the mouse pointer and implement its operation using a real time camera. The goal of this project is to form a system which will acknowledge the hand gestures and control the computer/laptop in line with those gestures. The project will profit the mobile systems where using pointing devices like mouse is tough. Implementation of all the mouse tasks like left and right clicking, double clicking and beginning the applications using the gestures like notepad, paint, command prompt etc. Before actual implementing gesture comparison algorithms, skin detection and hand segmentation from stored frames need to be done. The project is additionally developed in such the way that the user, new to the system can simply have to install the set up and not run the full project.

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It gives us nice pleasure in presenting this project report titled "Cursor Movement By Hand Gesture" and we have a tendency to want to precise our huge feeling to the those who provided valuable information and support within the completion of this project. Their guidance and motivation has helped in creating this project a nice success. Thus, we specific deep sense of feeling and satisfaction. We are indebted to our inspiring H.O.D Prof. Kanchan Dabre and Project Guide, Prof. Leena Raut, who has extended all valuable steerage, help and constant encouragement through numerous tough stages for the development of the project. We specific our sincere feeling to our respected Principal, Dr. J.B.Patil for encouragement and facilities provided to us. Last but not the least we'd prefer to convey all direct and indirect identities of the college with whom we have a tendency to took the strides for this successful project.

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