VIRTUAL PAINT APPLICATION BY HAND GESTURE RECOGNITION SYSTEM

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Abstract— **Gesture recognition is an emerging technology field. We create a natural user interface for interacting with MS-PAINT on windows machine.input will be be hand gestures of user which will be processed using camera for issuing a command to MS PAINT application. The paint application becomes virtual because the drawing happens in air. The virtual paint screen is made by help of UI. Web camera is used to extract the gestures of hand in order to achieve fast and stable gesture recognition in real time without any distance restrictions.**

Index Terms— **Gesture, web camera, Hand, Algorithm , Sense, Paint ,Human ,control etc,**

I. INTRODUCTION

Nowadays, the interaction between people and the machines is mainly completed through the mouse, keyboard, remote control, touch screen, and other direct contact manner, while the communication between people is basically achieved through more natural and intuitive non-contact manner, such as sound and physical movements. The communication by natural and intuitive non-contact manner is usually considered to be flexible and efficient; many researchers have thus tried efforts to make the machine identify other intentions and information through the non-contact manner like people, such as sound, facial expressions, physical movements, and gestures. Among them, gesture is the most important part of human language, and its Gestures play very important roles in human communication also. They are considered as the most easy means of communication between humans and computers gesture recognition has wide applications including sign language recognition, robotics and so on .gesture recognition can be simply categorized into two methods based on devices which are used to capture gestures: wearable sensor-based methods and optical camera-based methods. The example of device used in the wearable sensor based method is the data glove which is capable of exactly capturing the motion parameters of the user's hands and it can achieve high recognition performance. This devices used in wearable sensor method affect the naturalness of the user interaction and they are also expensive. In optical camera based method, optical cameras are used which record a set of images to capture gesture movements from a distance. This optical cameras recognize gestures by analyzing visual information extracted from the captured images so they are also called vision-based methods. optical cameras are easy to use and also inexpensive but the quality of the captured images is sensitive to lighting conditions and clutter backgrounds so it is difficult to detect and track the hands properly.

II. LITERATURE SURVEY

In the past decades, gestures were usually identified and judged by wearing data gloves to obtain the angles and positions of each joint in the gestureSeveral papers and projects have targeted the issue of hand gesture recognition. Francis et al[1]However, it is difficult to use widely due to the cost and inconvenience of wearing the sensor. In contrast, the non contact visual inspection methods have the advantage of low cost and comfort for the human body, which are the currently popular gesture recognition methods. Chakraborty proposed the skin colour models utilizing image pixel distribution in a given colour space, which can significantly improve the detection accuracy in the presence of varying illumination conditions. However, it was difficult to achieve the desired results using the model-based methods because of the light sensitivity during the imaging process. The algorithm-based non-contact visual inspection methods were also used to conduct the gesture recognition, such as the hidden Markov model the particle filter, and Heer features AdaBoost learning algorithm; however, it is difficult to execute real time due to the complicated algorithms. The above results cannot acquire gestures efficiently in real time since only the insufficient 2D image information was used. Therefore, it is inevitable that gesture recognition by 2D image is replaced by 3D with depth information. In general, 3D information can be acquired by binocular cameras, Kinect sensor, Leap Motion and other devices. Those devices can be usually utilized to obtain depth information by spatial relationship of different direction or infrared reflection, which can conveniently acquire non-contact image for recognition and classification instead of wearing the complicated equipment. To facilitate this process many gesture recognition applications resort to the use of uniquely coloured gloves or markers on hands or fingers [2].But computer vision is a rapidly growing field, partly as a result of both cheaper and more capable cameras, partly because of affordable processing power, and partly because vision algorithms are starting to mature. By using Hand gestures user can communicate more information in less time period. So for improving the interface

between users and computers human computers interaction (HCI) technology has great utilization [3]. The OpenCV itself has played a role in the growth of computer vision by enabling thousands of people to do more productive work in vision. With its focus on real-time vision. It gives reader a boost in implementing computer vision and machine learning algorithms by providing many working coded examples to start from. OpenCV, that allows the reader to do interesting and fun things rapidly in computer vision. It gives an intuitive understanding as to how the algorithms work, which serves to guide the reader in designing and debugging vision applications and also to make the formal descriptions of computer vision and machine learning algorithms in other texts easier to comprehend and remember. The gesture recognition methods such as template matching or finite-state machines were usually used, where high classification rates could also be obtained. However, only specific gestures can be recognized by the above methods. Recent trends of Computer vision techniques are easy, natural and less cost comparing[4] The convex hull detection algorithm recognizes gestures with the finger hull and can identify each fingertip position of the human hand. It can get more gesture information and have potential advantage.

III. TECHNOLOGY USED

A. Open CV

OpenCV (Open Source Computer Vision Library) is a library which mainly focuses at real-time computer vision. It is free for both academic and commercial use. It has C++, C, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android. OpenCV was designed for computational efficiency and with a strong focus on real-time applications. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. It provides basic data structures for image processing with efficient optimizations.

B. C++

C++ is is a general purpose programming language.

It is easy to leran and widely used language.it is object oriented language and includes classes, inheritance, polymorphism, data abstraction and encapsulation. It is a portable language and is often used for multi-device, multi-platform app development.it has a rich function library.

It allows exception handling, and function overloading

It is a powerful, efficient and fast language. It finds a wide range of applications – from GUI applications to 3D graphics for games to real-time mathematic

IV. PROPOSE METHODOLOGY

Our project aims to create a virtual paint application where the drawing happens in air as the gestures are recognized by the system. a real time image which is coloured when captured by web camera.this colored image consists of many objects

which are needless and will not be required for detection of hand image.

After background substraction the coloured image we get from web camera gets converted to black and white image where background is in black colour and white is image .

We find the contour with maximum area and then after checking if a ceratin value is greater than area we get convex hull.in countour we get information about boundary pixels and in convex hull we get information about the lines which connects the fingers that will not exceed the boundary pixel means contour . first Find the Convexity defects between adjacent fingers of hand and then it counts the number of fingers.

We create a virtual paint application same as MS Paint by using user interface libraries then this paint application is controlled by gestures. Gesture are recognized and then action is performed based on that gesture.

A. BALL TRACKING:

We will create a glove with ping pong ball attached to it.we map the motion of ball to predefined gestures .first the video capture starts then image is converted to from RGB space to HSV space . HSV(hue saturation value) space gives us better results then doing color based segmentation.

Image is seprated into its 3 component images(i.e H S V each of which is a one dimensional image or intensity image).we use a condition for intensity values in the image and get a Binary image. i.e we have taken H intensity image and our ball is of red color .Then in the image we will find that the values of the pixel where the ball is present , lies in a specific range. so we define a condition for every pixel : if (pixel > threshold_min & pixel < threshold_max)= pixel of o/p image is 1 else it is zero.

After doing this for H component,we do this for S & v component.Now we have three binary images(only black and only white) . Which has the region of ball as 1's and every thing else which has the intensity values greater(less) than threshold .The pixels that do not pass this conditions will be zero.We then combine all the above three Binary images (i.e we AND them all). All the pixels that are white in the three images will be white in the output of this step.So there will be regions too which will have 1's but with lower areas and of random shapes.

NOW WE USE HOUGHS TRANSFORM ON THE OUTPUT OF LAST OPERATION TO FIND THE REGIONS WHICH ARE CIRCULAR IN SHAPE.

THEN WE DRAW THE MARKER ON THE DETECTED CIRCLES AS WELL AS DISPLAY THE CENTER AND RADIUS OF THE CIRCLES.LIKE THIS THE MOTION OF BALL IS TRACKED.

B. Background substraction

Background substraction (BS) is a common and widely used technique for generating a foreground mask (namely, a binary image containing the pixels belonging to moving objects in the scene) by using static cameras. As the name

suggests, BS calculates the foreground mask performing a subtraction between the current frame and a background model, containing the static part of the scene or, more in general, everything that can be considered as background given the characteristics of the observed scene.

C. Hand segmentation

hand segmentation is used to extract the hand image from the background. There are several methods for segmentation. The important step in segmentation is transformation and thresholding. Segmentation partitions an image into distinct regions containing each pixel with similar attributes. To be meaningful and useful for image analysis and interpretation, the regions should strongly relate to depicted objects or features of interest. In this algorithm, the BGR image taken by a camera is considered as input to the algorithm. The BGR image is transformed into gray scale image. The gray scale image is blurred to get the exact boundary. The blurred image is threshold to the particular value.

D. Hand detection

It includes of contours,covex hull,convexity defects and finger count

In Contours are the curves joining all the continuous points along the boundary, having same color or intensity. The contours are a useful tool for shape analysis and object detection and recognition. The contour is drawn along the boundary of the hand image which is found after thresholding.

In covex hull is the set of continuous points in the Euclidean space that is connected to contours. Convex hull is drawn around the contour. Contour points within the convex hull. Convex hull works as an envelope around the hand.

In convexity defect,When the convex hull is drawn around the contour of the hand, it fits set of contour points of the hand within the hull. It uses minimum points to form the hull to include all contour points inside or on the hull and maintain the property of convexity. This causes the formation of defects in the convex hull with respect to the contour drawn on hand.

E. Gesture controlling the paint application

Gesture recognition lets you control your virtual paint application without touching a remote control or even the screen of your laptop.the ball on glove is detected by a camera and an action occurs.ie for eg,if we move the hand to our right side then a rectangle will be drawn or if we move our hand to left side then a circle will be drawn.

Like this the action will happen based on the gestures we do.

V. RESULT

In this paper, web camera used as data acquisition device and the experimental tests are conducted by visual studio 2010 platform using the C++ program open CV is used for image processing such as image data and contour points seeking according to above analysis, there are two steps in experimental tests. Three point alignment algorithm is used for finger detection the Find Contours algorithm is utilized to extract hand gesture contour from the ROI region The Graham Scan algorithm is used to calculate the convex hull of the detected hand clusters and then gestures are recognized by passing them through set of classifier.

Output:
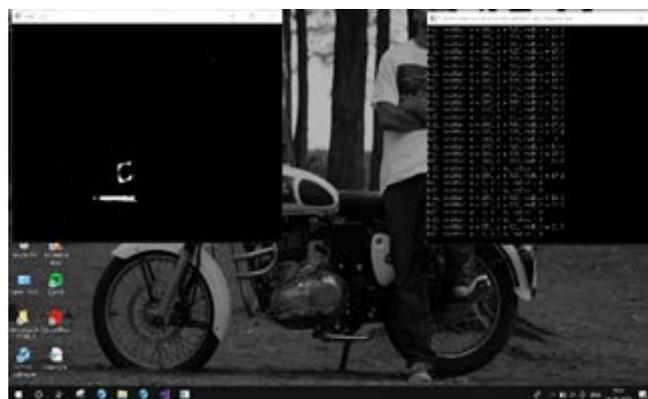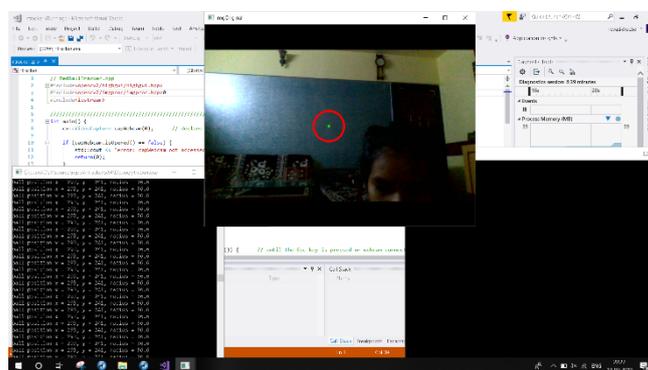
VI. CONCLUSION

We propose a solution for hand recognition system for virtual paint application. Generally, gestures could not be recognized by far distance but we proposed a system when HGR system based on 1Iicrosoft Kinect for Xbox is introduced. The system is motivated by the importance of real-time communication under It is capable of working in the dark, invariant to signer's skin color, clothing, and background lighting conditions, and it can be easily transplanted to other applications. The system is robust against clutter in the

background.. In future.it is expected that more applications with excellent recognition results will be developed.

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