Dynamic Hand Gesture Recognition and Detection for Real Time Using Human Computer Interaction

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Abstract: Dynamic hand gesture technology has been growing rapidly in this following couple of years. In earlier days people using input/output device like keyboard and mouse to interact with the computer. So we are implementing gesture technology to make use of human body gesture to interact with the computer more quickly and human friendly manner. Hence thereby we propose this system "Eyes On YOU". The experiment is done by capturing an image form the video feed. The object which placed on hand is extracted from the background. The movement of the object is traced by using webcam. This path of object is employed to blurring, grayscaling, HSV model, blob detection. After Processing on the images by using pattern matching with the database stored images which result in specified gesture made. This gesture is used to perform interaction that involves addition of new fonts, controlling media (music player, slide show, photo viewer etc) and operations on PC.

Keywords: Hand Gesture, Real Time, Recognition, Quickly, Tracking, Human Friendly.

I. INTRODUCTION

Hand gesture is an effective way of communication. Human-Human communication is generally done by using hand gesture. It is most natural thing which is performing automatically when communicates. Lots of research has been on Hand Gesture Recognition Technology. In earlier days people using Keyboard and mouse to interact with the computer. But because of time limitations and increasing speed of life there will be limitations on using these devices so that hand gesture technology is being need for future of computer. So by using this technology a person can operate computer without touching it.

Hand gesture is considered into two types:

1. Static Hand Gesture: Static hand gestures are predefined and fixed gesture. Static gesture deals with one frame at a time. The information used for static gesture may include template or posture. Well known example of these is Indian sign language.
2. Dynamic Hand Gesture: Dynamic hand gestures are the real time gesture. It is also called motion-based gesture as it is sequence of images. This sequence containing large number of frames which is used for extracting motion information.
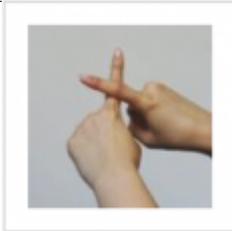
Fig. 1   Fig. 2   Fig. 3   Fig. 4

Generally, Hand Gesture Recognition technology is implemented using "Data Gloves" or "Color pins" or any object which is placed on our hand. To detect a hand gesture we need camera device. Webcam is an easily available device and today every laptop has an integrated webcam along with it. In our project, we will implement a hand gesture recognizer which is capable of detecting a moving hand with its gesture in webcam frames. The main purpose of our project is to overcome the typing languages other than English. Suppose when person wants to type in other language like "Marathi", "Bengali", "Japanese", so for doing that it requires special training this problem can be overcome by hand gesture. If the user is able to write his language on paper, so using this project he can easily write in computer (Character Set). Moreover, we also provide Human Computer Interaction quicker and easy through hand gesture for controlling applications i.e. Window Media Player, Changing slides in ppt. As the set of materials above, recognition of hand gestures and postures is a satisfactory way to first steps of solutions instead of using keyboards, mouse or joysticks. For recognition of hand gesture we require to access webcam thorough our application so for that purpose we are using jmyron. JMyron is a library which provide interface of webcam. So by using this webcam video feed of movements of hand is captured. An image from this video feed is extracted. Different algorithms are performing on these images.

II. SYSTEM OBJECTIVES

Our aim involves gestures with a high degree of freedom; which may require detection of fingers and articulated hands. It provides user friendly interface for common or ordinary people to for Human-computer interaction.

The main objective of the project is to design, develop and validate the concept of image processing and hand gesture recognition for efficient application/ service/ content provisioning for developing new fonts and controlling windows applications. In take to achieve this main objective, the project will conduct work addressing the various technical challenges, which closely relate to the detailed objectives of the project. To titivate on application provision scenarios, to derive requirements and technical challenges that should be addressed by the system, and to provide validation criteria (in terms of higher resource utilization, "green" footprint, and lower costs) that will drive the adoption of using hand gesture using self-learning approach.

III. LITERATURE SURVEY

Alongside are different tools for Beckon acceptance, based on approaches ranging from statistical modelling, computer vision and pattern recognition. Gesture recognition is mainly accomplished by combining both Image-processing techniques such as analysis and detection of shape, texture, color motion, optical flow, image enhancement, segmentation and contour modelling , followed by machine learning and pattern recognition techniques, involving feature extraction, object detection, clustering, and classification, which have been successfully used for Odd gesture recognition systems. Couple incentives can be found in the literature to suggest the use of gesture recognition pandect as a user-input mechanism. Bizarre of the gesture recognition systems use either static or dynamic gesture representations and there are very few gesture recognition system developed by considering both the spatial (i.e. Shape) as well as temporal changes. Many hand segmentation techniques make the assumption that the hand is the closest object to the camera. With this assumption, thresholding or region growing techniques can be used to extract hand regions. In rotation researchers have proposed to use skin color along with depth data for

hand segmentation. But in our system we use object which is placed on hand to accurate tacking of path. Repression the hand region is segmented out, one can use the hand silhouette as a shape descriptor. Alternative approach is to divide the hand region into cells and use the cell occupancy information as features. In everywhere sampled hand image with dimensionality reduction is used as features.

<div align="center">IV. DESIGN AND IMPLEMENTATION</div>

Our proposed system has following flow as shown in Fig 5. It does flow through following path as follows:

1. Video Capture & RGB HSV: In this step we take live feed from webcam and static image is taken from feed. On these images we apply following blur and grayscale algorithm. After applying these steps we perform RGB HSV model to find exact input colour for further processing.

2. Thresholding: In this step the graysacle image is converted into binary image as thresholding is also known as segmentation of image.

3. Blob Detection COG: This step is important step in a whole process as the center of selected image is selected through which gesture path or pattern /path is done and recognized. It is basically used to detect points that differ in properties like brightness or color compared to surrounding in image.

4. Template Matching/Pattern Matching: In this we perform the check with the database stored image and gesture made. If gesture found is true in database following activity or process is performed in accordance to it. The output character is produced with speech sound when recognized.
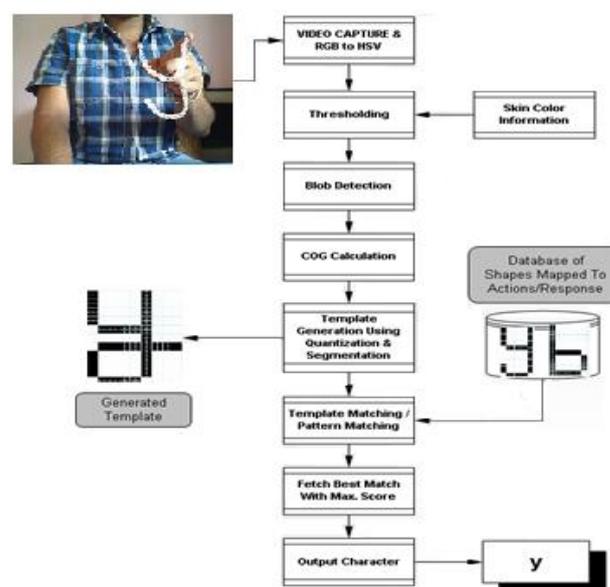

Fig. 5 Process Flow

Thus, the system looks as following when following all above are implemented. The system includes a computer with integrated web camera and speaker. As configuration, the computer is an Intel i7 processor Core 2.0GHz CPU PC with 4GB memory. The system contains a tab for select a point which will use for path tracking. Once point is selected gesture is made and it compared with trajectory stored in database. This controls the following programs as shown in "Eyes on you".
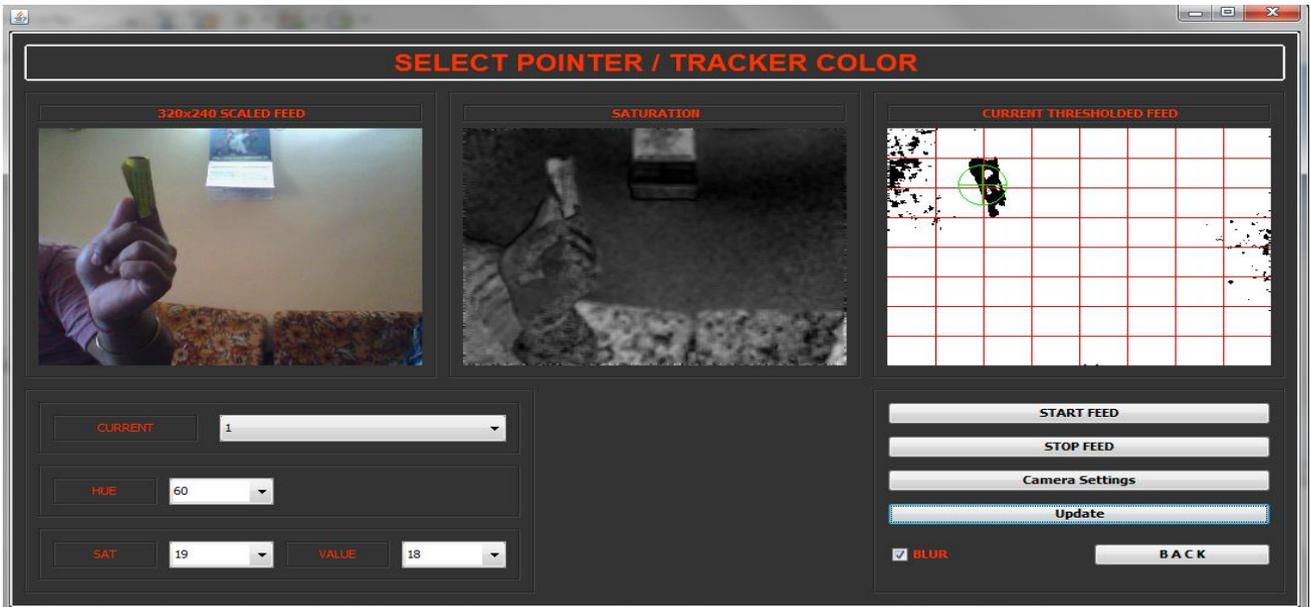
Fig. 6

Fig. 7

Fig. 8

V. ALGORITHMS

1. Blurring and GrayScale Algorithm: Blurring [5][6] means each pixel in the source image gets spread over and mix into surrounding pixel. Blurring an image which reduces sharpening effect which makes detection of object more accurate. After blurring we perform gray scaling it involves making the blurred image into monochromatic i.e. image with gray shade. These images are distinct from black-white images.

Steps:

1. Traverse entire image.

2. Read individual pixel value (24 bit).

3. Split colour value R,G, and B 8 bit values.

4. Calculate the grayscale component (8-bit) for given R, G and B pixels using a conversion formula.

5. Compose a 24-bit pixel value from 8-bit grayscale value.

6. Store the new value at same location in output image.

7. Calculate the RGB average of surrounding pixels and assign this average value to it.

8. Repeat the above step to each pixel.

9. Store the new value at same location in output image.

2. Thresholding Algorithm: It is the simplest method of image segmentation which is used to generate binary images.In these process the individual pixels are marked as object pixels if their value is greater than some threshold value otherwise these pixels are background pixel. Binary images [5][6] contain values "1" and "0". So value of object pixel is given to "1" and value of background pixel is given "0" with accordance to threshold value.

 Steps:

1. Traverse through complete input image array.

2. Read individual grayscale pixel value (24-bit).

3. Calculate the binary output pixel value (black or white) based on current threshold value.

4. Store the recent value of pixel at same location in output image.

 3. Blob Detection Algorithm: Blob detection [5][6] is used to detecting points or regions in the image which differentiate from surrounding It is used to obtain information about regions which is used further.

 Steps:

1. Filter with Gaussian at different scales this is done by just repeatedly filtering with the same Gaussian.

2. Subtract image filtered at one scale with image filtered at previous scale.

3. Look for local extreme

   – A pixel is bigger (smaller) than all eight neighbors, and all nine neighboring pixels neighboring scales.

4. More scales can produce greater accuracy and also more expense.

5. We are taking a derivative, so need to be careful about denominator.

– It turns out that we should increase scale multiplicatively. Sigma, k*sigma, k*k*sigma

– Sigma = 1.6 produces reasonable results.

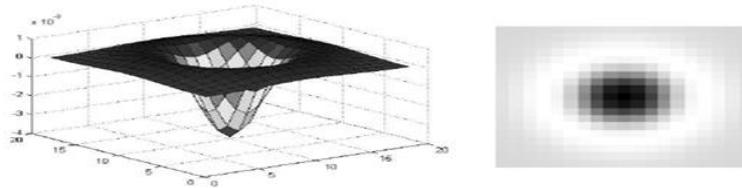– k = cuberoot (2). (These values are heuristic).

Fig. 6

$$\nabla^2 g = \frac{\partial^2 g}{\partial x^2} + \frac{\partial^2 g}{\partial y^2}$$

VI. CONCLUSION

In this paper we have implemented such a solution for human or users to make their work so easy. Our paper provides the user to create on run time or dynamically range of fonts to write in notepad with an extra facility in any language i.e. Japanese, Gujarati, Tamil, Kannda etc. It also added a controlling many window based application such as Window Media Player for controlling tracks, sound, etc. Moreover changing photos in photo viewer and slides in PowerPoint which brought human a easiness at work. Another important facility it provides is speech recognition of dynamically letter made gesture. Hence therefore in future we think or elaborate that such growth/improvement in hand gesture will lead technology to such an unimagined state of easiness to human interaction with computer or at other end on other devices in future.

References

1. Nianjun Liu, Brain C. Lovell, Peter J. kootsookos, "Evalation of HMM training algorithms for letter hand gesture recognition",Intelligent Real-Time Imaging and Sensing group (IRIS) School of Information Technology & Electrical Engineering .The University of Queensland, Brisbane,Austrialia 4072

2. Sheng- Yu Peng, kanoksakWattanachote, Hwei-Jen Lin, Kuan-Ching Li, "A Real Time Hand Gesture Recognition System for daily information retrieval from internet",978-0-7695-4493-9/11$26.00,2011 IEEE.

3. Rajesh Radhakrishnan, "Real Time Dyanamic Hand Shape Gesture Controller", University of Texas AtArilington, Dec. 2011

4. M.K. Bhuyan, D. Ghosh and P.K. Bora, "Feature Extraction from 2D Gesture Trajectory in Dynamic Hand Gesture Recognition" Department of Electronics and Communication Engineering Indian Institute of Technolgy Guwahati,India 781039

5. www.google.com

6. www.ieee.org