Contour Analysis Based Gesture Control PC Operation

Rupali N. Patil, Mansi M. Kambli

Abstract*: *There are a lot of home appliances and personal computers around us. However, few of the user interfaces are designed for user basic access. In this study, as an interface focusing on the ease of use, we develop a system to control personal computer by applying the natural behavior of human. This paper introduces a system that allows a user to carry out computer operation using a web camera. This system consist of four stages viz image acquisition, image pre-processing, feature extraction and gesture recognition. In the first stage , the input image is capture with the help of a camera. In the second phase, the skin color of hand region is distinguished using HSV color space and morphological operations like erosion, dilation, smoothing and thresholding. In Feature extraction stage, contours of hand image are identified. Lastly, Gesture recognition stage contains recognized hand gestures suing contour analysis. The Open CV is used to perform our research.

Index Terms: Hand Gesture recognition, contour analysis, HSV color space, skin detection, Open CV.

I. INTRODUCTION

In recent years, computer vision development has great growth and our everyday life tasks are incomplete without using computers. The major input devices like Keyboard and mouse are used to communicate with computers. Among the various interaction techniques use of hands as an input is an interesting method for building natural Human Computer Interaction. 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.[1]. Gesture operation can be considered as an easy-to understand and use method to operate the PC without using traditional mouse or keyboard.. Therefore, these hand gestures are easy to understand and easy to use for everyone. Moreover, they are also intuitive gestures that are able to operate naturally. By associating these hand gestures with a shortcut operation on the PC, it is possible to perform similar operations even among multiple applications using hand gestures.[2]

Human hand gestures provide the natural and effective mode of non-verbal communication with the computer interface. Hand gestures are the meaningful body motions that are movements of hands, arms or fingers. Hand gesture identification ranges from the static gesture with the complex background or dynamic gestures that express the human feeling and communicate with computer or humans. The hand is directly use as the input to the machine, for the communication purpose of gesture identification there is no need of an intermediate medium. Gesture recognition is the process of identifying the gestures by the computer which is made by the user. There are mainly two methods of hand gesture recognition. One is static hand gesture and another is dynamic hand gesture. Static hand gesture method could only recognize the predefined gesture. Whereas in the dynamic hand gesture it could not be like that, it could clear the meaning of gesture by its movement. Dynamic gesture is more practical as compared to static gesture, even though it has more difficulties.[3]

II. BASIC THEORETICAL DESCRIPTION

A generalized block diagram of gesture recognition system is shown in fig 1.

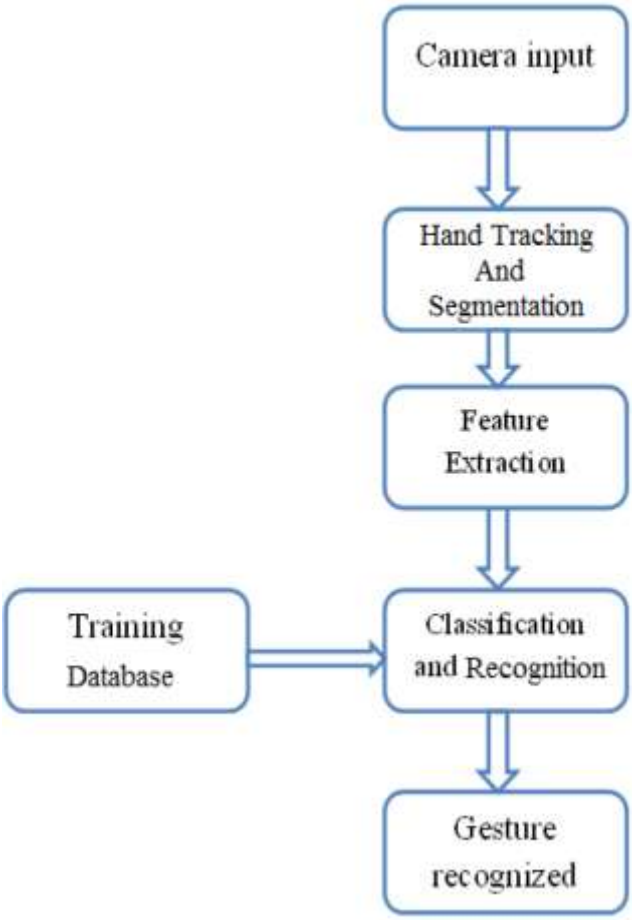


Fig 1: Generalised Block Diagram

Revised Version Manuscript Received on May 10, 2017.

Rupali N. Patil, Lecturer, Department of Computer Engineering, K. J. Somaiya Polytechnic, Vidyavihar (East), India. E-mail: rnpatil@somaiya.edu

Mansi M. Kambli, Department of Computer Engineering, K. J. Somaiya Polytechnic, Vidyavihar (East), India.

Image acquisition is the primary step in gesture recognition system. A set of image frames are captured by a cheaper camera. Segmentation of hand is the required to track the movement of the hand. Segmentation partition the image into its objects and region of interest from the virtual environment. Autonomous segmentation is one to the most difficult task in digital image processing. Hand tracking is a high resolution technique that is employed to know the consecutive position of hand. After the successfully hand tracking and segmentation is done there is the need to extract the important feature points in that segmented image. After obtaining the extracted features of hand, classifier and recognizer plays a major role in gesture recognition system. Classification and Recognition of the system where input features are compared with features of the trained database, which results in gesture recognition.

III. DESIGN

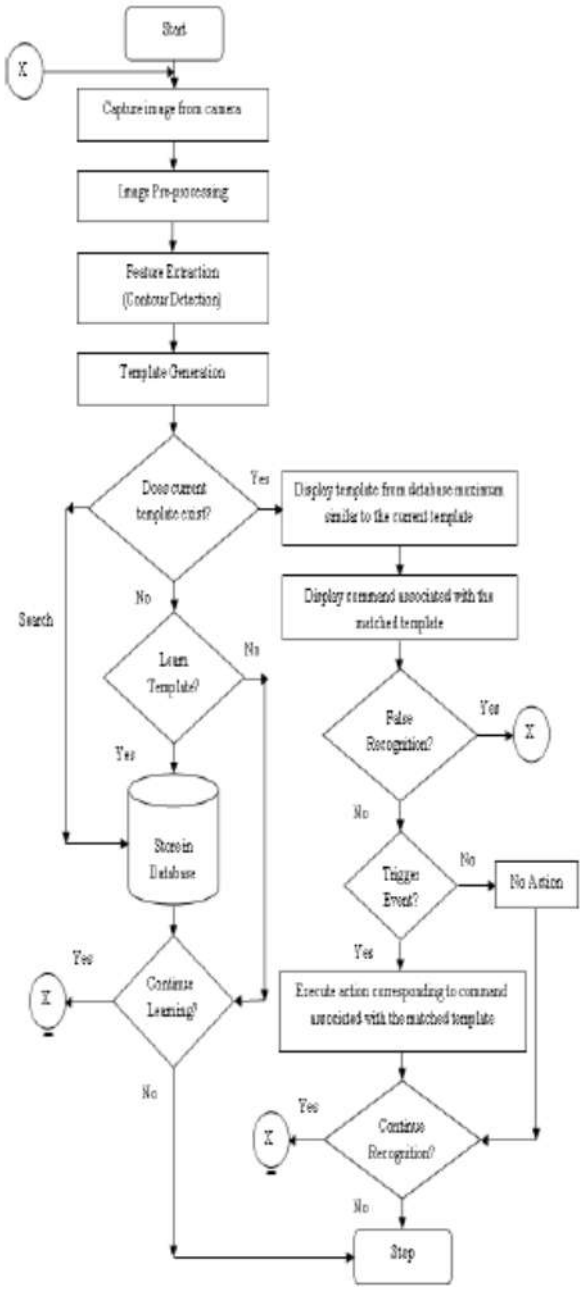
Step 1: User takes a picture of the hand to be tested either through the cell phone camera or from the Internet.
Step 2: The image is converted into gray scale and smoothed using a Gaussian kernel.
Step 3: Convert the gray scale image into a binary image. Set a threshold so that the pixels that are above a certain intensity are set to white and those below are set to black.
Step 4: Find contours, then remove noise and smooth the edges to smooth big contours and melt numerous small contours.
Step 5: The largest contour is selected as a target.
Step 6: The angles of inclination of the contours and also the location of the center of the contour with respect to the center of the image are obtained through the bounding box information around the contour.
Step 7: The hand contours inside the bounding boxes are extracted and rotated in such a way that the bounding boxes are made upright (inclination angle is 0) so that matching becomes easy. Step 8: Both the images are scaled so that their widths are set to the greater of the two widths and their heights are set to the greater of the two heights. This is done so that the images are the same size.
Step 9: The distance transform of both the query image and the candidate images are computed and the best match is returned.

IV. CONSTRAINTS

1. The picture of the hand must be taken against a dark background
2. The program recognizes a limited number of gestures as long as there are gestures similar to them in the database.
3. We must have each gesture with at least four orientations at 90 degrees each to return the best match.

V. METHODOLOGY

The Flowchart of implemented algorithm is shown in Figure 2.



. **Fig2. Flowchart of implemented algorithm**

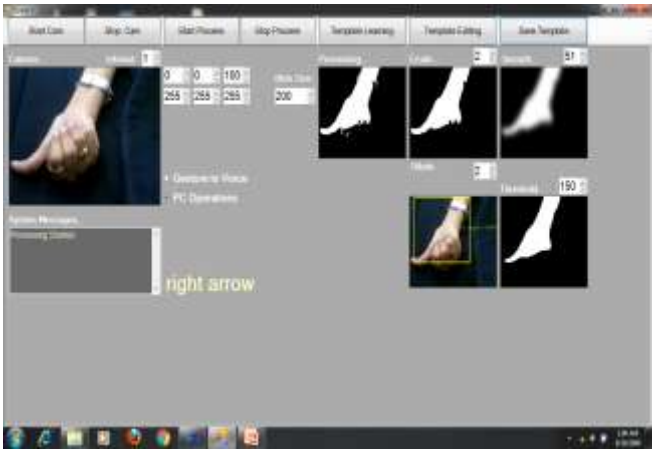
The algorithm for hand gesture recognition system is given below, where the input will be hand gesture and the output will be execution of action assigned to a particular hand gesture.
Input: Hand Gesture
Output: Assigned Action Executed
Step 1: Capture the input image from camera.
Step 2: Convert input RGB image into HSV image.
Step 3: Convert HSV image into gray image.
Step 4: Perform morphological operations such as erosion and dilation to reduce noise followed by smoothing and thresholding of image.
Step 5: Extract contours of hand image.
Step 6: Store contours as contour templates.
Step 7: Gesture is recognized using contour analysis by comparing ACF and ICF values.

Step 8: For each recognized gesture, different events are linked to perform various events by the computer.

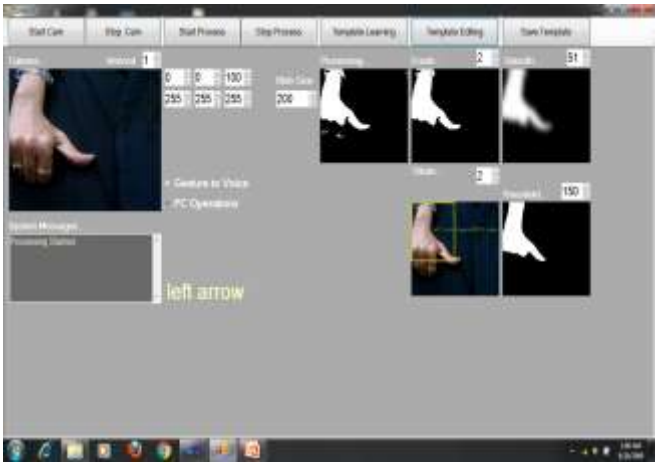
VI. RESULT

Open the ppt by double click gesture

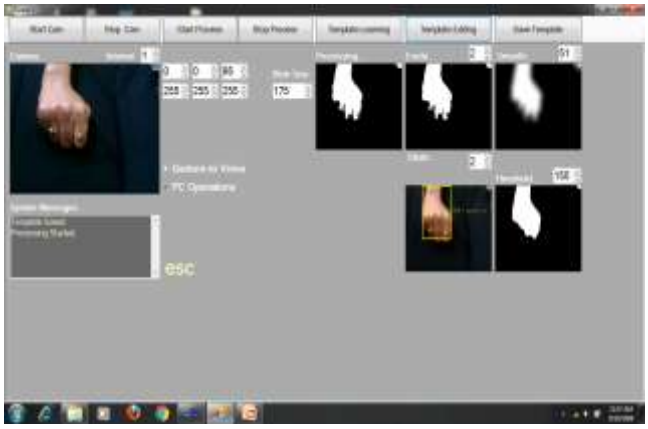
Run the ppt by thumb gesture



Using right thumb gesture forward the ppt



Using left thumb gesture backward the ppt



Using fest gesture close the ppt

VII. CONCLUSION

This paper describes a system that controls computer applications with the help of hand gestures. The proposed approach offers a unique method to identify hand gesture using contour analysis.

The current system gives best result in a plain black background. Thus the current system puts lots of constraints on the user for successful working. The future work includes reducing these constraints so that the system is usable in more scenarios

ACKNOWLEDGMENT

I thank to my guide Mansi Kambli for their guidance and suggestions during the preparation of this technical paper. I thank my beloved son Athansh , husband and parents, for their cooperation and support throughout. Finally I would like to thank all who contributed and helped me in this project.

REFERENCES

1. Ruchi Manish Gurav, Premanand K. Kadbe “Real time Finger Tracking and Contour Detection for Gesture Recognition using Open CV” , 2015 International Conference on Industrial Instrumentation and Control (ICIC) College of Engineering Pune, India. May 28-30, 2015.
2. Kaoru Yamagishi, Lei Jing*, Zixue Cheng*, “A System for Controlling Personal Computers by Hand Gestures using a Wireless Sensor Device”, 978-1-4799-4476-7/14/$31.00 ©2014 IEEE.
3. Jayesh S. Sonkusare, Nilkanth. B. Chopade, Ravindra Sor, Sunil.L. Tade,” A Review on Hand Gesture Recognition System”, 2015 International Conference on Computing Communication Control and Automation.
4. Hsiang-Yueh. Lai , Han-Jheng. Lai, “Real-Time Dynamic Hand Gesture Recognition”, 2014 International Symposium on Computer, Consumer and Control.
5. Feng-Sheng Chen, Chih-Ming Fu, Chung-Lin Huang, “Hand gesture recognition using a real-time tracking method and hidden Markov model”, F.-S. Chen et al. / Image and Vision Computing 21 (2003) 745–758.
6. Thittaporn Ganokratanaa and Suree Pumrin ,” The Vision-Based Hand Gesture Recognition Using Blob Analysis”, 78-1-5090-5210-3/17/$31.00 ©2017 IEEE.