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Human Computer Interaction System

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Abstract: *A real time dynamic hand gesture recognition system is performed in this paper. Vision-based hand gesture recognition enabling computers to understand hand gestures as humans do is an important technology for intelligent human computer interaction. In this paper, a recognition system for dynamic hand gestures is proposed. In dynamic hand gesture recognition, hand is segmented by using background subtraction method. The images are trained using neural network.The accuracy is to be calculated based on confusion matrix is 96%.*

Index Terms: *Neural network, background subtraction, Feature extraction.*

I. Introduction

Gesture recognition is a vital space of analysis inthe field of computer vision. Gesture recognition pertains to recognizing meaning expressions of motion by a person's, involving the hands, arms, face, heador body with the intention of conveying meaning full information or interacting with the environment. In addition to the theoretical aspects, any practical implementation of gesture recognition typically requires the use of different imaging and tracking devices or

Gadgets .Gestures can be static (the user assumes a certain pose) or dynamic (with prestroke, stroke, and poststroke phases). Direct use of the hand as an input device is an attractive method for providing natural human computer interaction (HCI)(Pavlovicet al., 1997). Vision-based techniques, while overcoming this constraint, need to contend with other problems related to occlusion of parts of the user's

body. Vision-based devices can handle properties such as texture and color for analyzing a gesture ,while tracking devices cannot. Vision-based techniques can also vary among themselves in: the number of cameras used, their speed and latency, the structure of environment (restrictions such as lighting orspeed of movement), any user requirements (whetheruser must wear anything special), the low-level features used (edges, regions, silhouettes, moments, Histograms), whether 2-D or 3-D representation is used.Gesture recognition has wide-ranging applications inhuman-computer interaction, sign-language communication, video surveillance, dance/video annotations ,forensic identification and the likes .Since the introduction of the foremost common input laptop devices not a lot have changed. This is probably because the existing devices are adequate. It is also now that computers have been so tightly integrated with everyday life, that new applications and hardware are constantly introduced. The means of communicating with computers at the instat square measure restricted to keyboards, mice, light pen, trackball, keypads etc. These devices have grown to befamiliar however inherently limit the speed and naturalness withwhich we interact with the computer. In recent years there has been a great deal of studies aimed At the inconvenience of human computer intercommunication tools such as keyboard & mouse. As one of the alternative gesture recognition methods have been developed by which a variety of commands can be used naturally. Since conventional input devices need a great deal of technical education, many researches feel a great interest in & attach importance to hand gesture recognition. In the present day, framework of interactive ,intelligent computing, an efficient human –computer interaction is assuming utmost importance in our daily life.Gestures are physical positions or movements of aperson's fingers, hands, arms or body accustomed convey information. Hand gestures, i.e., gestures performed byhand. Gesture recognition is the process by which gesturesformed by a user square measure created renowned to the system.

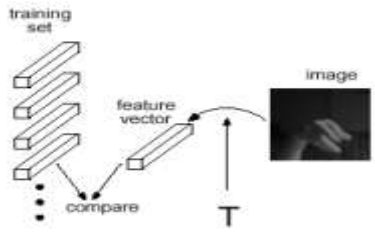

Fig 1 Pattern recognition

A pattern recognition system are employing a remodelthat converts a picture into a feature vector, which willthen be compared with the feature vectors of a coaching setof gestures. The final system will be implemented with aneural networkAs the computer industry follows Moore's Lawsince middle 1960s, powerful machines are built equippedwith more peripherals. Vision based interfaces are feasibleand at the current moment the pc is in a position to "see".Hence users square measure allowed for richer and user-friendlier manmachine interaction. This can lead to new interfaces that will enable the readying of recent commands that aren'tpossible with the current input devices. Plenty of time willbe saved as well.

Recently, there has been a surge in interest inrecognizing human hand gestures. Hand gesture recognition has varied applications like laptop games,machinery control (e.g. crane), and thorough mousereplacement. One of the most structured sets of gesturesbelongs to sign language. In sign language, each gesturehas an assigned meaning (or meanings).

Computer recognition of hand gestures mayprovide a more natural-computer interface, allowingpeople to purpose, or rotate a CAD model by rotating theirhands. Hand gestures will be classified in 2 categories:static and dynamic.A static gesture is a particular handconfiguration and create, represented by a single image. Adynamic gesture may be a moving gesture, represented by asequence of images. We will focus on the recognition ofstatic images. Interactive applications pose particularchallenges. The interval ought to be in no time. Theuser ought to sense no considerable delay between once he orshe makes a gesture or motion and once the pcresponds. The computer vision algorithms should bereliable and work for different people. There are alsoeconomic constraints: the vision-based interfaces will bereplacing existing ones, which are often very low cost. Ahand-held video game controller and a television remotecontrol each cost about $40. Even for added functionality,consumers may not want to spend more. When additionalhardware is needed the cost is considerable higher.

Academic and industrial researchers have recently beenfocusing on analyzing images of people. While researchersare creating progress, the matter is difficult and lots of giftday algorithms are complex, slow or unreliable. Thealgorithms that do run near real-time on computers thoseare very expensive relative to the existing hand-heldinterface devices.

2.1 Skin color detection :

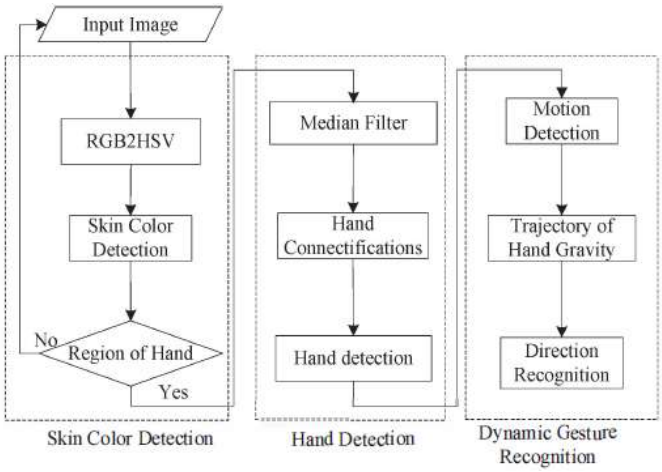

Figure 2 The flow chart of dynamic gesture recognition algorithm

The image obtained from the camera is RGB imagewhere skin color region clusters together. So we use theskin color model to remove the background according tothe easily distinguishable from non-skin area. Thedifferences of skin color of image are mainly caused bylight, so we obtain region of hand to avoid the effect oflight. In HSV space each uniform color area of colorimage corresponds to a relatively consistent tone,therefore the tone is able to as a rule of color segmentation.

2.2 Hand detection:

Hand detection is the most important part of the wholealgorithm, which is made up of three parts: median filter,hand connections and hand detection. Median filter andhand connections are mainly to filter out the noise,preparation for next hand segmentation. In skin colorregion, the area of hand and face are large, while thereare many smaller blocks in the binary image to greatlyaffect the efficiency of hand detection. So we set areathreshold to filter out the smaller blocks.After the skin color detection, we can see that face is themain skin color blocks, which are filtered out to obtainhand. According to the contour feature of hand and face,the obvious difference of them is that the gravity of handis below the half of the height of the hand contour.

2.3 Dynamic hand gesture recognition :

Dynamic hand gestures recognition is composed of three parts: movement detection, the trajectory of palm gravityand direction recognition. As the camera takes time toopen, so we record the movement of image from the15th frame as a start. Movement detection is mainly totrack hand and information,record the coordinates of handgravity, as is shown in formulas.

$$\bar{x} = \sum xf(x,y) / \sum f(x,y)$$
$$\bar{y} = \sum yf(x,y) / \sum f(x,y) \quad \ldots (1)$$

2.4 Picture of the difference with the background :

The difference with the background can be done using the Matlab function “imabsdiff”. After that, to make all the preprocessing easier, it is better to create a binary picture. To do so, it is necessary to choose a threshold: pixels with value lower than this threshold will be set to 0 (black) and others will be set to 1. The choice of this threshold depends on the video camera properties: if we consider that the camera provides pixels coded on bytes, pixel values will be from 0 to 255. Some measurements have proven that in this case, the presence of the hand will imply a variation of pixel values bigger than 20 units. Of course, the optimal threshold depends on the background; nevertheless, this threshold can be correct in most of cases. Then it is necessary to execute noise-removal functions, else every noisy pixel that its value is too high may be considered as part of the hand and will be included in the zoom-in picture. For example if we suppose that the hand is in one corner of the picture and that there is a noisy pixel in the opposite corner of the picture of the differences, so the zooming function will keep it and the resulting picture, after zooming, will not be very different of the initial picture.

2.5 Classification and Recognition

For classification and recognition neural network with spatial feature are used. Feature which are extracted are perimeter, area, coefficient are calculated after skin detection, background removal then contour detection. The training of total 203 images are given and 3 output are classified. It takes 58 iteration and total 1.08 second time. The training of neural network is shown in figure

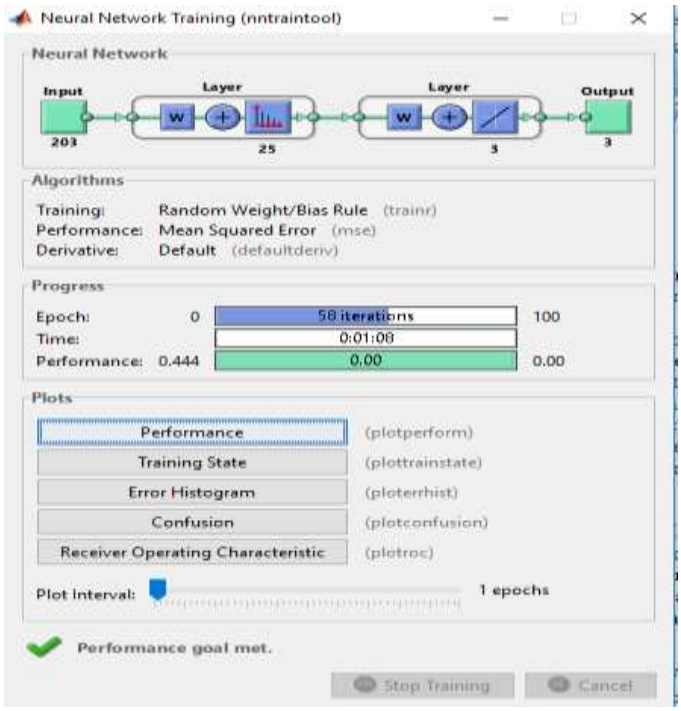

Figure : 3 Training of neural network

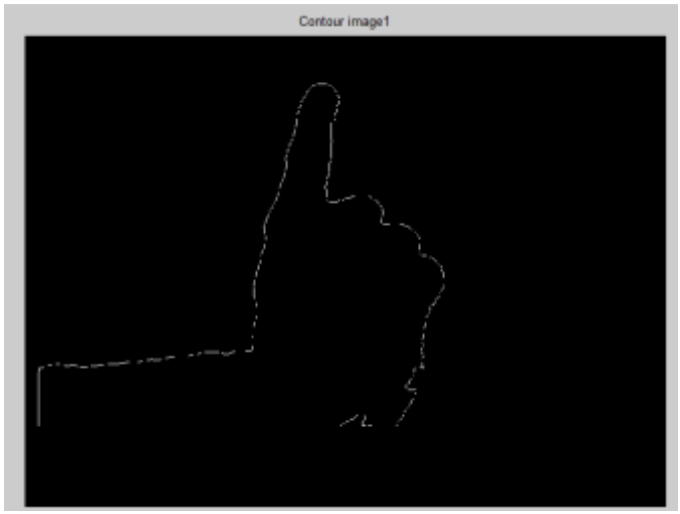

Figure: 4 Contour image of sign 1.

II. Conclusion

The algorithm is tested on database as well as on camera.Firstly, the RGB image is converted to a skin colour model. The contour detected is done then the feature are extracted and trained using neural network. The skin image is called hand region. The hand region is moved and direction is to be shown according to the requirement.

References

[1]. W. WANG, J. PAN "Hand Segmentation Using Skin Color and Background Information," International Conference on Machine Learning and Cybernetics, pp. 1487-1492, July, 2012.

[2]. A. Y. Dawod, J. Abodullah, and Md. J. Alam, "Adaptive Skin Color Model for Hand Segmentation," International Conference on Computer Applications and Industrial Electronics (ICCAIE 2010), pp. 486-489, December, 2010.

[3]. A. Y. Dawod, J. Abodullah, and Md. J. Alam, "A New Method for Hand Segmentation Using Free-Form Skin Color Model," International Conference on Advanced Computer Theory and Engineering (ICACTE), pp. V2-562-V2-566, 2010.

[4]. G. Bebis, M. Nicolescu, R. D. Boyle, and X. Twombly, "A Review on Vision-Based Full DOF Hand Motion Estimation," IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR, 05), 2005.

[5]. A. Erol, G. Bebis, M. Nicolescu, R. D. Boyle, and X. Twombly, "Vision-based Hand Pose Estimation: A Review," Computer Vision and Image Understanding, vol. 108, pp. 52–73, 2007.
[6]. X. Wu, C. Yang, Y. Wang, H. Li, and S. Xu, "An Intelligent Interactive System Based on Hand Gesture Recognition Algorithm and Kinect,"Fifth International Symposium on Computational Intelligenceand Design, pp.294-298, 2012.
[7]. Z. Ren, J. Yuan, Member, IEEE, J. Meng, Member, IEEE, and Z. Zhang, Fellow, IEEE "Robust Part-Based Hand Gesture Recognition Using Kinect Sensor," IEEE Transactions On Multimedia, vol. 15, pp. 1110-1120, AUGUST, 2013.
[8]. M. Panpar "Hand Gesture Recognition Based on Shape Parameters," Communication and Applications (ICCCA), International Conference, pp, 1-6, 2012.
[9]. G. Tofighi, S. A. Monadjemi, N. G. Aghaee, "Rapid Hand Posture Recognition Using Adaptive Histogram Template of Skin and Hand Edge Contour," Machine Vision and Image Processing (MVIP), pp. 1-5, October, 2010.
[10]. K. Oka, Y. Sato, "Real-Time Fingertip Tracking and Gesture Recognition,"IEEE Computer Graphics and Applications, pp. 64-71, 2002