HAND GESTURE RECOGNITIONUSING NEURAL NETWORK

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ABSTRACT

In the area of image processing hand gesture recognition system having great attention in the recent few years for general life applications. Hand gesture recognition is a growing field of research among various human to machine interactions. This research area is full of innovative approaches.Hand gesture recognition has the potential to be a natural tool supporting interaction between human and the computer. In this paper two method ofhand gesture recognition system is presented. These methods are motion based and skin color based hand gesture recognition.The hand gesture image is gone through three stages, pre-processing, feature extraction, andclassification. In pre-processing stage some operations are applied to subtract the hand gesturefrom its background and create the hand gesture image for the feature extraction stage. For the classification of hand gesture back propagation algorithm of artificial neural network is used. After the classification result will be displayed on the screen.

Keywords—Artificial neural network, Hand Gesture, Human Computer Interaction (HCI), Hand Gesture recognition, image processing.

I. INTRODUCTION

Development of information technology needs new type of human to machine interaction that is easy to use. User's generally use hand gestures for expression of theirfeelings and thoughts.Hand gesture recognition system is used to create interactionbetween human and computer.Recognized gestures can also be used for handling a robotor transfer meaningful information.

Human to computer interaction also known Man-Machine Interaction (MMI) [2].It is based on the relation between the human and the computer or machine.HCI system isdesigned with the consideration of it's functionality and usability [2].System functionality defined as the set of functions or services that the systemoffers to the users, while system usability defined as the level and scope that the system canoperate and perform specific user purposes efficiently [2]. The system that matains a suitablebalanced between functionality and usabilityknown as influential performance and powerful system.

Gestures used as a communication medium.Gestures used for communicating between human as well as machines also between people usingsign language.There are two types of gestures performed by human static and dynamic gestures[4][5].Static gestures are easy to understand , while dynamic gestures are more complex.For real time application dynamic gestures are more suitable. A dynamic gesture indicates to change over a certain amount of time whereas a static gesture is observed at the moment. A waving hand means goodbye is an example of dynamic gesture and the thumbs up sign is an example of static gesture. To

understand a complete message, it is necessary to interpret all the static along with dynamic gestures over a period of time. This complex process is called gesture recognition.The aim of gesture recognition is tocreate a system which can analyzespecific human gesturesand use them to convey information or use for device control. A gesture may be defined as a physical movement of hands, face, arms and body. Gesture recognitionconsists the tracking of human movement along with the interpretation of that movement as meaningfulcommands.

II. PROBLEM STATEMENT

Development of information technology needs new type of human to machine interaction that is easy to use. User's generally use hand gestures for expression of their feelings and thoughts. Hand gesture recognition system is needed to create easy interaction between human and computer. Robot control is difficult using a remote. Speech impaired persons suffers difficulty to communicate with normal one. So these mute people are isolated from the non-impaired people's community. Sign language is only way for communicating the mute with others. But sign language not serves an effective way for communicating the mute with normal persons. So the only way for enhance the communication between mute people and normal people is recognition of sign language and converting it to the corresponding voice.

III. PROPOSED SYSTEM

In this section, we propose the method to recognizehand gestures. Block diagram of hand gesture recognition is shown below. We use artificial neural network because of its power and flexibility. Hand gesture recognition is mainly divided into four steps that are image acquisition, image preprocessing, feature extraction and classification. For hand gesture recognition this proposed system having two methods for the image acquisition and preprocessing motion based and skin color based.
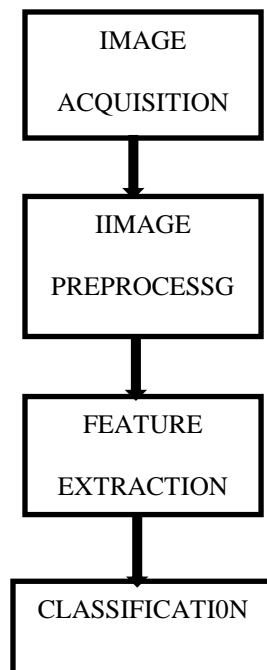
IMAGE ACQUISITION

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IIMAGE PREPROCESSG

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FEATURE EXTRACTION

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CLASSIFICATI0N

Fig. 3.1 Block diagram ofhand gesture recognition

3.1 Motion based

3.1.1 Image Acquisition

For hand gesture recognition first image acquisition is required. In this system it is done by using Webcam. The system uses the camera present in the pc for continuous video capturing and a simultaneous display on the screen. Here first we capture background image by pressing a key. This image should not contain any motion based object. After that continuous video capturing is done, according to the motion object is detected. And video is transferred into the frame. Both Images are showed in the GUI.

3.1.2 Image Preprocessing

Here we take difference of both the images then color RGB image is converted to gray scale image using matlab inbuilt command When converting an RGB image to grayscale, we have to consider the RGB values for each pixel and made as output a single value reflecting the brightness of that pixel.Segmentation process is the process for analyzing hand gestures. It is the process ofdividing the input image into regions separated by boundaries[10]. For dynamic gesture hand gesture need to be located and tracked [10].The hand should be located firstly depending on the motion.The video is divided into frames and eachframe have to be processed alone, in this case the hand frame is treated as a posture andsegmented [10], using tracking information such as motion However there are some factors that obstacle the segmentationprocess which is [10]; complex background, illumination changes, low video quality.[4][12] Some preprocessing operations areapplied such as subtraction, edge detection, and normalization to enhance the segmented handimage [6][12].
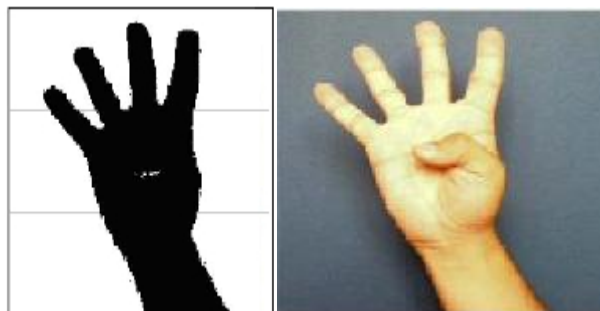
Figure 3.2 Motion based Segmentation

3.2 Skin Color Based

3.2.1 Image Acquisition

Here first we capture background image by pressing a key. This image should not contain any skin color based object. After that continuous video capturing is done, according to the skin color object is detected. And video is converted into the frame.Then both Images are showed in the GUI.

3.2.2 Image Preprocessing

Here the color RGB image is converted to gray scale image using matlab inbuilt command When converting anRGB image to grayscale, we have to consider the RGB values foreach pixel and make as output a single value reflecting the brightness of that pixel. Segmentation process is the processfor recognizing hand gestures. It is the process of dividing theinput image (in this case hand gesture image) into regionsseparated by boundaries[10]The hand should be located firstly, generally a boundingbox is used to specify the depending on the skin color [11], orusing some tracking information such as shape, skin colorThe commonhelpful cue used

for segmenting the hand is the skin color[10], since it is easy and invariant to scale, translation, androtation changes..[4][12] applied HSV color model which concentrates on the pigments of the pixel, B[11] used YCbCr color space.

Figure 3.3 Skin color filter result

3.3.1 Features Extraction

After segmentation processfeatures extraction is done and the play animportant role in a successful recognition process [4]. Various methods have been applied for representing the features can be extracted. Some methods used the shape, position of the handsuch as hand contour and silhouette [4] while others utilized fingertips position, palm center, etc.[4]These extracted features are stored for the classification as database.

3.3.2 Gestures Classification

After feature extraction and analysis of the input hand image, gesture classification method is used to recognize gesture. In this work a standard backpropagationneural network is used to classify gestures. The network consists of three layers input, hidden and output layer;the first layer consists of neurons that are for inputting a hand gesture to ANN. The second layer is a hidden layer. This layer allows neural networkto perform the error reduction necessary to successfully achieve the desired output. The final is the output layer.

IV. CONCLUSION

This paper proposes a method of recognizing hand gestures using hand image. Usingmotion based provide good results. The major aim of this system is to develop a system that will provide the interaction between human and computer through the use of hand gestures as a control commands as communication medium to mute people.

REFERENCES

[1]. RafiqulZaman Khan and Noor Adnan IbraheemB, "Hand Gesture Recognition: A LiteratureReview",International Journal of Artificial Intelligence & Applications (IJAIA), Vol.3, No.4, July 2012.

[2]. FakhreddineKarray, MiladAlemzadeh, JamilAbouSaleh, Mo NoursArab,"Human-Computer Interaction: Overview on State of the Art", International Journal on Smart Sensing andIntelligent Systems, Vol. 1(1),2008.

[3]. Mokhtar M. Hasan, Pramoud K. Misra,"Brightness Factor Matching For GestureRecognition System Using Scaled Normalization", International Journal of Computer Science &Information Technology (IJCSIT), Vol. 3(2),2011.

[4]. XingyanLi.,"Gesture Recognition Based on Fuzzy C-Means Clustering Algorithm",Department of Computer Science, the University of Tennessee Knoxville,2003.

[5]. S.Mitra, and T. Acharya,"Gesture Recognition: A Survey" IEEE Transactions on systems,Man and Cybernetics, Part C: Applications and reviews, vol. 37 (3), pp. 311- 324,2007.

[6]. Simei G. Wysoski, Marcus V. Lamar, Susumu Kuroyanagi, Akira Iwata,"A RotationInvariant Approach On Static-Gesture Recognition Using Boundary Histograms And NeuralNetworks," IEEE Proceedings of the 9th International Conference on Neural InformationProcessing, Singapura,2002.

[7]. Joseph J. LaViola Jr.,"A Survey of Hand Posture and Gesture Recognition Techniques andTechnology", Master Thesis, Science and Technology Center for Computer Graphics and ScientificVisualization, USA,1999.

[8]. Rafiqul Z. Khan, Noor A. Ibraheem,"Survey on Gesture Recognition for Hand ImagePostures", International Journal of Computer And Information Science, Vol. 5(3),2012

[9]. Thomas B. Moeslund and Erik Granum,"A Survey of Computer Vision-Based HumanMotion Capture," Elsevier, Computer Vision and Image Understanding, Vol. 81, pp. 231–268,2001.

[10]. N. Ibraheem, M. Hasan, R. Khan, P. Mishra,"comparative study of skin color basedsegmentation techniques", Aligarh Muslim University, A.M.U., Aligarh, India,2012.

[11]. E. Stergiopoulou, N. Papamarkos,"Hand gesture recognition using a neural network shapefitting technique", Elsevier Engineering Applications of Artificial Intelligence, vol. 22(8), pp. 1141–1158,2009.

[12]. M. M. Hasan,P. K. Mishra,"HSV Brightness Factor Matching for Gesture RecognitionSystem", International Journal of Image Processing (IJIP), Vol. 4(5)2011.

[13]. Malima, A., Özgür, E., Çetin, M,"A Fast Algorithm for Vision-Based Hand GestureRecognition For Robot Control", IEEE 14th conference on Signal Processing and CommunicationsApplications, pp. 1-4,2006.