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A Review on Gesture Segmentation and Classification

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ABSTRACT

The aim is to bring Human Computer Interaction to a regime where interactions with computers will be as natural as an interaction between humans. HCI techniques like keyboard, mouse, joysticks etc. Hand segmentation is the most crucial step in every hand gesture recognition system. Hand segmentation which overcomes problems such as skin colour detection One of the major concerns with respect to hand gesture recognition is segregation or segmentation of the hand and identifying the gesture. the various possible ways of segmentation using different colour spaces and models and presents the best algorithm with highest accuracy to perform the human-computer interaction (HCI) and for human alternative and augmentative communication (HAAC) application. A vision-based static hand gesture recognition algorithm has three stages: pre-processing, feature extraction and classification. The pre-processing stage involves following three sub-stages: segmentation which segments hand region from its background images using a histogram based thresholding algorithm and transforms into binary silhouette; rotation that rotates segmented gesture to build the precise algorithm, filtering that affectfully retains background noise and object noise from binary image by morphological filtering technique. The 1st principal component of the segmented hand gestures with vertical axes. A localized contour sequence (LCS) based feature is used here to classify the hand gestures. The k-mean supported radial basis operational neural n/w is also presented here for subdivided of hand gestures from LCS based feature. We use HSV (Hue Saturation Value) colour space mix with skin detection to remove the complex background and create segmented images.

Keywords : Image recognition Pattern recognition. Hand Segmentation, Skin Colour Segmentation, Principle Components Analysis (PCA). American Sign Language (ASL).

I. INTRODUCTION

Hand Gesture can be subdivided into two types, firstly global motion where the entire hand moves And secondly local motion. Hand segmentation is the pre-requisite in gesture recognition system since if we get better segmented output of the region of interest. Recent research works have mainly focussed on. Recognition of gestures that have been recorded under controlled background conditions. Hand shape estimation technique under complex background for sign language recognition by using a shape transition network to reduce the matching candidates. Hand

segmentation of single-handed and double-handed gestures in complex background and background involving multiple gesturers the goal of PCA is to reduce the dimensionality of the image data to enhance efficiency by expressing the large 1-D vector of pixels constructed from 2-D hand gesture image into the compact principal components of the feature space. This can be called Eigen space projection. Detect and track different hand postures and can be recognized using Principal Component Analysis (PCA), which is used to achieve fully real-time performance and accurate classification of hand gestures. Achieved real-time performance and accurate recognition for the bare hand postures using our approach in for detecting and tracking hand posture and PCA for recognition. The versatile in-vehicle atmosphere introduces many challenges for gesture verification as compared to a controlled indoor environment they report their best recognition accuracy with a combination of concatenated HOG features and HOG2 features highest recognition accuracy to date on the VIVA hand gesture (symbol) dataset using a 3D Convolution Neural Network. Without sign language, hearing and speech impaired people would face lot of difficulties in communicating their thoughts and ideas, especially to those who have less or meagre knowledge on sign language Generally, gestures can be classified into static gestures , and dynamic gestures . Static gestures are usually described in terms of hand shapes or poses, and dynamic gestures are generally described according to hand Sign language is one of the main communication media for the deaf people worldwide This becomes a cause of isolation of the deaf people. Gestures are forms of body language or nonverbal communication that commonly use combination of shape/patterns, orientation and movement of the hands, face and expression patterns of the lips. Many research works related to sign languages have been done such as the American Sign Language (ASL) [1] , the BriA single camera is used to capture hand gesture pose, which then will be recognized by the system and translate to an Indonesian alphabet. Sign Language [2], the Japanese Sign Language They build an intelligent system using image processing, machine learning and artificial intelligence concepts to take visual inputs of sign language's hand gestures and generate easily recognizable form of outputs.

II. RELATED WORKS

[1] we have presented two categories of Vision based hand gesture verification, which are the 3(D) hand model based methods and the presentation based methods. This will be suitable for realistic interactions in virtual environments.

[2] The 3D hand model based technique provides a rich description that permits a wide class of hand gestures. Appearance based techniques extract image (symbol) features to model the visual appearance of the hand and compare these features with the extracted features from the video frames. They have real time performance because of the easier 2 D image features that are used.

[3] A simple method, searching for skin colored regions in the image, was used it is very sensitive to lighting conditions. Secondly, it is required that no other skin like objects exist in the image. There have been a number of research efforts recently on local invariant features [17, 18, 19].

Reference	Segmentation Process	Description
(Hasan, 2010)	 a b c Segmentation phases a. input image; b. segmented image; c. edge detection.	HSV color model used to extract the hand region, and Laplacian filter for detection the edges.
(Stergiopoulou, 2009)	 a b Hand segmentation a. original image; b. segmented hand.	YCbCr color model used to segment the hand.

[4] In [17], Ad boost learning algorithm and Scale Invariance Feature Transform (SIFT) features were used to achieve in-plane rotation invariant hand detection the authors propose a complex framework consisting of multiple lower- and higher-level modules processing information between each other.

[5] We prove that dealing with the sub gesture problem is a viable approach realizable efficiently in real-time. Moreover our suggestion does not have to deal with detecting the optimal sequence within a timeframe and classification is done reliably by an MLP.

III. METHODOLOGY

In order to simplify the process of gesture identification, special modified white colour woollen hand gloves were used. One of the most important features of sign language is that each finger in a gesture conveys a particular message and hence each and every finger has to be individually identified as well. This was done by replacing and sewing each finger of the glove with a colored cloth for each digit of the hand. Each finger of the hand would therefore now be represented by a unique color This "unique color coded scheme" for each finger of the hand will help us to differentiate the fingers and recognize the hand gestures by minimizing any noise which affects the images.

This in turn eases the detection to be performed by the image processor and also involves little or no expenditure at all In this paper we formulate a less computationally complex and cost effective method of segmenting a sign language gesture, at the same time taking into account actions and
Movements as well.

IV. PROPOSED MODEL

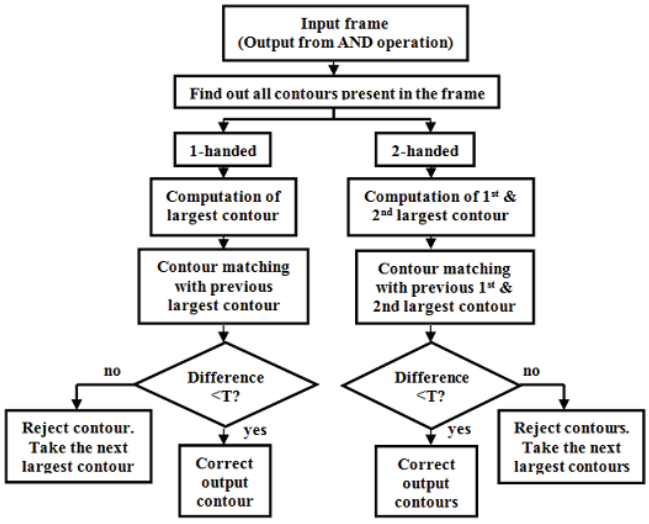

Figure 4: Flowchart of contour processing stage

The block diagram of the proposed model for hand segmentation is shown in Figure 3. The detailed description of all the steps undergone is described below:

At first, the input frames are captured from webcam and face detection and removal using Haar Classifier is done to mask out the face region. After that skin color segmentation is done to segment out the hand region. This is followed by some morphological operation to filter out noise and to fill up holes (output O1). Simultaneously, on the other side motion detection is carried out by frame differencing of the input frames. This is again followed by some morphological operation (output O2). In the next step logical AND operation is performed between outputs O1 and O2 to get the final hand segmented output. The output after AND operation is effective only in case of simple and complex background, but in case of background having multiple gesturers the last step i.e. contour processing is done irrespective of one-handed and two handed gesture to get the correct gesture output.

The contour processing stage is shown in Figure 4. In this stage, at first all the contours present in the input frame are found out. Followed by it, the largest contour having largest area is computed for one

handed gesture. In case of two-handed gesture, the first largest and second largest contour is determined. There might be a situation where an unintended gesturer may have contour greater than that of the actual gesturer. In such situations, an incorrect gesture might be reported as a correct gesture output. So, after computation of the largest contour, contour matching is done by finding the difference with the previous largest contour in case of one-handed gesture and for two-handed gesture, it is performed with the previous first largest and second largest contour. For contour matching, a training and testing method is employed. A threshold value of difference (T) is selected empirically and if the obtained value of difference is less than T, it will be interpreted as correct gesture otherwise it will be rejected.

V. CONCLUSION

This paper presents an efficient technique used to detect and recognize gestures. We have presented an in-car dynamic hand gesture recognition system based on ToF-sensor data and MLP classification. The sensor is mounted to the front console and captures the nearby driver environment, making our system sensible to user input. a fast deep learning hand gesture recognition algorithm is proposed for intelligent vehicle applications. The long-recurrent convolution neural network is utilized to perform the hand gesture recognition. we have proposed a method for bare hand posture recognition followed by accurate palm and fingertip position estimation based on hand contour. The system performance in recognizing an alphabet sign language in the complex background is relatively low, which is about 63% with computation time around 1.6 second.

we have introduced a novel approach to detect hand gestures which are a part of sign language, we have presented three different methods to perform segmentation based on the three popular colour spaces. We have proposed a real-time system that consists of two modules: hand detection and tracking using face subtraction, skin detection and contours comparison algorithm and gesture recognition using Principle Components Analysis (PCA).

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