Hand Gesture Recognition:Case Study

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Abstract: Hand gestures can communicate to people through the gesture shapes, even if common man may not be aware of these gestures and cannot be understand the essence of matter. Recognition of hand gesture is infallible method and it is momentous in some situation. Gesture recognition could be done in different ways. Image processing is a pivotal technique in real world. The analysis of a digitized image is known as image processing technique. And the quality of image is improved by the image processing techniques. This paper compares different methods by various authors in the field of gesture recognition based on image processing techniques.

Keywords: Principle component analysis, feature extraction, background subtraction, template matching, linear finger tips, contour

I. INTRODUCTION

Nowadays hand gesture recognition is necessary to understand the essence of matter. Presently the hand gesture ascertainment is done manually which is prone to errors. Hand gesture is repository of lot of information such as number, measurement etc. The main application is the recognizing the gesture if immigrants in situation where there are no way to exchange the information. In some situation time may insufficient for performing the necessary conversion of hand gesture into their true meaning by manually. The delay in gesture recognition may even cause the misunderstanding of communication matter. Gesture recognition is an area in computer vision and that aims in defining gestures via mathematical algorithms. Each gesture represents a gesture command mode.

These are commonly used to communicate with each other and can thus be used in various applications. This work started with creation of a database with all hand gesture images to be used for training and testing of gesture to classify them. Hand gesture recognition is an area in image processing and its sub area is computer vision. Analysis and manipulation of digitized images is known as image processing. And its quality is improved by using different image processing methods. Computer vision is also a field that includes methods of acquiring; processing, analysis and understanding etc. vision based gesture recognition can be divided into 3 types. Appearance based, Sensor based and 3-D hand model based.

According to appearance based approach it used the image features to model the visual appearance of the hand and compare these parameters with the extracted features from the input. According to sensor based gesture recognition the gestures are collected by using different sensors. And these are attached to hand which record to get the position and shape of the hand from the signals by the sensors. According to 3-D hand gesture recognition method it tries to find out the meaning of gesture by the help of 3-D kinematic hand model. By the recognition of hand gesture we can translate the gesture into their true meaning using image processing.

II. RELATED WORKS

[1] Author explains the gesture recognition by PCA technique. PCA means principle component analysis. Here includes the detection of hand using skin detection and contour comparison algorithm. After the determination of Eigen vectors the training weights are calculated by the projecting each training image onto the most Eigen vectors. Also find out the test weights. Finally the minimum Euclidian distance is determined between weights of images to recognize the hand gesture type. Viola-Jones method is used to detect face and subtract that face from that image. After the subtraction of face the skin area is detected using HSV method. Then contours of skin area were compared with all the images.

[2] Explains about the Real time hand gesture recognition using finger segmentation technique. Here firstly perform the background subtraction method and that result is converted to the binary image. From that image the palm point is detected. We can draw a circle with the palm point as the center point inside the palm. After the detection the image is segmented by using the labeling algorithm. Labeling algorithm helps to mark the regions of fingers. From that regions draw a line to center point that line helps to count the number of fingers. The finger is detected by using a rule classifier. It helps to prediction of gestures according to the number of fingers.

[3] Author tells about the method of feature extraction for hand gesture recognition. In main phase the images goes under the pre-processing stage. Here also perform the edge detection, smoothing and filtering process. This output is given to the feature extraction stage. Here used the local orientation histogram method to extraction. Here same gestures map to similar histogram and different gestures map to different histogram.

[4] Explains gesture recognition by template matching. Firstly the image is resized and passes a kernel over the image for the detection of matching template. If we don't get matched template then again resized the image. Here Euclidean distance is used as the distance measuring component. The image is viewed as matrix of pixel values. And this is resized to N X N pixel image. From the Euclidian distance we can identify the hand gesture.

[5] Tells about Recognition method by neural network shape fitting technique. Firstly the hand region is detected by using colour segmentation. From the extraction of hand shape characteristics we can identify the number of fingers. From this output we can recognize the gesture type. Here also used rule classifier to predict the hand gesture according to the number of fingers.

[6] Explains about feature extraction method for the gesture identification problem. Here used the local brightness method for this problem. In first phase the image is divided into 25 X 25 blocks. These blocks are calculates the local brightness after applying colored segmentation operation. After the segmentation a block white image is created and represented the hand pose. From this hand pose we can identify the gesture type.

[7] Author explains about the gesture recognition by convexity approach. Background subtraction is eliminating the useless information. The series of points are calculated the boundary pixels of image. By using the convexity approach the feature can be extracted from contour detection. The shape and type can be determined from the contour image. Here we use canny's edge detection algorithm to extract the contour.

[8] Tells about pattern recognition technique with histogram of local orientation to determine the hand gesture. Orientation histogram is used as the feature vector for gesture assessment. For each input image the computer stores one or more feature vectors, blurred orientation histograms. In processing stage the computer compares the feature vector for the present image with those in the training set, and picks the category of the nearest vector. Then we can find out the gesture type.

[9] Here tells about the vision based gesture recognition using single camera. Used different methods such as pixel-by-pixel comparison, edges method and orientation histogram to determine the gesture type. By pixel-by–pixel comparison each frame is being compared with the image. Edges method is used to find out particular portion of the image. Orientation is used to combine both edges method and

pixel-to pixel comparison method. Euclidian distance is used to find out the differences between the input and edge detected image. From the Euclidian distance the orientation histogram is created. The histogram will tell the type of gesture.

[10] Author proposes a hand gesture recognition system using tracking device. Here used colored glove and HSV color space for the identification process. The particular features are extracted from the acquired image. And SVM is used for the classification purpose with cascaded multi-binary-class configuration. By using colored gloves we can identify the particular portion. The main thing is, the pixels near the edge of the colored regions will be darker than those at the center of the colored regions. From the pixels we can determined the gesture.

III. COMPARISON

Methods	Advantages	Disadvantages
Principle Component Analysis	***ƒ It is used to reduce the dimension of the data***	***It is very time consuming.***
Finger Segmentation	***Good recognition accuracy***	***Recognize small set of postures***
Feature Extraction	***Layered architecture***	***Transformation may be expensive***
Template Matching	***Simple***	***Does not let for rotated and large images***
Neural Network	***High fault tolerance in counting number of fingers***	***Increased duration of developing shape characteristics***
Local brightness	***Offers some robustness to scene illumination changes***	***High computational cost***
Contour Detection	***Better detection of edge in fast and east method***	***No orientation in complex problem***
Pattern Recognition	***Simple to compute***	***Slow method***
Vision based using single camera	***Edge method gives higher rates***	***Pixel-by-pixel gives lesser recognition rate***
Colored Glove	***By using SVM Less over fitting, robust to noise.***	***Computationally expensive, thus runs slow***

IV. CONCLUSION

Gesture recognition is widely applicable and it has great potential in real world. Hand gesture is repository of lot of information such as number, measurement etc. The main application is the recognizing the gesture if immigrants in situation where there are no way to exchange the information. The gesture recognition is made a pivotal role in world. Hand gestures can determine in different methods. Contour detection method is very effective method. Because contour detection is easy method to implement and fastest in gesture recognition filed. All these methods are helps to translate the gestures to their true meaning.

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