Rajat et. al. [11] proposed system provide dynamic HGR by using intel image processing OpenCV. It has three stage: 1. detection & tracking: Lαβ color space is used for hand detection where α component represents pixel position between red and green and β is component represents between yellow and blue. Thresholding combined with color space to extract information. CAMSHIF (Continuously Adapted Mean Shift) Algorithm to track hand. 2. Feature extraction: Hu moment invariant has 7 moments which are invariant to rotation and translation. 3. Training & recognize. HMM with left- right banded model (LRB) technology. In this model state is not directly visible but output is visible and it is dependent on state. HMM has three topologies and it is fully connected and each state can be go back to itself. After completion of process maximal likelihood from gesture set selected. It has 90% accuracy. It is focus on speed not recognition rate.

Saad [12] proposed the process for detecting, understanding and translation sign language gesture to vocal language. There are two mode recording and translation mode. In recording mode, user adds gesture to dictionary. In translation mode, gesture is compared with gesture stored in dictionary. In this method call this gesture "Recording Translation Gesture" or "RTG". This method contains four steps: 1.Getting joint of interest 2. Normalize the skeleton frame data 3. Build link list of temporary storage data 4. Detecting gesture. Dynamic Time Wrapping algorithm is used to compare gestures. It is provide 91% accuracy. It is not suitable for finger movement.

Jaya [13] proposed method for HGR using Microsoft Kinect Sensor. In preprocessing stage, Kinect depth feature for background segmentation of hand gesture. Feature Extraction is done using find contour of hand then calculate convex hull, convexity defects. After calculating defects extract image features. Classification is done using naïve Bayesian classifier. As a feature set Convex hull and convexity defects are are considered as two attributes to classify data. Number of images for each attribute set is considered as weighted sum. It is provide good classification rate. It is not recognize hand orientation and not recognize dynamic gesture.

Archana [14] introduces a HGR system to recognize the alphabets of Indian Sign Language. There are five modules:

1) Hand tracking: Camshift algorithm is used to hand tracking.
2) Hand Segmentation: HSV color space is applied on track hand for segmentation.
3) Feature Extraction: Shape representation techniques are used for feature extraction and define relationship between features.
4) Recognition: Genetic algorithm is better choice for managing randomness for natural samples and hand gesture analysis. In this algorithm first initialize population and evaluate fitness of each individual. Choice of parent based on fitness. Create new individual using 2 point cross over. Chose elements randomly and choose worst one and replace with new individual and check stop if best solution. It is easy to use and inexpensive approach but not more dynamic and applies on all.

Ayan [15] proposed hand gesture recognition under varying illumination. Overall process has two step: 1. Segmentation: To achieve segmentation of hand from complex background using Information Measurement Ratio based threshold technique. It is work more efficient in manner. 2. Training & recognition: Principle Component Analysis (PCA), Euclidian distance is used for recognize hand accurately and efficiently. In training phase, first convert image matrix to column vector and calculate average matrix and difference matrix. Find covariance matrix using Difference matrix and calculate Eigen value and Eigen vector. In recognition phase, transform image into its components and compute vector and its Euclidian distance. PCA is fast, simple and accurate. It has also reduced dimensionality of picture and cheaper in terms of time. It is give reduce time complexity but not apply on orientation of hand gesture recognition.

Parul [16] This paper provide method for recognize sign language. It has three steps: 1. Pre-processing: First input sign image in RGB to convert into Lab colour space where L is lightness a and b are two colour channel. Lab color space for convert image into binary image and hand region is cropped and perform filter for remove noise.2. Feature Extraction: It is done using Area, height, centered-origin Euclidance distance, Average height. 3. Classification: Feed forward back propagation algorithm is used for training and classification. Feed forward back propagation training algorithm is supervised learning algorithm. In this input and output vector are provided for training network. Target vector is provided for each input gesture. It is provide 85% accuracy. It is not recognize dynamic gesture.

3. Proposed Work

In this section, Dynamic Hand Gesture Recognition using clustering based technique. Flow chart of proposed work is as follow in figure 1:

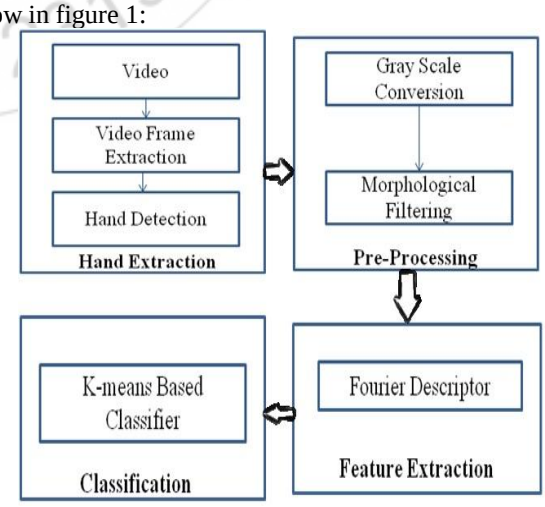

Figure 1: Proposed Dynamic Hand Gesture Recognition

Proposed Work is based on Dynamic Hand Gesture Recognition (HGR). Dynamic HGR is performed with 4 steps:

1) Hand Extraction
2) Pre-Processing
3) Feature Extraction
4) Classification or Recognition

3.1 Hand Extraction

Image frames are being retrieved from the video at 25 or 29 frames per second (fps), depending on video type. This image is in rgb form. It is then passed to the next step for applying skin color detection using YCrCb skin color detection function for detect hand region from frame.

3.2 Pre-Processing

After hand extraction pre-processing step are performed on hand gesture. First convert hand region into gray scale. Greyscale is performed using inbuilt function of EmguCv library. For filter noise in Gray scale hand region performed morphological filter. Morphological filter is performed using dilation, erosion.

3.3 Feature Extraction

Feature extraction is performed using Fourier descriptor method. Fourier descriptor contains boundary pixels, signature function and computation of Fourier descriptor (FD). Edge detector and boundary tracing are used for computation of boundary pixel. From boundary pixel shape signature function compute. Shape signature function contains complex coordinate, curvature, cumulative and cumulative angular function. Centroid distance method first compute centroid of shape for set pixel set by taking average of all pixels. Shape signature is formed by taking distance between centroid pixels to pixels in boundary. Apply Discrete Fourier transformation on shape signature. It is generate Fourier transformed coefficient of transformed phase. All Fourier transform coefficient standardized by first Fourier transform coefficient. Normalized coefficient is invariant translation, scale, rotation and change start point of contour. Shape feature vector contain in FD. Shape feature vector contains rotation, scale, translation invariant and change of start point. FD provides high accuracy and less time for computation. It is easy to normalize and also overcome the noise sensitivity in shape signature representation.

3.4 Classification

Classification is done using clustering technique. It is provided fast computation and high classification accuracy. It is unsupervised method. K-means based method is find center of two cluster and find euclidance distance between them. Then from that distance is find out finger calculation.

4. Test Results

In proposed method take input using video file. Input Video is 25 or 29 frame/sec. Using frame grabber frame extract from video file. On extracted frame apply skin color detection for detect hand. In pre-processing stage apply gray scale conversion on skin result and then apply morphological operation on that for remove noise. In feature Extraction stage apply Fourier descriptor on hand. Fourier descriptor is invariant to rotation, scale, translation and starting point of hand. On that feature apply k-means based clustering technique. Clustering method create different class of each sign and assign label to each and based on that detect sign. Proposed method is give 97.03% classification accuracy with reduce time complexity 53 msec. All operation results with its detected sign (0 to 5) is as shown in figure 2 and figure 3.

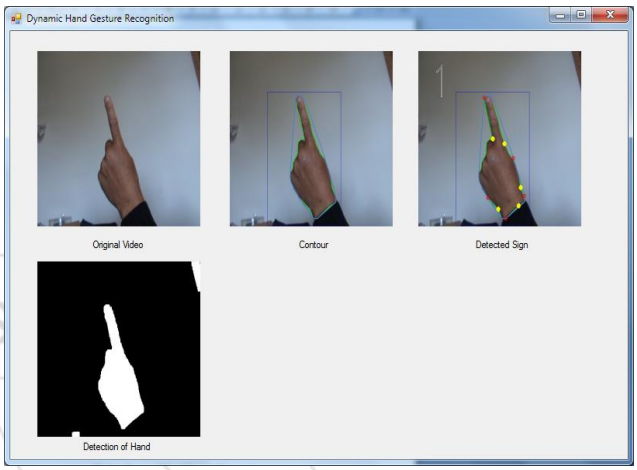

Figure 2: Proposed Hand Gesture Recognition (Detected Sign One)

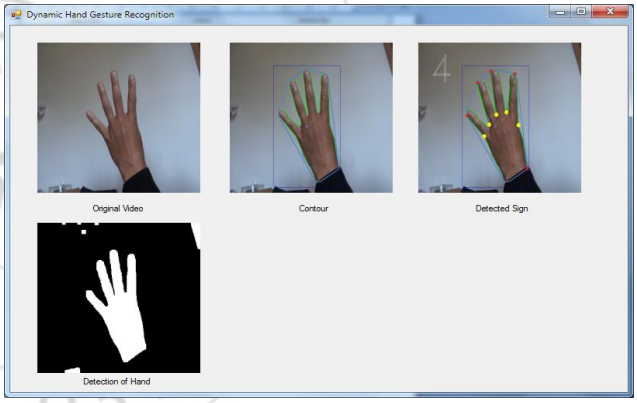

Figure 3: Proposed Hand Gesture Recognition (Detected Sign Four)

5. Conclusion

This paper implements dynamic hand gesture recognition. In Proposed dynamic hand gesture recognition, Fourier descriptor method is proposed for feature extraction and normalize that feature and provide to K-means based clustering technique for classification. Dynamic hand gesture recognition using clustering based technique is provided better accuracy and reduce time complexity than other methods. Future work is extended with better hand detection technique with varying background condition.

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