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Human Face Detection using Fusion Technique

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Abstract— Nowadays Face detection and recognition has become an important tool of identification in industry, Educational institutes, Verifying websites, hosting images and social networking site. Face Recognition is nothing but Features such as eyes , nose ,lips etc. are extracted from a face, these features are processed and compared with similar processed faces present in the database . If a face is recognized it is known or the system may show a similar face existing in a database else it is unknown face. In proposed system, input image can be taken as a static image or by capturing image. System is trying to improve efficiency. System is using ANN (Artificial Neural Network) and Euclidean Distance Measure are working collaboratively for detection of face. Over here, features are been marked using ELBP (Elliptical local binary pattern) using specific values. Facial features such as fore head, eyes, nose, lips and cheeks. System basically converts RGB values of features to HSV (Hue saturation value) and stores this HSV values. These HSV values are compared with the feature values of HSV which are stored in databases and if these values are matched with the database face image values then the face is detected otherwise it is not detected. These features distances are calculated using Euclidean distance algorithm. For improving the efficiency OCA (Optimized comparison algorithm) plays important role as in OCA two features are taken for comparison with the database image. Two features lips and cheeks are taken into consideration and it is compared with the all the database image. Whatever images have got is further compared with the optimized database and finally face is recognized otherwise user not found message will be printed. Also for real time application live streaming is facilitated in system for recognition and continuous processing is done. This way system facilitates to efficiently recognize the faces and also helps to improve accuracy of the system.

Keywords: Artificial Neural Network, Euclidean Distance Measure, BELBP, RGB, HSV.

I. INTRODUCTION

In recent few years, face recognition or detection has become huge necessary aspect in different fields. Human face recognition has already established its acceptance as a superior biometric method for Identification and authentication purposes. It is touch less, highly automated and most natural since it coincides with the mode of recognition that as humans employ on our everyday affairs .It has emerged as a preferred alternative to traditional forms of identification, like card IDs, which are not embedded into ones physical characteristics. In earlier for attendance or for identification, manual cards, human effort was been engaged. As well as in different areas such as criminal identification, security systems also time was been spent just for human identification to maintain security or recognition. To reduce this efforts now a days different recognition systems has emerged. But earlier some systems were not efficient to cope up with the elimination condition viewing direction or poses, facial expressions, aging, and disguises such as facial hair, glasses, or cosmetics, this challenges were been faced. Performance of visual face recognition is sensitive to variations in illumination conditions and usually degrades significantly when the lighting is dim or when it is not uniformly illuminating the face. As face recognition is a booming field but still there are some problems faced in it such as illumination, poses, different lightening conditions and detection rate been slow. The proposed system tries to cope up with the problem and also reveals working with different media.

II. LITERATURE SURVEY

LPOG (Local Patterns of Gradient) algorithm is used. LPOG uses BELBP.LPQ is used as blur tolerant. KNN classifier is used for comparison [1]. In this, Gabor feature that is face recognition methods is used. MBC (monogenic binary coding) is used for face representation and detection. Gabor filtering methods are used. In this proposed MBC scheme has significantly lower time and space complexity than the Gabor-transformation-based local feature methods [2]. Lucas-Kanade algorithm is used to handle

illumination. A virtual frontal view can be reconstructed from a given non-frontal face image using MRF (Markov random field). One of the most important parameters in this method is the patch size. It should not be either too large or too small [3]. A block based bag of words method is proposed for robust face recognition. Local SVM is applied for histograms. In BoW several order less local patches are firstly extracted from images of different categories as candidates for basic elements, words. Feature descriptors are then applied to represent the patches as numerical vector [4]. Fusion of POD and POEM based representations is used to get more compact and discriminative face descriptors. Partition a face image into 5X5 blocks, and consider each block as an ROI (region of interest). For each ROI, system calculate dense SIFT features on a sampling grid with an interval of 2 pixels [5]. FACE algorithm is compared with SVM, incremental SVM, PCA, ICA, incremental LDA and hierarchical MLBP can be easily integrated. [6]. First, system proposes based on Local Phase Quantization (LPQ) blur-robust face image descriptor and extend it to a multiscale framework (MLPQ) to increase its effectiveness. (Multiscale) Local Phase Quantization Histogram (LPQH) was proposed [7]. This system uses structured space error coding algorithm is used for face detection. LSF (local salient feature) is widely considered [8]. In this system MLBP (multiple scale local binary pattern) is considered for age, occlusion variant face detection [9]. The Local Binary Pattern (LBP) has been extensively known for image representation. AdaBoost learning is applied to select most effective uniform MB-LBP features and construct face classifiers [10]. In this paper different face detection algorithms such as detection with the help of Artificial Neural Network (ANN) and combining it with the Adaboost to gain efficiency. This combines many neural networks together so it is known as Multi ANN. The system uses Independent component Analysis (IDA) for feature extraction. MIT+CMU database is used for testing [11].

III.PROPOSED METHODOLOGY

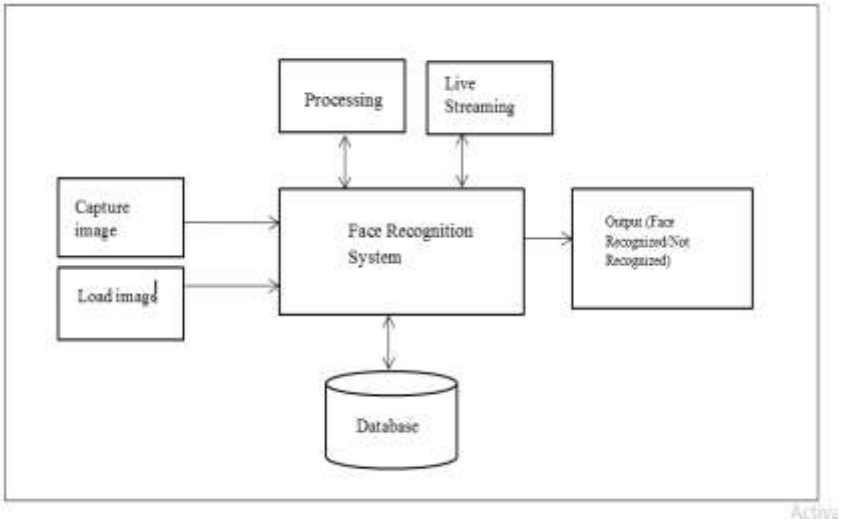

Fig.1: System Architecture

The above figure 1, shows the System Architecture which has mainly 3 parts input, processing and output.

- Input: Input will be provided to the system in the form of image that can be static /dynamic image. Static image means we just need to browse image which is already present in the system and dynamic image is which we need to capture from the camera and save in the database.
- Processing: Processing here is processing on images which are loaded performs different pre-processing techniques on it. These pre-processing techniques need to applied for any image for processing on it. These pre-processing are nothing but channel separation, grey scaling , edge detection, face localization and further cropping feature extraction is carried out on it.
- Recognition system: The image after undergoing all the pre-processing techniques. Classifiers are applied on that image. As whenever image is trained is HSV (hue, saturation and value) is calculated. These HSV values are for each feature marked. Features marked are forehead, eyes, nose, cheeks and chin part. This HSV value will be stored for each user. When for training this person will again recognize his face then previous stored HSV values will be compared with the current HSV values. If it matches then image is recognized. If values are not matched then image is not recognized.
- Live streaming: Live streaming provides real time recognition of face images in order to maintain security. Continuous live streaming is on for the purpose of security. As this system can be used in the security purposes.
- Output: Output of the system will be image will be recognized/not recognized. When image is recognized all the details of user who is captured in image will be displaced. Otherwise no user found message will be displayed.

IV. PRE-PROCESSING TECHNIQUES

1) **Channel Separation**

Channel Separation is used to separate all the channels of the input image. Here RGB Channel Separation is used. In which, Red Green and blue channels will be separated. This is basically done to lower the intensity of the image and proper edges can be captured through this.

2) **Grey Scaling**
In Grey Scaling, Average Grey Scaling method is used. In which (R+G+B)/3 formula is used. Colored RGB image is converted into Grey scale image for getting the edges. If color is too much then processing speed is affected so grey scaling is the mid of the two ends.

3) **Edge Detection**
Edge detection is the process in which input image edges are been find out and this can be further used for face detection. Here, Sobel Edge detection algorithm is used. Edge Detection undergoes steps such as Smoothing i.e. removal of noise, non-maximum suppression i.e. only local edges are marked, thresholding i.e. potential edge marking and edge tracking i.e. maximum edges are marked. Sobel Edge Detection method is used.

4) **Face Localization**
Face localization is basically locating only face feature part in which the system is actually going to process. In this system case, from head to neck part is need to be located for the recognition purpose. It is done by scanning first pixel and locating it, then find first black pixel and local all the min X, min Y, max X and max Y.

5) **Cropping finding**
Cropping is basically separating out only face part which is needed. This is done using separating original image. Considering pixels for min X to min Y and Max X to Max Y and scanning those pixels.

6) **Image Segmentation**
Image Segmentation is the technique to convert the input image into blocks. There are various techniques such as 4 X 4, 16 X 16.But this system uses 8 x 8 windowing technique is used. Segmentation is used for finding out width and height of each clock and calculating the pixels.

7**) RGB to HSV**
HSV basically shows the amount of hue, saturation and value in the original image. HSV gives color information of the luma in the image as well as about color intensity. Hue shows the amount of white pixels content in the image whereas saturation finds amount of black pixels in the image and value shows amount of value in the image. These HSV values are stored for comparison.

8) **Feature Extraction**
Feature Extraction is done for extracting features out of input image. LPOG (Local Patterns of Gradients) method is used for feature extraction in which face is divided into block wised elliptical pattern and LPOG is applied on it.

V.ALGORITHM

1) **ANN Algorithm**
For classification of image fusion of ANN and Euclidean is used for better performance. In ANN, feed forward algorithm and Back Propagation Neural Network is used. Neurons are been generated and mapped with the matching neurons of input image. That mapped neurons are compared with the neurons of output image. This way features are classified and difference is calculated by Euclidean Algorithm. In ANN Feed Forward and Back Propagation Neural Network both are used. Feed forward and Back Propagation is used during Training the set i.e. storing the images into the system and only Feed Forward is used during detection i.e. when detection of images is used. Over here, neurons are features extracted and pixels calculated out of it

2) Euclidean Distance Measure Algorithm
In system Euclidean distance is used for measuring distances, of two image features. Such as image derive the score or value of the image to be compared. Score of trailing image and score of database image is compared. Euclidean distance measure is used for 2D image.

3) Optimized Comparison Algorithm
OCA works basically to reduce time complexity. OCA comes into role when images of database are compared with trailing image. This process consumes time as trailing image is compared with each and every database image rather with the each and every feature of database image. This comparison consumes time to recognize the image. Instead of considering any two features of the trailing image and comparing those features with the features of database image. Then system has to compare these features with less images and our database also gets optimized. Comparison is done with these optimized databases. If image is found else all the optimized database face features will be compared.

VI.RESULT

For evaluating the performance of the proposed collaboration of ANN and Euclidean OCA is used. Result is evaluated in the terms of how much accuracy is gained for the system. Also performance parameters are taken into consideration. Performance parameters such as detection rate of different algorithms specifically comparison of earlier algorithm and proposed algorithm.

Performance parameters such as accuracy of proposed algorithm, specificity, detection rate etc. with the help of algorithm and combination of ANN and Euclidean distance.

The table 1 show images processed in per second using KNN and ANN classifier. As well as table 2 shows detection rate and accuracy using KNN and ANN classifiers.

TABLE I: Images processed per second

Time	KNN	ANN
Images processed per second	44	48

TABLE II: Performance parameters

Parameter	KNN	ANN
Detection rate	93.89%	98.4%
accuracy	95.25%	95%

Figure 1 shows the face recognition been done i.e. whenever the user details are displayed in text fields it is said to be face is recognized.

Figure1: image recognized

Figure 2 shows the list of user's entry in the system.

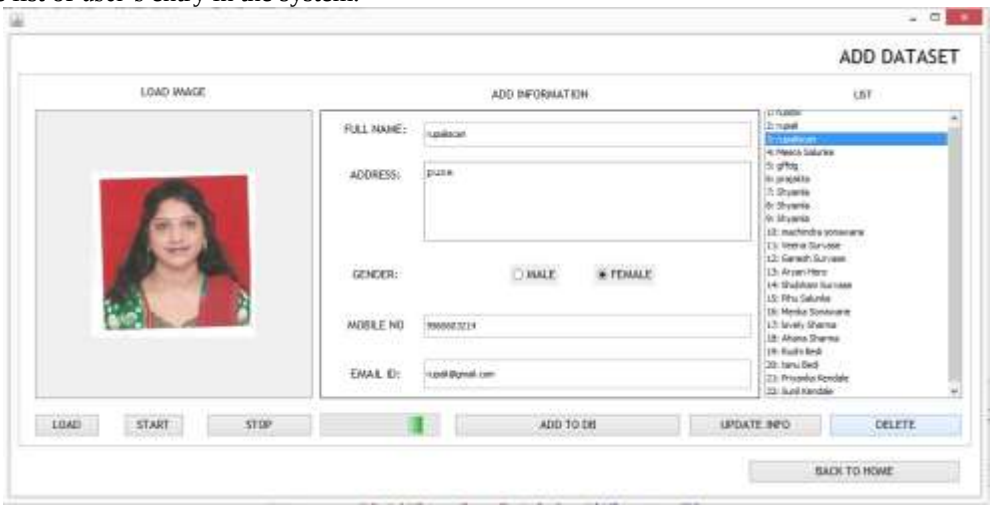

Figure 2: List of users

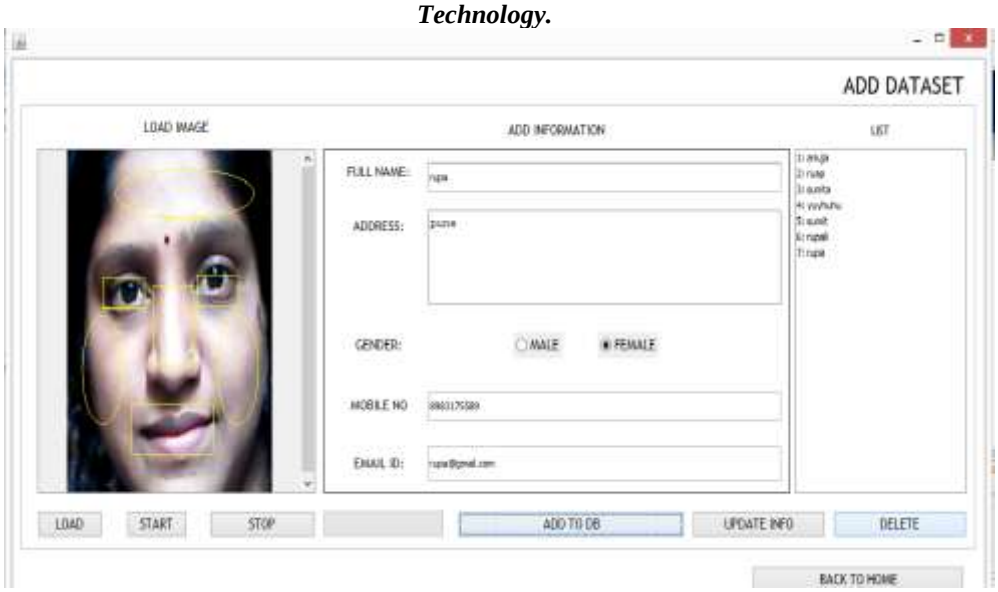

Figure3: Features detected

Figure 3 shows the features detected i.e. forehead, eyes, nose, lips and cheeks.

Figure4 shows the graph displaying the accuracy of the system with different classifiers

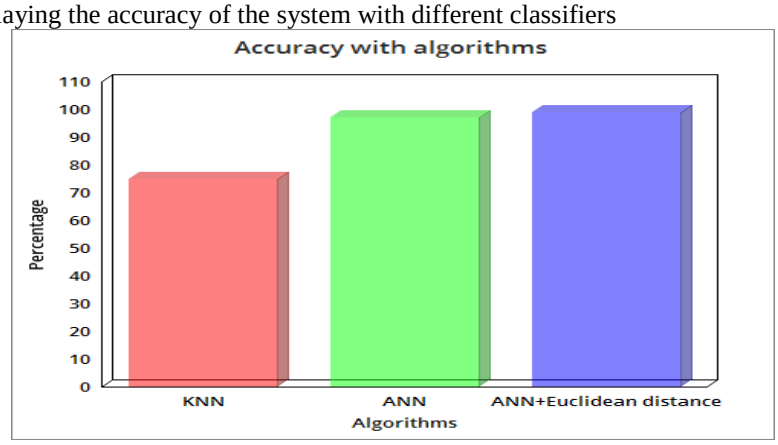

Figure4: Graph showing accuracy

Figure 5 shows the graph displaying the performance evaluation parameters for classifiers.

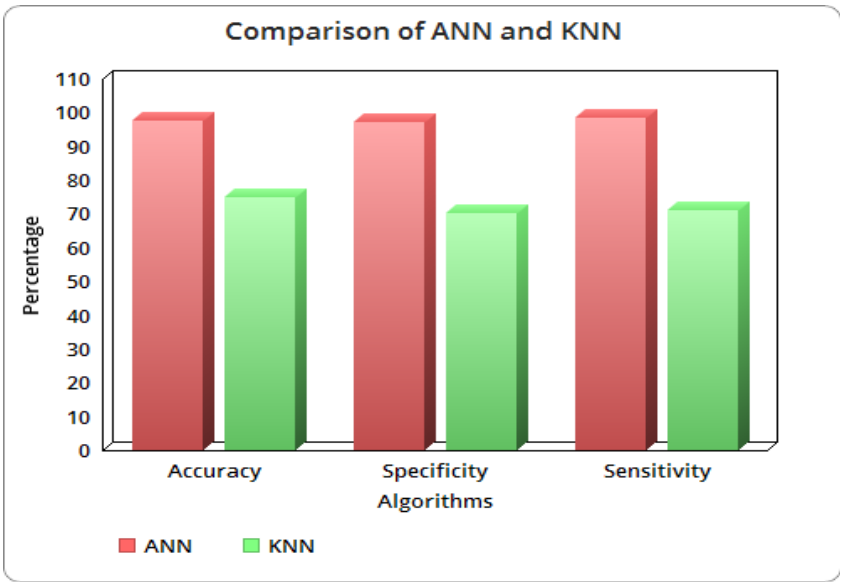

Figure 5: performance evaluation using ANN and KNN

VII. CONCLUSIONS

The image after going different pre-processing steps such as channel separation, Grey scaling, Edge Detection, Face localization, Cropping , Image Segmentation , local feature vectors generation an image is recognized using different classifiers such as ANN and Euclidean Distance measure algorithm. ANN is used for assigning values to the features. These assigned values are compared with trailing image and database image using Euclidean distance measure and result is derived. Image can be loaded that is static image recognition can be done as well as dynamic image recognition can be done that is image can be captured through webcam. However, not only with images but with continuous streaming of images that is live streaming in that image can be recognized by adjusting the scale for capturing the frame per second and accordingly frame will be captured. Using OCA also time complexity is reduced as the two features are compared with the database image, which are recognizing that images are optimized and then database is optimal. And again comparison is done with optimal database. Therefore, time is saved instead comparing with whole database.

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