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Design of Face Recognition System using SIFT, Genetic Algorithm and Neural Network

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Abstract: *Human face detection and recognition play important roles in many applications such as video surveillance and face image database management. In this paper for face recognition the algorithm various algorithms has been used like SIFT, BPNN and Genetic Algorithm in which we recognize an unknown test image by comparing it with the known training images stored in the database as well as give information regarding the person recognized. SIFT is for feature extraction, Genetic Algorithm for optimization of feature dataset and Neural Network for testing of uploaded image. The result evaluation has been done using parameters like FAR, FRR, Error Rate and Accuracy. Result values shows that proposed technique works well for different color complexion faces also and the whole implementation is taken place in MATLAB environment.*

Keywords: *Face Recognition, SIFT, Neural Network, Genetic Algorithm.*

I. INTRODUCTION

Face Recognition is one of the input areas under investigates. It has number of applications and uses. Many method and algorithms are put onward like, 3D facial recognition etc [1]. Face recognition comes under Biometric identification like iris, retina, finger prints etc. The skin of the face is called biometric identifiers. The biometric identifiers are not easily forged; misplaced or shared hence access from side to side biometric identifier gives us a better secure way to provide service and security. We can also develop much intelligent application which may provide security and identity [2]. This work has proposed a novel method for face recognition using Robust SIFT and BPNN. These systems can be well included into mobile and embedded systems professionally and can be utilized on larger scale [3]. Face recognition becomes challenging with varied clarification and pose conditions. This method over comes the varied lighting problem and discovery in noisy environment Rao et.al [4, 5].

In mathematical terms, Face Recognition can be written as:

$$Testing\ Set = P1 * R1$$

Where F= Face Recognition; I= Input symbols; O= Output Symbols; Training Set= P*R; Feature Extraction= F

Face Recognition System:

$$I + (P * R) + F = P1 * R1$$

Below figure shows the face recognition architecture normally followed by each method.

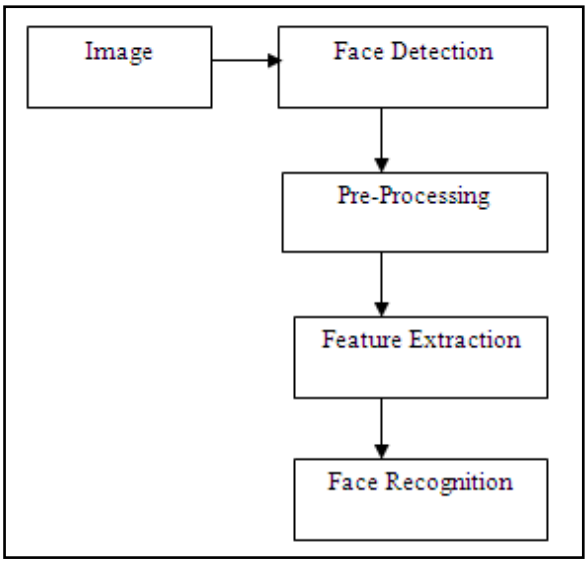

Fig.1: Face Recognition General Method

The image may not always be verified or recognized in facial recognition alone. Indented has created a new product to help with precision. The development of Facet Argus uses skin biometrics, the uniqueness of skin texture, to yield even more correct consequences. The process, called Surface Analysis, works much the same way facial recognition does. A photograph is taken of a patch of skin, called a skin print. That area is then broken up into smaller blocks. It can identify differences between the same twins, which is not yet possible using facial recognition software alone [6].
Human face detection and recognition play important roles in many applications such as video surveillance and face image database management. Earlier many algorithms has been introduced to solve the same problem like SVM, AFNN, Fuzzy logic etc. These techniques does not works well under robust conditions like complex background, different face positions. These algorithms give different rates of accuracy under different conditions as experimentally observed.

That is why this exploration paper proposes a novel plan of whole Face acknowledgment system which includes SIFT for highlight extraction, Genetic Algorithm for highlight improvement and Neural Network for characterization of the spared highlights. The process of face detection will takes place in this manner. There are two segments in this examination work in particular Training and Testing. Firstly gray scale conversion of RBG image takes place. Then feature extraction takes place using SIFT in which mainly three features has been find out i.e. Maximum pixel, minimum pixel, average pixel and adjacent pixel and on that particular sample Scale invariant feature extraction is applied to obtain the key points. The SIFT algorithm predict around 40 to 45% key point for the processing. But SIFT always provides a distinct key point set which would differ by 20% to its predecease. After this application of genetic algorithm is done to reduce the dataset and to optimized it for the further process and should be reduced to get the further proceeding easy.

Then training of uploaded images will be done using neural network. Some mathematical terms used in neural network in this proposed work are Number of iterations, gradient which deals with the magnitude of the weights, mu which deals with updation of the weights and validation checks Now move on to testing panel. Firstly image will be uploaded for testing then testing will be done using SIFT and GA algorithm. In the end result will takes place using chosen parameters like FAR, FRR, Accuracy and error rate. This technique works well for all faces which have a specific complexion varying under certain range [7].

2. OUTLINE OF THE SYSTEM

The system starts with acquisition of the image and then recognition is done at output end. Various step series flowed as image pre-processing, feature extraction, feature reduction and recognition method and it has been described below.

Fig.2: Proposed System Flowchart

2.1 Face Image acquisition

An image has been collected from UMC machine learning algorithms website. The image can be saved into various formats such as Bitmap, JPEG, GIF and TIFF. This FRS can process face images of any format.

2.2 Feature Reduction

To extract features [8] of a face at first the image is converted into a binary. E.g. From the binary image the centric (X, Y) of the face image is calculated using equation 1 and 2.

$$X = \epsilon mx$$
$$Y = \epsilon my/m$$

Where x, y is the co-ordinate values and m=f(x, y) =0 or 1.

2.3 Recognition

Extracted features of the face images have been fed in to the Genetic algorithm for further features reduction and Back-propagation Neural Network for recognition. The unknown input face image has been recognized by Back-propagation Neural Network.

3. METHODOLOGY

3.1 Database Collection

Fig.1: Database

3.2 Feature Extraction Using SIFT

On particular image sample Scale invariant feature extraction is applied to obtain the key points and having their pixel values in the edit text like
maximum pixel value, minimum pixel value, average pixel value and adjacent pixel value. The database file used in MATLAB having .mat extension after applying Scale invariant feature transforms and should be optimized for the further process and should be reduced to get the further proceeding easy.

1st level octave generation
2nd level, 3rd Level pyramid generation
Obtaining key point from the image
Key points plotting on to the image
Magnitude and orientation assignment to the key points
Finding orientation and magnitude for the key point
Forming key point Descriptors & key point neighborhoods
Dividing into 4x4 blocks
Finding orientation and magnitude for the key point

3.3 Training using GA

```
Function [f] = fitness_fn(e,Fs,Ft)
Fs= each feature, Ft = total number of features, e is classification error rate (optimization parameter (unknown))
if Fs<Ft
f=1;      else
f=0;      end      end
% f= (1-e)*((1-Fs)/Ft);
```

The genetic algorithm process applied to the particular image number as shown in the figure that GA is applied to image number 1 and then we will have the data set and we will find the maximum, minimum and average pixel values from the reduced data base created by Genetic algorithm.

3.4 *Training Using NN*

Then the neural network has been used for calculation of gradient function, epochs.

```
Net=newff(Training_set',Target,20);
net.trainParam.epochs
net.trainParam.goal
Net=train (net,Training_set',Target);
```

3.5 *Testing using SIFT*

Then we will apply SIFT on the test image to obtain the key points of the test image and then we will apply it to Genetic algorithm.

```
test_set=mysift(test_data);
siftkey_point=test_set;
```

3.6 Testing using GA

We have applied Genetic to reduce the feature vector of the testing image after applying scale invariant feature transform

```
test_ga_value=Gareduced1(pos,:);
```

3.7 Results

Evaluate FAR, FRR, Error Rate and Accuracy.

4. EXPERIMENTS AND RESULTS

The whole implementation has been taken place in MATLAB 7.10 environment.

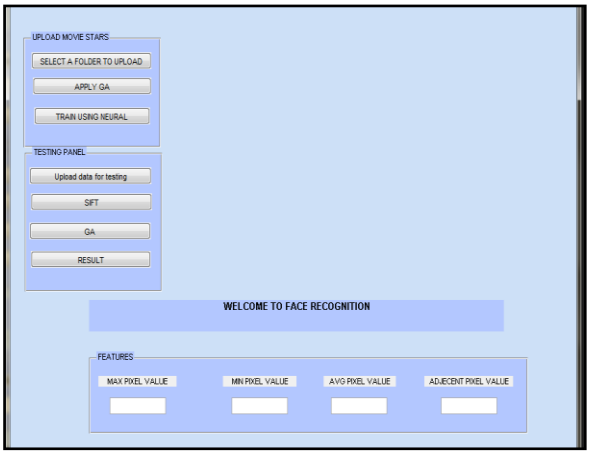

Fig.4: Graphical User Panel

The above figure shows the graphical user panel of the proposed system having user interface controls for example button upload, Genetic algorithm button. Neural network button. The panel contains training and testing section which deals with static and edit text controls in which values will be added.

Table 1: Parameter Evaluation

Parameter	Parameter Values
FAR	0.013
FRR	0.0021
Accuracy	98.4
Error Rate	0.918

Below graph shows the performance measurement parameter values in terms of FAR, FRR, Accuracy and Error rate.

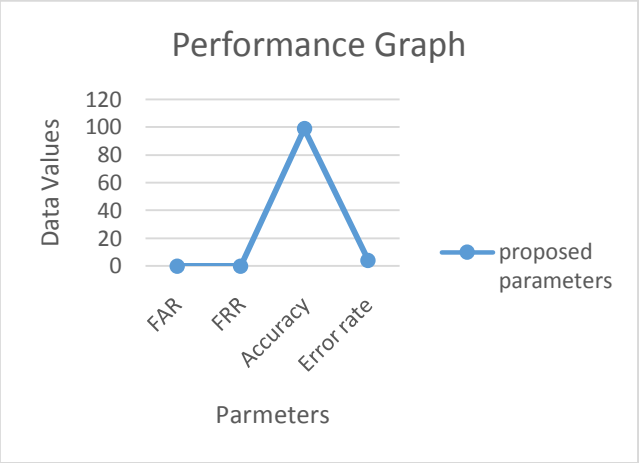

Fig.5: Performance Graph

5. CONCLUSION AND FUTURE SCOPE

The presented work identifies a unique model for face recognition pattern. It evolves two stages of performance namely training and testing. The training part is concern with two algorithm namely SIFT and GENETIC ALGORITHM. The SIFT algorithm predict around 40 to 45% key point for the processing. But SIFT always provides a distinct key point set which would differ by 20% to its predecease. Hence it is required to performance optimization .To reduce the irrelevant features exacted by SIFT algorithm. For the same purpose GENETIC ALGORITHM has been initialized. An further own the training set has been design using BPNN .The training set has been utilized for the testing purpose with varying number of epochs and around 10 hidden neurons. The result computed shows a good amount of accuracy in recognition and decrease in false acceptance rate and rejection rate.

The current research worker opens up of a lot gate for the future research workers optimization algorithm can be changed from GENETIC ALGORITHM to BFO which is more powerful in nature in terms of evaluating complex data. The NEURAL NETWORK applied so far percentage only 10% hidden neurons which can vary accuracy to the size of the data. Hence the future research worker may also try their hands in varying the amount of hidden neuron can see their over the computation.

References

1. Arun, S., et al. "Neural networks and genetic algorithm based intelligent robot for face recognition and obstacle avoidance." 2013 International Conference on Current Trends in Engineering and Technology (ICCTET).
2. Mishra, Deepak, and Shaila Chugh. "Face detection using genetic based SIFT algorithm." Green Computing, Communication and Conservation of Energy (ICGCE), 2013 International Conference on. IEEE, 2013.
3. Long, Tran Binh, and Tran Hanh. "Face recognition using circularly orthogonal moments and Radial Basis Function Neural Network & Genetic Algorithm."Industrial Electronics and Applications (ICIEA), 2012 7th IEEE Conference on. IEEE, 2012.
4. Omidyeganeh, Mona, et al. "Face identification using wavelet transform of SIFT features." Multimedia and Expo Workshops (ICMEW), 2013 IEEE International Conference on. IEEE, 2013.
5. SanthoshKumar, S., et al. "A fast time scale genetic algorithm based image segmentation using cellular neural networks (CNN)." Signal Processing and Communications, 2007. ICSPC 2007. IEEE International Conference on. IEEE, 2007.
6. Lin, Cheng-Jian, et al. "2D/3D face recognition using neural networks based on hybrid taguchi-particle swarm optimization." Intelligent Systems Design and Applications, 2008. ISDA'08. Eighth International Conference on. Vol. 2. IEEE, 2008.
7. Naini, Afsaneh Alavi, et al. "Face detection based on dimension reduction using probabilistic neural network and genetic algorithm." Mechatronics and its Applications, 2009. ISMA'09. 6th International Symposium on. IEEE, 2009.
8. Hua Gu Guangda Su Cheng Du, "Feature Points Extraction from Faces", Image and Vision Computing NZ, pp.154-158, 2006.
9. Srinivasan A, "A frame work for face recognition using adaptive binning and adaboost techniques", The International Journal of Multimedia & Its Applications (IJMA) Vol.3, No.1,pp.76-88, February 2011