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FAST FACE RECOGNITION USING ENHANCED SOM ARCHITECTURE

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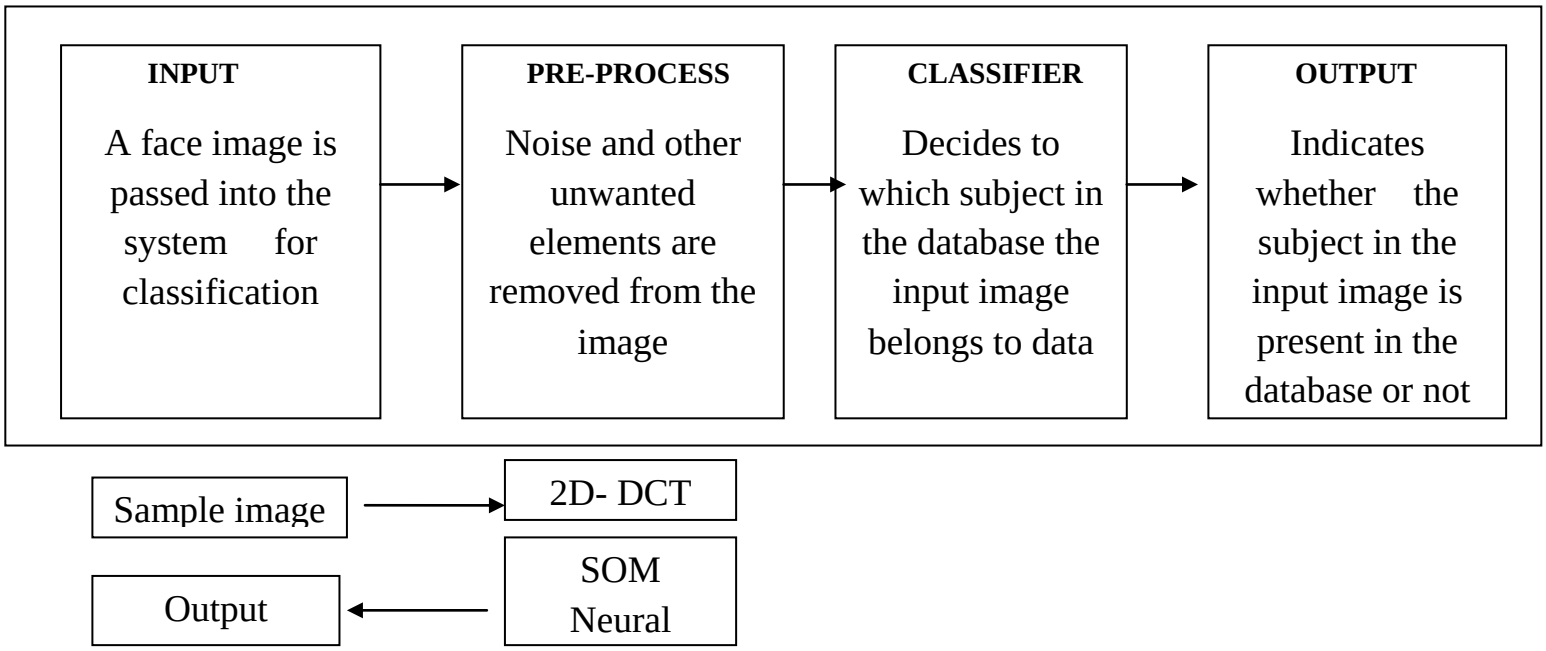
Abstract: Face recognition is one of the challenging problem is still facing in the recent years in many applications and may fields up to date and still there is no solution is to be find to face that problem. Face recognition is the biometric method, and it is one of the undefined solutions that still cannot rectify that problem, because human faces may be changed due to various reactions according to their different situations according to their age, emotional expressions. etc given at different times. When this problem occurs means the output may be incorrect, so that confusion may occurs and it enacts the incorrect results and the total pattern must be changed. So that in this paper we can identify the Face Recognition system for human faces using SOM (Self Organizing Map). So that we can optimize the correct recognition and identify the human face. And to extract the correct image we can use here the algorithm the DCT(Discrete Cosine Transform) to identify the image based on skin color.". So that it is used to easy to classify the images from the database which are present and not present in the database. Then in the inner classification which the process should be made according to the coefficients and weight vectors of the image.

Keywords: **SOM(Self Organizing map), Face Recognition, Discrete Cosine Transforms.**

INTRODUCTION: Even in real time applications and in research side the face recognition as become one of the challenging applications due to increasing in of security side, and robust with the unauthorized security[3] demands and criminal activities law applications. There are many attempts shows that many methods which used are with emphasis on such applications as human-computer interaction (HCI), biometric analysis, content-based image retrieval and content based video retrieval [2]. With the different task face recognition as artificially proved that recognizing [3] the faces with the related face, since the face may be vary according to age, skin color, gender. The problem is still face cannot be identify which it differs in facial [5] expressions, backgrounds etc. In the existing system they survey for finding face they used to identify with the pixel rate of skin dependent on [4] face related features. But this approach got failure in computational oriented like research and real time based, because computation requirements are lot to satisfy the problems of face related features. So that generic features can be varies according to skin color based on the research side. For recognition we use the method of DCT (Discrete cosine Transform) to compress the image which can be used for feature process

Face Recognition Architecture:



In the block diagram for SOM and DCT [1][2][3] which were given that first the sample image is given as input for face recognition. And then the international standard loss image compression algorithm known as JPEG. The DCT is one of the belongings that for a typical image most of the illustrated the significant information about the image is done in just a few coefficients. The extracted DCT coefficients can be uses as a type of signature that is useful for recognition tasks, such as face recognition. Face images have high association and unnecessary information which causes computational burden in terms of processing speed and memory utilization.

DCT(Discrete Cosine Transform) is used to compress the image to find the coefficients and vectors of each image and to find the pixel rate of the image. At the second stage we apply the SOM(Self organizing map) that the images are clustered into an single group. So that whenever we given the image as an input the SOM will recognize [6][7]and match the images whether it has been present in given database or not present in the database. First the images are given to be training and form in a single group, when the image are given to be testing, it will find the recognize the face and given the best result.

SOM is the best technique, that to successfully recognize the face. This technique is better than other techniques then PCA[10] and ICA in existing system for face recognition. In face recognition the SOM method can be classified easily from the given database. Whenever we give a new image in the training database the image compared with the image database which determine if there is a match the face and display the result. It is a very interesting and challenging biometric technique of identifying individuals by facial features. Appearance based, rule based, feature based and texture based methods are the basic methods for face recognition.

I. DISCRETE COSINE TRANSFORM

1. Outline:

The discrete cosine transform is an algorithm which is widely used in all real time applications and research oriented development. The most popular use of the DCT is used to compress the data or images as it forms the basis for the The DCT transforms images from the spatial domain to the frequency domain. Because lower frequencies are more illustrated and significant in an image than higher frequencies, and the DCT[3] discards high frequency coefficients and quantizes the remaining coefficients. So that this reduces data volume which having too much image quality.

2. Collection and example:

In a large database or in data warehouse there may be thousands and millions of valueless images. Since there are thousands and millions of different images are involved also, there must be different variables of each images. So when the images are done in computational loading process is done in the system first the images are classified according to the variables and stored in the database or data warehouse.

So the images in the databases or data warehouse or given training, which it may be large complex databases, without any values assigned to images.,. With the help of biology researchers generally got an idea to identify the relationships bases on the heuristics. Sampling is done here for face recognition, which large amounts of images are taken from the data warehouse. When an analog image is given as sampling the mapping of images are done in continuous of points in space and also done the process in possible time. When the digital image are given as sampling means the mapping can be done from discrete set from one points to another.

3. Spects and Decline:

In the decline(decrease) phase of the face recognition phase, data sets are grouped in to one single group which the datasets are in maximum size or in minimum size from sampling databases. So that for each images measurement is taken from the database, and for sampling reduction can be done.

4. Feature Extraction:

In this process feature extraction is used with the withdraw the samples from the database using the techniques such as categorization, mean of the image which it was taken as the pixel rate of the image, link analysis, division, or distinguish the variation.

5. Grouping:

After grouping all the data , grouping can be done by mapping the data from already defined classes and the classification can be done and after that face can be recognized from the grouping data.

II. 2D – DCT Image Compression:

In this proposed design technique calculates the 2D-DCT by the image blocks of size 8 x 8 pixels using ‘8’ out of the 64 DCT coefficients for masking. The other remaining 56 coefficients are set as zero or discarded. Then the image is then remodeled again by applying the 2D-IDCT of each block using [8]DCT transform matrix computation model. Then the output is a set of arrays. Each array size is in the form of 8 x 8 pixels format and represents a single image. The 2D-DCT matrix contains the most important values, which they correspond to low- frequency components with the image block.

III. SELF-ORGANIZING MAPS

A. Outline:

The self organizing map is also known as Kohonen Map is a well known for artificial neural network. The SOM[7] is an unsupervised learning process, which it shows the distribute set of examples without any class information. It has the property of any network preservation. There is a revolution that the neurons are to be activated or fired, and the final result is only one neuron should be wins in the revolution and others are to be fired and the neuron which are struggled are came in front is called "Winner".

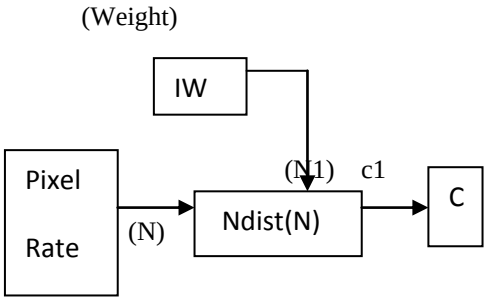
So that SOM network identifies the winner from the procedure from the competitive layer. Anyway by using the kohonen Rule cannot update only the winning neuron, instead of that it update all the neighborhood neuron.

And also it accepts the weights of a neuron to learn an input vector, and which it was considered as useful application.

B. Network Architecture:

SOM can be one-dimensional, two dimensional or multi dimensional maps. The number of input connections in a SOM network depends on the number of elements which are used according to classification.

Architecture of SOM:



The input vectors are given here the pixel(P) for DCT compressed image. Then the distance(dist) is used to measure the distance between the input vector P and the weight matrix IW1 for the vector having s1 elements. The elements of the distances between the input vectors and vectors iW1, from the rows of the input weight matrix. Then the distance is used to measure the weight of the rows of the input weight matrix. The Euclidean distance (dist)is used to find the measurement between the input vector p and the weight vector. The input vector for a layer which it takes the neuron and outputs of 0, and the winner is declared as 0, and the output vector is assigned as 1. The procedure follows here as the competition occurs as the neurons [8] which the positive and negative element as declared as the winner. Then according to the pixel, weight, Euclidean distance the images are classified.

The self organizing map is also known as Kohonen Map[2] is a well known for artificial neural network. The SOM is an unsupervised learning process, which it shows the distribute set of examples without any class information. It has the property of any network preservation. There is a revolution that the neurons are to be activated or fired, and the final result is only one neuron should be wins in the revolution and others are to be fired and the neuron which are struggled are came in front is called "Winner". SOM are in the form of the one-dimensional, two-dimensional or multidimensional. The common one may be [6]one-dimensional or two-dimensional maps. When the input connections are classified, the classifications are done according to the weight and attributes. Then after the classification the input data with weights closest to the neuron vector is declared the winner in training process.

So that SOM network identifies[9] the winner from the procedure from the competitive layer. Anyway by using the kohonen Rule cannot update only the winning neuron, instead of that it update all the neighborhood neuron.

And also it accepts the weights of a neuron to learn an input vector, and which it was considered as useful application. The neighborhood vectors are classified and clusters according to the attributes.

C. Algorithm Implementation Steps:

Step1 – Initialization: Different random values are given for the initial weight vectors wi(0), the weight vectors which are different for j=1,2…. Where 1 is the total number of neurons.

Step2: Sampling: Draw a sample x from the input space with certain probability.

Step 3: Similarity Matching: To find the best matching(winning) neuron i(x) at n time steps by using the minimum distance Euclidean criterion.

Where,

$$i(x)= \arg \min_j ||x(n)-Wj||, j=1,2\ldots 1$$

Step 4: Updating: The weight vector of all neurons are update by using the update formula.

where, $\eta(n)$ is the learning rate parameter, and

$h_{j,i(x)}(n)$ is the neighbourhood function centered around the winning neuron i(x).

Both $\eta(n)$ and $h_{j,i(x)}(n)$ are varied dynamically during learning for best results.

Step 5- Continue with Step-2 until no noticeable changes in the feature map are observed.

Training images are mapped into a lower dimension using SOM network, and for each image the weight matrix are stored in training database. During the recognition trained images are remodeled using matrix format. And the recognition is done through untrained test images using Euclidean distance with the measurement of similarity function.

D. Training:

In the training phase using DCT- vectors are used in the SOM[1][4]. In the training methods the data are given trained that is to group all the data in a

single ware house and are given trained based on the SOM classification methods. During the training phase the images are trained according to the vectors, weight, pixel rate, classification from the image data warehouse. In the network nodes are updated from the learning phase. Then the images are taken as testing from the network, when one image is given for testing the network search whether the images are present in image database comparing to weight, vectors and classification, and then it displays the results which was the best match image for given input based on Euclidean[3][5] distance.

1V. Functions:

The use of face recognition is that it is a useful technique that which is to be effective in all real time applications and in research applications. Mainly it is used in for daily basis as for passport identification, eligible voter card, then for census security as for many face recognition techniques.

V. Experimental Results:

A. Image Database:

In this face image database was created with the use for the target of the face recognition system. So that image database as two subjects for training and testing. After applying SOM the training part contain more than 50 images were be taken with having faces with different facial expressions.

TABLE I

DCT Block Size Vs Recognition Rate

DCT Block Size	4 x 4	6 x 6	8x 8	10x10	12x 12	16x16
Recognition Rate	74.32	77.56	78.3	76.3	74.23	73.23

B. Validation of Techniques:

The preprocessed grayscale images of size 8 8× 8 pixels are reshaped as a 64 × 1 array with 64 rows and 1 column for each image. This technique is performed on all 5 test images to form the input data for testing the recognition system. Similarly, the image database for training uses 25 images and forms a matrix of 64 × 25 with 64 rows and 25 columns. The input vectors defined for the SOM are distributed over a 2D-input space varying over [0 255], which represents intensity levels of the grayscale pixels. These are used to train The SOM with dimensions [64 2], where 64 minimum and 64 maximum values of the pixel are represented of each sample.

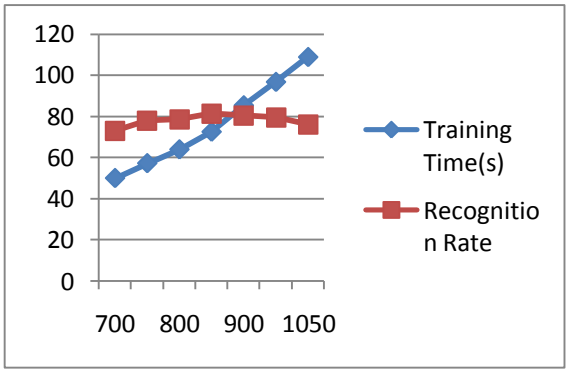
TABLE II

The inner process rate done in Recognition

DCT Coefficient	Training Time	Recognize Rate	Memory use
5	95.67	80.23%	2841720
9	165.09	79.23%	6573480

The results of SOM created with the parameters in a single layer forward to SOM map with more than 128 weights and with the transfer function. The weight function is calculated using Euclidean distance in this network. This SOM network used for all real time applications.

C. Reducing processing time based on eposis



The another method is done by the processing time Using an eposis for all the overall system. The time which it mainly concentrates on time for training period in the SOM network. The training time taken depend on the number of epochs for training. Mainly this method is used for reducing the training time according to the calculation done for recognition.

The aim of this experiment is to reduce training time, while maintaining the previously calculated recognition rate in experiment 2 for the reduced DCT-feature vectors. Table 3 shows that the best recognition rate achieved with the least amount of processing time is for the case of 850 training epochs. Recognition rate results obtained are the average of ten consecutive simulations.

Then the output results of the SOM created with the parameters according to the weight of the image in the network with the help of Euclidean distance. So that after applying SOM the images are displayed according to the

result. When after 5 images are given training means with the same database without any overlapping.

D. DCT Block Size:

The DCT block size were taken according to the pixel rate, vector of the image, and the weight of the image which the block size were taken 8 x 8 for recognition used in all subsequent experiments.

In the large sized feature vectors as been used means we will got a computational load, then applying the DCT we can calculate for large image database, we can assign the weight and the vector of the each image with the system performance. With the help of DCT we can get the train the data in the image database, then we can select the image and recognize the image using DCT Feature Extraction.

VI. Conclusion:

This paper has presented Fast Face Recognition using SOM architecture which it derives from DCT coefficients, along with the SOM classifier. SOM is sheet-like artificial neural network, the cells of which become specially tuned to various input signal patterns or classes through an unsupervised learning process. Each cell or local cell group acts like separate decoder for the same input it is thus the presence or absence of an active response at the location and not much the exact input-output signal transformation or magnitude of the response, that provides an interpretation of the input information. SOM reduce dimensions and display similarities. Self-Organizing Maps are topologically ordered, which leads to good extracting feature ability.

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