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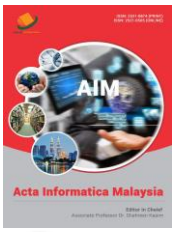

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RESEARCH ARTICLE

FACE RECOGNITION BY USING NEURAL NETWORK

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ABSTRACT

Now a day's security is a big issue, the whole world has been working on the face recognition techniques as face is used for the extraction of facial features. An analysis has been done of the commonly used face recognition techniques. This paper presents a system for the recognition of face for identification and verification purposes by using Principal Component Analysis (PCA) with Back Propagation Neural Networks (BPNN) and the implementation of face recognition system is done by using neural network. The use of neural network is to produce an output pattern from input pattern. This system for facial recognition is implemented in MATLAB using neural networks toolbox. Back propagation Neural Network is multi-layered network in which weights are fixed but adjustment of weights can be done on the basis of sigmoidal function. This algorithm is a learning algorithm to train input and output data set. It also calculates how the error changes when weights are increased or decreased. This paper consists of background and future perspective of face recognition techniques and how these techniques can be improved.

KEYWORDS

ANN, BPNN, NLP, PCA, Resilient Back propagation

1. INTRODUCTION

Face Recognition is a biometric software or computer application which identifies or verifies person automatically and that to from a digitalized image or from other video sources. It is a technique in which the individual faces are recognized which are already stored in the database. It is majorly used for person's verification, security, computer entertainment, passport verification, criminal list verification, border checkpoints, e-mail authentication, etc.

The techniques or methods which are described in this paper are as follows:

PCA: It is a statistical technique which is used for the dimensionality reduction while preserving the required information or it is a way of identifying the patterns in data and expressing the data in such a way so that their similarities and differences can be highlighted. This technique is mainly used for converting the set of input values of correlated variables into the set of values of linearly uncorrelated variables.

BPNN: Back propagation Neural Network is multi-layered network in which weights are fixed but adjustment of weights can be done on the basis of sigmoidal function. It also calculates how the error changes when weights are increased or decreased.

ANN: Artificial Neural Network is inspired by biological neural network which are used for the approximation or estimation of functions which depends upon large number of inputs.

RESILIENT BACK PROPAGATION: Resilient Back Propagation is an algorithm which can be used for training the neural network, similar to the back propagation. It has advantage over Back Propagation; the training is faster than Back Propagation.

EIGEN FACES: Eigen faces is the name given to an Eigen vectors set when they are used in computer vision problem of human face recognition. Eigen faces themselves from a basis set of all images used to construct the covariance matrix.

FEEDFORWARD NEURAL NETWORK: In Feed forward Neural Network, Back propagation cannot be done as a feedback in the network.

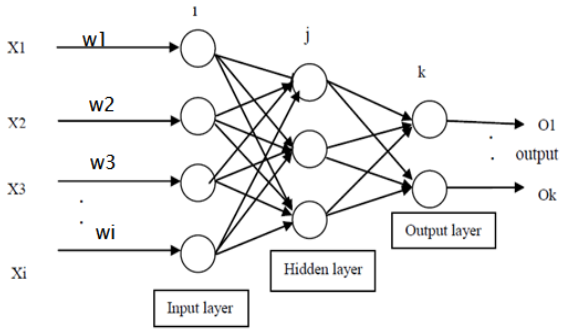

Figure 1: Back Propagation Neural Network

2. LITERATURE REVIEW

This section deals with the analysis that we have done on the above stated techniques or methods. Several papers have been critically analyzed which are as follows: The PCA technique is used to reduce the dimensionality of face and BPN is used for the recognition purposes. The eigen faces extracts the characteristic features which is then combined with BPN for the recognition of the images. Each face image is stored in a

one-dimensional array. The method which is proposed in this paper is tested on ORL face database. It provides high accuracy and also the fast computation. This has an acceptance ratio greater than 90% and also the execution is fast [1].

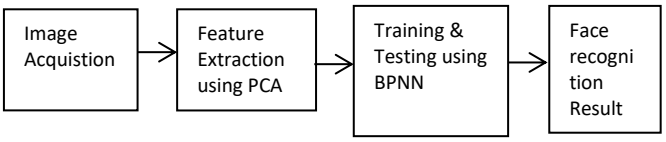

Figure 2: Block Diagram of Face Recognition System

The implementation of face recognition system is divided into the three parts. The first part is recognition of face automatically by using BPNN, second part is the facial extraction of features, and the third part is artificial intelligence and BPNN [2], [3]. In this, the verification and identification of face is done by using Principle Component Analysis and Back Propagation Neural Network. The dimensionality reduction is done by PCA and recognition by BPNN. Therefore, it is more secured and also efficient. Its acceptance ratio is greater than 90% and also non-linear face images can also be recognized easily. This paper presents approach for human face recognition. This facial recognition was done by the characteristic's comparison of the new face with the known one. In this, Face localization part the end point of mouth and also eyeballs are obtained. In feature Extraction part, the distance between end point of mouth and eyeballs were calculated [3], [4]. The recognition is done using Back Propagation Networks and Radial Basis Function networks.

The transformation for different inputs is compared with unknown face to detect whether the given face is contained in database or not. This method shows the high recognition rate and accuracy for human face recognition. The various problems occurred in this due to the motions and the subject orientation. But subject orientation problem is overcome by training neural network. Eigen face algorithm works well when variation in lighting is small [5]. This paper proposed a technique for the face recognition by using eigen faces with artificial neural network. The facial structure is converted into eigen values, the eigen faces are implemented using eigen vectors, values and also Jacobi's method. By testing of the original image, the human face detection is done and therefore this technique is more efficient than other techniques [6], [7]. The use of Eigen faces is more accurate and also its computation is fast, the non-linear images can also be recognized very easily. Therefore, it is said that this method has good acceptance ratio and that to more than 90% and has fast computation and execution.

The Back-Propagation method is a learning algorithm to train input and output data set. By using back propagation neural network, the recognition rate of the system was 99.2%. The BPNN is widely used than other neural network algorithm because of the ability to reduce the errors. It extracts the features from human face having different features such as differential projections and other features. Firstly, the training set is collected, then network is trained, and then mapping and accuracy for recognition is tested. The comparison of the proposed method is done with principal component analysis method, the linear discriminated analysis method, and Markov Random Fields (MRF) method. The ORL face database is used to show the recognition rate by 98% by the use of only 13 features [2], [10]. Thus, there was improving in the accuracy, effectiveness and computational complexity.

3. PROPOSED FACE RECOGNITION SYSTEM

A simple face recognition system includes some basic steps like input as digital image then it includes face detection after detection it include feature extraction then face identification by matching it from face database.

3.1 Input Image

Please Input image include a digital image that is being identified. It may be taken from any cameras or from any video frame or database. It may also be taken from nay airport railway station or from any place. Then this image has sent to face detection process.

3.2 Face detection

Face detection can be regarded as a specific case of object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class. Examples include upper torsos, pedestrians, and cars. Face-detection algorithms focus on the detection of frontal human faces. It is analogous to image detection in which the image of a person is matched bit by bit. Image matches with the image stores in database. Any facial feature changes in the database will invalidate the matching process. Firstly, the possible human eye regions are detected by testing all the valley regions in the gray-level image. Then the genetic algorithm is used to generate all the possible face regions which include the eyebrows, the iris, the nostril and the mouth corners. Each possible face candidate is normalized to reduce both the lightning effect, which is caused by uneven illumination; and the shirring effect, which is due to head movement. The fitness value of each candidate is measured based on its projection on the eigen-faces. After a number of iterations, all the face candidates with a high fitness value are selected for further verification. At this stage, the face symmetry is measured, and the existence of the different facial features is verified for each face candidate.

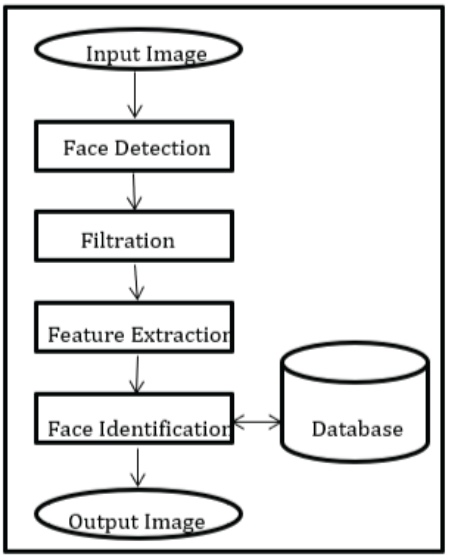

Figure 3: Proposed Face Recognition System

3.3 Filtration

This includes the reduction of unwanted noise, irregular brightness, illumination effect, image refinement etc. Its basic function is to make the image smooth and fine for feature extraction

3.4 Feature Extraction

Feature extraction starts from an initial set of measured data and builds derived values (features) intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction. When the input data to an algorithm is too large to be processed and it is suspected to be redundant (e.g. the same measurement in both feet and meters, or the repetitiveness of images presented as pixels), then it can be transformed into a reduced set of features (also named a feature vector). Determining a subset of the initial features is called feature selection. The selected features are expected to contain the relevant information from the input data, so that the desired task can be performed by using this reduced representation instead of the complete initial data.

3.5 Face Identification

This step includes the matching of faces being extracted in form of features are being matched from the database which is a collection of many images which has already being processed. If the image matched from it then it can be concluded that the image is matched and is present in the database. If this happens then we have successfully processed the image.

3.6 Applications

Machine recognition of faces has several applications, ranging from static matching of controlled photographs as in mug shots matching and credit card verification to surveillance video images [10]. There are various application areas in which face recognition can be used for various purposes:

1. It is used for security such as in person's verification, border checkpoints, airports or seaports, ATM machines, passport verification, etc.

2. It is used in internet communication.

3. Used in computer entertainment.

4. It is used in verification of electoral identification.

5. Used in authentication of e-mail on multimedia 0workstations.

6. Machine learning is used in healthcare by combining the computer vision for producing the accurate result of the patient.

4. RESULTS & DISCUSSION

The results and discussion of this paper is discussed in table-I.

Table 1: Result Face Recognition System

METHODS	ADVANTAGES	DISADVANTAGES	RECOGNITION RATE
PCA	High accuracy can be obtained.	It is less robust.	99.2%
BPNN	1. Highly accurate. 2. It can be used for the detection of online real time.	Robustness is low.	96.6%
RESILIE-NT BPN	Non -linear images recognized.	Not suitable for small sized data base.	98.3%
EIGEN FACES	It gives good recognition rate than K-means and fuzzy c-means.	It is very sensitive mismatches occurs due to large size of head orientation.	97%
FEED FORWA-RD NN	The input side weights are reduced to approximately 30%.	Recognition rate is poor.	93.7%

5. CONCLUSION

Face Recognition can be used in various purposes such in security purposes, Verification of the criminals in the police department, ATM machine for the security of the card, Driving License and Visa Processing. Face Recognition technique can be used with back propagation and PCA for non-linear face images. A survey on various methods has been done in order to identify and classify which technique gives more recognition rate.

FUTURE WORK

This can be implemented as to recognize the faces which are covered with any mask. This paper work on when persons covered their face by hands then we try to identify the person with his/her ear, jewelry, behavior like smile, dimples, etc. This can also be implemented in face recognition by using Back Propagation neural network.

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