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Binary Representation for Face Detection and Recognition with Back Propagation Neural Network

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***Abstract* - In this paper, an neural network is used to detect frontal views of faces. The recognition can be done by the Back propagation Neural Network (BPNN). Also, we reviewed some of the recent research works on face recognition algorithms. Issues with the previous face recognition techniques are recognition rate , time required is more for face recognition and database required to store the face images. To overcome these problems binary representation of face image technique can be used.**

KEYWORDS - Binary Representation, Neural Networks, Feature Extraction,Nodal Points.

I. INTRODUCTION

The process of face detection involves the detection of face image of human being and face recognition involves comparing an image with a database of stored faces in order to identify the individual[20]. Face detection and recognition has attracted broad interests in the area of pattern recognition since from the past 20 years. Face recognition is quite easy for a human being, but for the computer it is a difficult task.So face recognition is a critical issue in today's world.

Neural network is an interconnected group of artificial neurons and it uses a mathematical model for information processing. The difficulty level increases when two persons match the faces.In order to reduce the storage requirements for face images and to improve the performance of a neural network system the Binary Representation method is used. The basic idea of Binary Representation is to extract the essential features on a face. Therefore it helps in increasing the performance of face recognition and also reduces the storage requirements to store the captured faces[1].

Our literature review indicates that problem of face recognition is still a critical issue and having some limitations. These are recognition rate, time required for face recognition time and storage requirements of the captured faces. Some of the important research papers studied and tabular overview is presented in next part of the paper.

II. RELATED RESEARCH WORK

Face detection methods are classified into following four different broad categories. They are:

(i) Knowledge based method
(ii) Feature Invariant method
(iii) Template matching method
(iv) Appearance based method.

Literature survey on Previous face recognition methods	Overview of issues with previous face recognition methods		
	Year/Authors	***Based on***	***Limitations/ongoing work***
	1994 G. Yang , T. S. Huang[8][9]	Knowledge of face	Difficulty in building appropriate set of rules
	1995, T.K. Leung, M.C. Burl, and P. Perona[10]	Facial Features	Can't achieve good results with variations in pose,shape
	1999, H. Wu, Q. Chen, M. Yachida[11][12]	Multiple Features	Detect faces with features such as beard and glasses
	1993, A. Tsukamoto, C.-W. Lee,and S.Tsuji[13][13][14]	Predefined Templates	Subtemplates used for future work
	1992,A. Yuille, P. Hallinan, and D. Cohen[15][16]	Deformable Templates	Deformable template must be initialized in the proximity
	2013, Jian Yang , Delin Chu[1]	Feature Extraction	Sparse representation of facial features
	2012, Stefanos Zafeiriou, Georgios Tzimiropoulos, Maria Petrou, Tania Stathaki[2]	Eigen Analysis	Face Recognition time is more
	2011, Yong Xu, Jian Yang, Jing-Yu Yang[3][5]	Supervised Learning	In the future, anyone can explore the applications of this two-phase classification framework on other methods
	2005, Jian Yang, Alejandro F.Frangi, Jing-yu Yang[6][7]	Kernel Methods	Difficulty in analyzing and recognizing patterns for classification
	2011,Mohammod Abul Kashem, Md. NasimAkhter, Shamim Ahmed[4]	Creation of template	Database size is more to store templates

3. PROPOSED SYSTEM

A. Nodal Points

Nodal points are the Distinguishable landmarks on individual face. E.g. distance between the eyes, width of the nose, length of the jaw line[4].If nodal point is selected then white spot is shown, remaining spot is shown as black.

B. New User Registration

Face image is captured by using laptop camera and to register the new captured face image, user has to enter his details such as name,email id, contact etc.Now nodal points are selected for that captured face image and then face image is saved in database with the selected nodal points.

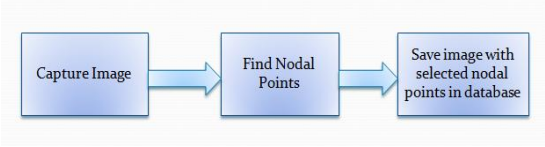

Fig. 1: New User Registration

C. Face Recognition of User

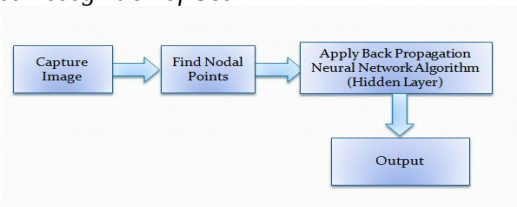

Fig. 2: Face Recognition of User

New user has to capture his face image by using camera and nodal points are selected. Back propagation neural network algorithm is used to match the two faces.BPNN algorithm is explained further.

III. BACKPROPAGATION ALGORITHM

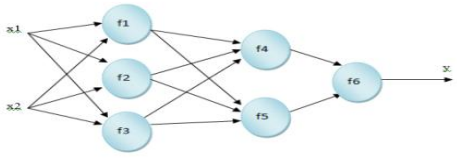

Fig.3:Input training set passed by using back propagation technique

The backpropagation algorithm is used to train the Artificial Neural Networks[17]. Backpropagation algorithm can be used for many practical applications. The BP algorithm used to calculate the weight changes of artificial neural networks. Above picture shows three layer neural network with two inputs and one output. Training set of nodal points are passed as x1 and x2.Activation function is calculated with the help of nodal points and matched with the stored face images with selected nodal points. Activation function is recalculated by using back propagation to reduce the error and to improve the performance. If face image is matched greater than 70% then popup box is shown with the individual details which are saved at the time of registration, otherwise popup box shows face is not matched.

IV. CONCLUSION AND FUTURE SCOPE

Face recognition has received substantial attention from researches in biometrics, pattern recognition field and computer vision communities. Face recognition can be applied in Security measure at Air ports, Passport verification, Criminals list verification in police department, Visa processing, Verification of Electoral identification and Card Security measure at ATM's. In this paper, we reviewed some of the recent research works on face recognition .We classified face recognition approaches using knowledge based methods, feature invariant method, template based methods and appearance based methods.

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