International Journal of Engineering Research and Application *www.ijera.com ISSN : 2248-9622 Vol. 9,Issue 3 (Series -II) March 2019, pp 39-42*

RESEARCH ARTICLE OPEN ACCESS

A comparative experimental analysis of separate and combined feature extracion and recognition for ANN

Rahul Kundu[1] Darshna Kundu[2]

(Cyber Security Consultant) Tata Consultancy Services, London, United Kingdom
(Salesforce Consultant) WEX Europe Services,Crewe,United Kingdom
Corresponding Author: Rahul Kundu

ABSTRACT: In this article we are going to do the face recognition, using the neural network concept. In this whole process of face recognition, it deals with 3 different techniques for extracting features from the image. These techniques used for feature extraction are Discrete Wavelet Transform(DWT), Discrete Cosine Transform(DCT), Sobel Edge Detection(SED). Face detection is a first necessary step in face recognition systems, with the purpose of localizing and extracting the face from the background. This paper presents aneural network architecture Self-Organizing Map (SOM) for face recognition. The SOM method is trained on images from the database. The novelty of this work comes from the integration of images from database, Training and Mapping. Face Recognition here is using unsupervised mode of training in artificial neural network by SOM. Among all architectures and algorithms suggested for artificial neural network, the Self-Organizing Map has special property of effectively creating spatially organized "internal representation' of various features of input images and their abstracts.

Keywords: Face Recognition (FR);Discrete Wavelet Transform (DWT); Discrete Cosine Transform (DCT); Sobel Edge detection(SED); Self Organising map (SOM); Neural Network.

Date of Submission: 21-02-2019 Date of acceptance: 10-03-2019

I. INTRODUCTION

In recent years many sensing devices, computational powers and intelligent papers have been developed in the field of image processing. In last 20 years, machine recognition of faces is becoming a growing interest. Face recognition is one of the challenging problems, there is no technique that provides a robust solution to all situations and different applications that face recognition may encounter. Face recognition has several characteristics which are advantageous for consumer applications. Also, the need for an automatic face recognition system especially at the border control, like airports is becoming very important to strengthen the security. Generally, feature extraction and classification criterion are the two basic operations of any face recognition system. Face recognition consist of neural network design process. In which data is being collected. Then creation and configuration of network is done. After network configuration, the adjustable network parameters (called weights and biases) need to be tuned, so that the network performance is optimized. This tuning process is referred to as training the network. The validation of network is done.

II. NEURAL NETWORK

Generally systems of interconnected neurons which can compute values from inputs, and are capable of machine learning as well as pattern recognition because of their adaptive nature are known as neural network. Like other machine learning methods, neural networks have been used to solve a wide variety of tasks that are hard to solve using ordinary rule-based programming, including computer vision and speech recognition as well as face recognition.

III. DISCRETE WAVELET TRANSFORM

DWT has been used in various face recognition systems in order to extract multiple sub-band face images. These sub-band images contain coarse approximations of the face as well as horizontal, vertical and diagonal details of faces at various scales. These wavelet-based methods focus on the sub-bands that contain the most relevant information to better represent the face image.

IV. DISCRETE COSINE TRANSFORM

DCT is data independent and can be implemented using a fast algorithm. The discrete cosine transform (DCT) represents an image as a sum of sinusoids of varying magnitudes and frequencies. The DCT has the property that, for a typical image, most of the visually significant information about the image is concentrated in just a few coefficients of the DCT. For this reason, the DCT is often used in image compression applications. For example, the DCT is at

the heart of the international standard lossy image compression algorithm known as JPEG.

V. SOBEL EDGE DETECTION

Sobel Edge detection is the process of localizing pixel intensity transitions. The edge detection have been used byobject recognition, target tracking, segmentation, and etc. Therefore, the edge detection is one of the most important parts of image processing.

VI. METHODOLOGY

In this section procedure has been discussed, the work flow for the face recognitionsystem process has following steps:

1) Collect data.
2) Create the network.
3) Configure the network.
4) Initialize the weights and biases.
5) Train the network.
6) Validate the network.
7) Use the network.

After the image is provided at the input it undergoes preprocessingstage .In the pre-processing stage of theproposed system, a facial region based on skin color detection is cropped from an input image. The obtained facial region is then resized into 50×50 pixel image to make the face recognition system scale invariant. After then, histogram equalization is applied to enhance the image brightness and contrast.

This topic discusses the basic ideas behind steps 2, 3, 5, and 7. The details of these steps come in later topics, as do discussions of steps 4 and 6, since the fine points are specific to the type of network that you are using. (Data collection in step 1 generally occurs outside the framework of Neural Network Toolbox software, but it is discussed in Multilayer Neural Networks and Back propagation Training.).

The Neural Network Toolbox software uses the network object to store all of the information that defines a neural network. This topic describes the basic components of a neural network and shows how they are created and stored in the network object. In SOM also known as a Kohonen Map,which is awell-known artificial neural network. It is an unsupervisedlearning process, which learns the distribution of a set of patterns without any information of class. There is a competition between the neurons to be fired. The result is that one neuron that wins the competition is fired and that is the "winner" neuron. A winner neuron is identified by the SOM network using the same procedure as employed by a competitive layer. However, instead of updating only the winning neuron, all neurons within a certain neighborhood of the winning neuron were updated using the Kohonen Rule.

After a SOM neural network has been created, it needs to be configured and then trained. Configuration involves arranging the network so that it is compatible with the problem you want to solve, as defined by sample data. After the network has been configured, the adjustable network parameters (called weights and biases) need to be tuned, so that the network performance is optimized. This tuning process is referred to as training the network. Configuration and training require that the network be provided with example data. This topic shows howto format the data for presentation to the network. It also explains network configuration and the two forms of network training: incremental training and batch training.

VII. SIMULATION RESULTS

In this section test results with SOM architecture are presented.

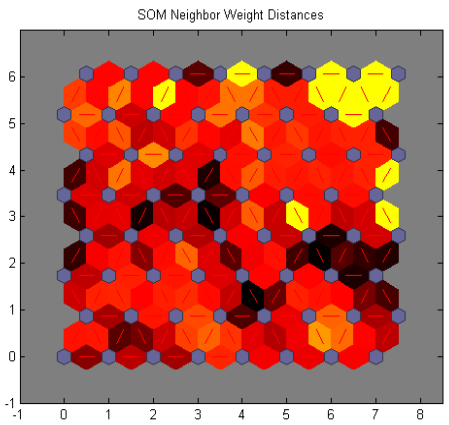

Fig. 3. SOM neighbor weight distance of Sobel Edge

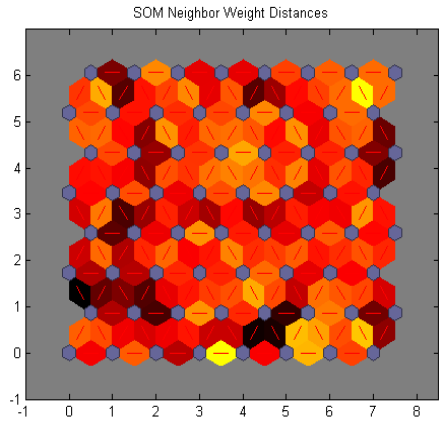

Fig. 4. SOM neighbor weight distance of DWT

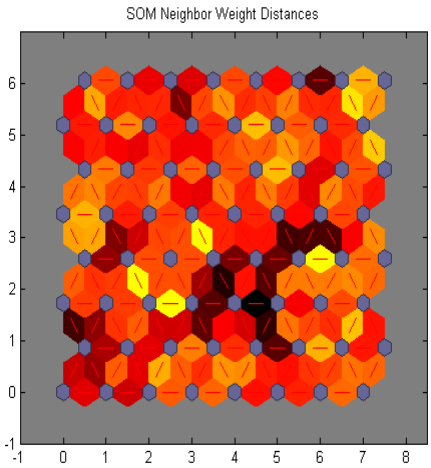

Fig.5. SOM neighbor weight distance of DCT

Face Recognition using SOM Self Organizing Maps Result Analysis

Sr. No.	Image Name/ Feat	Clusters	Sobel		DCT		DWT	
			Value	Mean	Value	Mean	Value	Mean
1	'subject01.normal_crop.jpg'	CL-1	33	38	37	43.6	23	18
2	'subject01.sad_crop.jpg'		42		26		12	
3	'subject01.sleepy_crop.jpg'		41		43		5	
4	'subject01.surprised_crop.jpg'		57		53		22	
5	'subject01.wink_crop.jpg'		17		59		28	
6	'subject02.normal_crop.jpg'	CL-2	28	30.8	18	31.8	8	13.8
7	'subject02.sad_crop.jpg'		27		17		16	
8	'subject02.sleepy_crop.jpg'		21		18		7	
9	'subject02.surprised_crop.jpg'		20		57		6	
10	'subject02.wink_crop.jpg'		58		49		32	
11	'subject03.normal_crop.jpg'	CL-3	6	22.6	62	50.2	2	3.4
12	'subject03.sad_crop.jpg'		14		40		3	
13	'subject03.sleepy_crop.jpg'		30		46		1	
14	'subject03.surprised_crop.jpg'		32		56		10	
15	'subject03.wink_crop.jpg'		31		47		1	
16	'subject04.normal_crop.jpg'	CL-4	1	6.8	21	19.4	17	30.4
17	'subject04.sad_crop.jpg'		1		21		17	
18	'subject04.sleepy_crop.jpg'		19		14		58	
19	'subject04.surprised_crop.jpg'		3		22		43	
20	'subject04.wink_crop.jpg'		10		19		17	
21	'subject07.normal_crop.jpg'	CL-5	8	13.6	32	22	35	41.8
22	'subject07.sad_crop.jpg'		24		16		49	
23	'subject07.sleepy_crop.jpg'		16		24		35	
24	'subject07.surprised_crop.jpg'		5		8		57	
25	'subject07.wink_crop.jpg'		15		30		33	
26	'subject08.normal_crop.jpg'	CL-6	47	46.8	33	8.8	38	51
27	'subject08.sad_crop.jpg'		61		5		53	
28	'subject08.sleepy_crop.jpg'		45		2		54	
29	'subject08.surprised_crop.jpg'		38		3		47	
30	'subject08.wink_crop.jpg'		43		1		63	

Fig. 8. Result analysis of Sobel, DCT, DWT

Source Codes	Time Seconds	Epochs
Edge_feat.m	0.12	200
Dct_feat.m	0.14	200
DWT_feat.m	0.03	200

Fig. 10. Result comparison of 3 techniques

VIII. CONCLUSION

This paper present's a novel face recognition technique that uses features derived from DCT, DWT, Sobel Edge, alongwith a SOM Neural Network Architecture. The system was evaluated inMATLAB using an image database of 30 face images,containing six subjects and each subject having 5 images with different facial expressions.The system achieved a recognition rate of 100% with same training and testing data.

The DWT technique is faster than DCT and Sobel Edge Detection.The image is recognized faster by DWT i.e in 0.03 sec in 200 epochs. This makes our system well suited for high speed, low-cost, real-time hardware implementation.

In future work, a face detection system will be discussed based on using Pattern Net and Back propagation artificial neural network (BPNN) architecture with many hidden layers.

REFERENCES

[1]. MahendraPratapPanigrahy and Neeraj Kumar: Face Recognition using Genetic Algorithm and Neural Networks, International Journal of Computer Applications (0975 – 8887) Volume 55– No.4, October 2012.

[2]. Pankaj Bhandari, Pankaj K Gupta, Karthik U.S Goutham Reddy, Jeeva.B: Analysis of Face Recognition Based On Edge Detection Algorithm with Hardware Interfacing, Vol. 3, Special Issue 3, April 2014.

[3]. Prof K.H. Wanjale, SaurabhPadmane, Prashant Sethi, Pratik Shah, Sagar Thakur: Face Recognition in Video-A Survey, International Journal of Emerging Technologies in Computational and Applied Sciences (IJETCAS).

[4]. Henry A. Rowley, ShumeetBaluja, Takeo Kanade: Neural Network Based Face Detection, 1996.

[5]. S.Venkatesan and M.Karnan: Advanced Classification using Genetic Algorithm and Image Segmentation for Improved Face Detection., computer research and Development 2010 second International Conference (ICCRD) 7-10 May2010 Page364-368

[6]. Gur, E., Zalevsky, Z., 2007, Single-Image Digital Super- Resolution A Revised Gerchberg Papoulis Algorithm, IAENG international Journal of Computer Science, 34:2, IJCS_34_2_14.

[7]. Y. Suzuki, H. Saito, D. Ozawa, Extraction of the human face from natural background using GAs, Proceedings of the IEEE TENCON, Digital Signal Processing Applications, Vol. 1, 1996, pp. 221}226.

[8]. A.M. Mohamed, A. Elgammal, Face detection in complex environments from color images, Proceedings of International Conference on Image Processing 3 (1999) 622}626.

[9]. Brunelli, R. and Poggio, T., "Face recognition: features versus templates," IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 15, No. 10, pp. 1042 -1052, 1993.

[10]. Chellappa, R., Wilson, C.L. and Sirohey, S., "Human and machine recognition of faces: a

survey," Proceedings of the IEEE, Vol. 83, No. 5, pp. 705 -741, 1995.

[11]. A.Samal and P.A.Iyengar (1992): -Automatic recognition and analysis of human faces and facial expressions: A survey. Pattern Recognition.

[12]. K. Okamoto, S. Ozawa, and S. Abe. A Fast Incremental Learning Algorithm of RBF Networks with Long-Term Memory. Proc. Int. Joint Conf. on Neural Networks, 102-107, 2003.

[13]. M.A.Turk and A.P.Petland, (1991) "Eigenfaces for Recognition," Journal of Cognitive Neuroscience. vol. 3, pp.71-86.

Rahul Kundu" A comparative experimental analysis of separate and combined feature extracion and recognition for ANN" International Journal of Engineering Research and Applications (IJERA), Vol. 09, No.03, 2019, pp. 39-42