Natural Object Categorization Using Artificial Neural Network

[1]E.Deepankumar, [2] M.Sathishkumar, [3] A.Periyasamy, [4] V.Surendhiran

[1]Assistant Professor, [2]Assistant Professor, [3]Assistant Professor, [4]Assistant Professor
[1234] Department of Computer Science and Engineering,
[1234] Excel Engineering College,
Namakkal, Tamilnadu.

***Abstract*-Supervised machine learning algorithms used to identify and classify the natural objects with great success. Natural object identification, in that image may be comes under different categories, in a highly object identification and classification problem. It is a very difficult to distinguish them and within each class all the images are dissimilar from one another. It is a prevalent problem in data analysis. However, identification of natural object instances is typically more lengthy or expensive to process and compare with single object instances. The approach for used to learning has been widely studied on reducing classification effort for single object problems, current research on natural object learning remains in a preliminary state. In this paper we propose an approach for artificial neural network for natural object classification.**

Keywords—Artificial Neural Network, Feature Extraction, Haar and Daubechies Wavelet Features

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I. INTRODUCTION

Human beings are particularly talented at observing natural scene images and understanding their contents in images. However, we know unexpectedly little about how or even where in the brain are process the natural scene images. How is it process, for instance, that the brain concludes whether it is considering at desert image or mountain image Work on this project is concerned with how we identify natural scenes [8]. The demonstration of natural scenes is likely to simultaneously reside at different categories.

Classification of natural image is an active area of exploration in computer or machine vision. In machine learning method natural object classification problems where different objects must be there in each image. This is the problem of categorizing image into more than two classes [1]. It is known that manually labeling images it's taking more time-consuming and expensive. In order to reduce the human effort of labeling images, especially multi object natural image [17]. In all these cases, each object in the training set is connected with a set of labels, and the task is to output a label set for each unseen object through analyzing training instances with known label sets [2].

Multi object learning could enclose traditional binary and multi object problems in appropriate cases, restricting each occurrence to have only one object [5]. Although the generality of multi object natural image problems necessarily makes it more difficult to learn researchers have proposed a number of algorithms to learn from multi label objects[13], such as multi label decision trees [9] [10] and multi label kernel methods etc. In this paper, we adjust the popular neural networks classifiers to deal with multi object images where a new method called MO-ANN. multi object natural image classification, is propose in order to improve the classification performance. Specifically, in the first stage, Color Image (RGB) convert into HSV image. Second stage Haar wavelet and Discrete Wavelet transform (DWT) is used to decompose the image and extract features from those images.

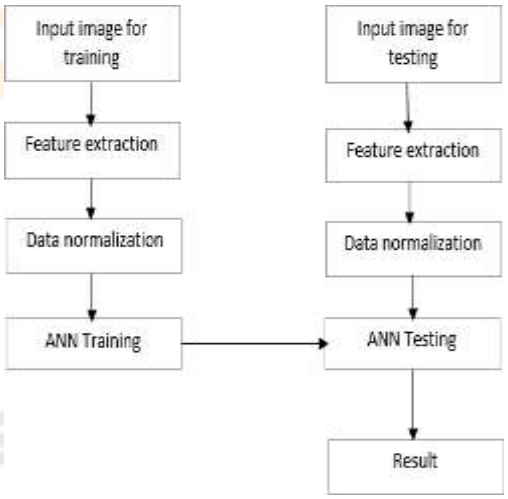

Fig 1.1: The flowchart diagram of the system

The arrangement of the paper is as follows: Section 2describes Artificial Neural Networks, Section 3describes Feature Extraction, Section 4describes Haar and Debauchies wavelet Features, Section 5describes Data Preparation, Section 6 explains Experimental Results and Discussion, finally Section 7 concludes with conclusion

II. ARTIFICIAL NEURAL NETWORKS

Artificial Neural Networks are computational encouraged by a humans central nervous systems, and are used to estimate or approximate functions that can depend on a large number of inputs and are generally unknown.

Artificial neural network model are generally constructed of several layers are interrelated with large number of neurons. A neuron feeds its output to all the units on the subsequent layer, but there is no such feedback to the previous layer. Weights are applied to the signal which passes from one unit to another [1].

A neural network makes an important role in an ample variety of problems application [12]. The information about the network architecture, learning procedure and weights updating techniques can be described (Egmont-Peterson, 2002 and R.C. Gonzalez, 2010).

For example, a neural network for image classification is defined by a set of input neurons which may be activated by the feature values of an input image. After being weighted and transformed by a function [7], the activations of these neurons are then passed on to other neurons. This process is repeated until finally, an output neuron is activated. Finally we are calculating the performance of the classifier.

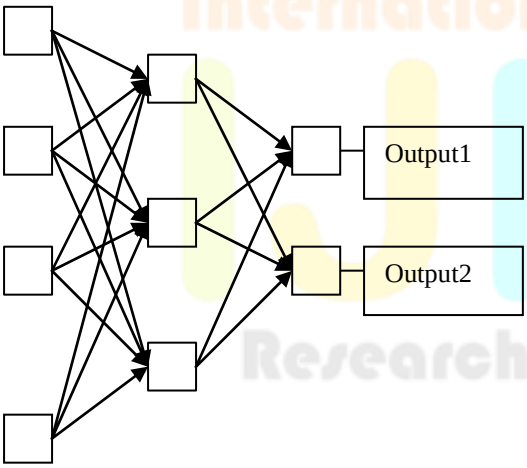

Fig 2.1: Neural network Structure

III. FEATURE EXTRACTION

In our system process only digital information of data, but we are given an input data of an image is too large mean to be treated and it is doubtful to be very redundant, then the input data will be changed into a reduced representation set of features (also named features vector) [14]. Transforming the input data into the set of features is called feature extraction [3][11]. If the features extracted are thoroughly chosen it is predictable that the features set will mine the significant information from the input data in order to perform the preferred task using this reduced representation as a sub suitable of the full size input.

The colored images (RGB) are converted into HSV images [19]. The each HSV image is distributed into a massive number of non-coinciding chunks of an equal size. The experiments can be done with the Haar wavelet and daubechies wavelet features methods are used to extract features from more often then used statistical specifications namely mean, standard deviation, energy and entropy from above mentioned chunks from HSV images to obtain N-measurements information visible in form from an image. The features mined were stored as [1xN] to form the feature vector [18]. The process is repeated to all the images and feature vectors are stored in the database.

The normalization mechanisms enforced to the data set to acquired normalized feature vectors. The normalized feature vectors are distributed into two sets: first is training dataset and the second is testing dataset for neural network classifiers. The training data set distribute as input to the neural network classifiers [16]. The trained network is tested with the test data set and verifies the correct and non-correct images from the database and performance are evaluated based on classification results. The performance evaluation of the neural network is compared based on % classification as parameter. The accuracy can be measured with the help of adjusting the neural weights (Matti Pietikainen 2004).

IV. HAAR AND DAUBECHIES WAVELET FEATURES

Haar and Daubechies wavelets are widely used techniques for the feature extraction, the Fourier transform not able to represent the signal adequately, so Haar function used signify to analyze the signal which are three levels in one dimensional wavelet breakdown and give both an approximation and detailed coefficients of a representation features in an images [15]. Approximation coefficients which are of size 1*64 for Haar wavelet and Daubechies wavelet

are considered as the feature set for our problem domain.

V. DATA PREPARATION

The proposed work of project is the color images are taken from multi objects are different category in a natural scene image collected in Corel image database download it from internet [20]. That the color images(RGB) are different pixels, that images are resize into (256*256) pixels after converted into HSV image (Hue, Saturation, and Value). Then the HSV Image can split up into three different blocks (in means of H, S, and V). After split the H, S and V each block perform into three level decomposition and extract feature from Haar wavelet and Daubechies wavelet method. In this method we are choosing only approximation coefficient values and calculate the mean, standard deviation, energy and entropy and normalization process was performed in image [6]. The same process was done again in the entire images.

The database was distributed into two sets: training set and testing set of classification network. Training set data are given to input of the network classifier. In the data set has 75% of randomly selected feature are used for training, rest of 25% features are used for testing.

VI. EXPERIMENTAL RESULTS AND DISCUSSION

The tests were executed by INTEL CORE i3 2.10GHZ processor machine with Windows 7 and MATLAB 7.0 as the development tool for image processing. The images are collected in image database contains 200 multi object color images from natural scene images. The sample images are given in the Fig.6.1, Hence the classification by Neural Network. The neural network was trained with a casually a selection of training set. After the possible training of the neural networks, the classification performances of the neural networks were evaluated on 50 test dataset used to calculate the performance of the classifier. A two hidden layer feed forward network was selected to train with back propagation algorithm using the gradient descent method on the training set. The Neural Network categorized the images based on the result known in correctly classify and incorrectly classify in the test phase. Hence, finally identify the better feature extraction method and classification rate of classifier.

Fig 6.1: Multi label natural scene image

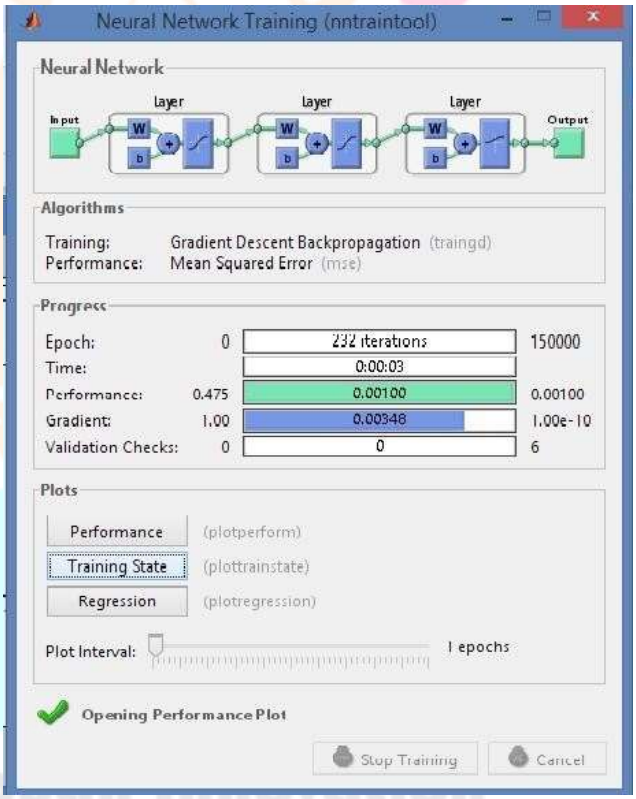

Fig 6.2: Neural network training

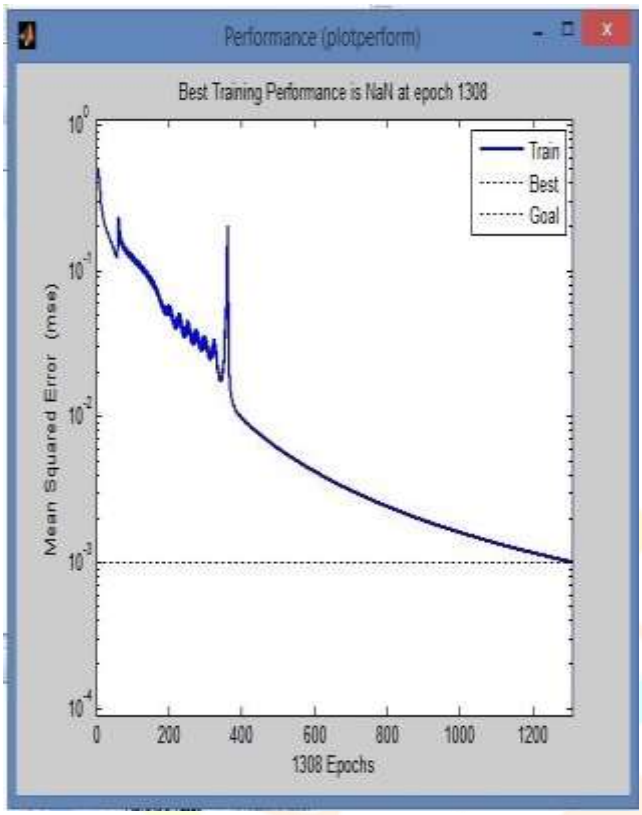

Fig 6.3: ANN with Daubechies wavelet features

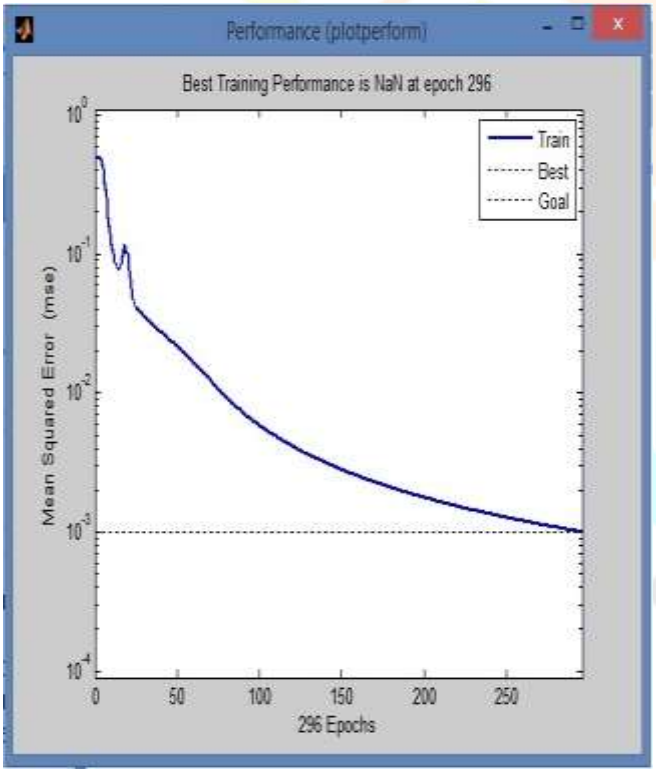

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Fig 6.4: ANN with Haar Wavelet Features

TABLE 6.1: COMPARATIVE RESULTS OF DAUBECHIES AND HAAR WAVELET FEATURES

Feature Extraction Method	Desert		Mountain		Classification Rate
	TP	TN	TP	TN	
Daubechies	**82**	**18**	**83**	**17**	**82.5%**
Haar	**87**	**13**	**86**	**14**	**86.5%**

TP-True Positive, TN-True Negative

Table 6.1 represents the experimental results, of multi object natural image classification.

In this experiment perform on two type of feature extraction method. First method Daubechies wavelet method getting a correctly classify images classification rate is 82.5% and Second method Haar wavelet method getting a correctly classify images classification rate is 87.5%. Haar wavelet method is better feature extraction method Compare with the Daubechies wavelet method. The classification rate is also high in Haar wavelet feature extraction method.

VII. CONCLUSION

This paper describes the simulation results on multi object natural images classification by neural network classifier. The multi object natural image identification method is exposed here. There are not performing in any preprocessing process, which means of blur, smoothening and noise removal techniques in the images. In that stage, an entire and capable feature extraction method was implemented in this method.

The networks were trained with multi label natural object problems. Each and every time, the network hidden layer values are slightly modified after train the neural network. The neural network performance was investigated based on the image classification results. In that first investigate implemented in ANN with Daubechies wavelet features and second investigate implemented in ANN with Haar Wavelet Features. In this experiment to identify the better Feature extraction method based on ANN classifier and it's performance.

This work can be further extended to change the classifier from neural network to support vector machine or any other classifier investigation and evaluate the performance of the natural object classification process. This complete work is implemented using Matlab 7.6.0.

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