International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 02 Issue: 04 | July-2014 www.irjet.net p-ISSN: 2395-0072

IMAGE MINING BASED ON EVOLUTIONARY COMPUTING

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Abstract: In today's era, neural networks and genetic algorithms are very challenging methods of solving image mining problems. The use of neural networks in image classification has been explored in a various of application. The efficiency of a genetic algorithm strongly depends on the parameter setting: successive populations (generations) have to converge toward what is wished, that is, most often the global optimum of a performance function. In the genetic algorithm, the network weights are encoded into a chromosome.

Keywords: Image, genetic algorithm, neural network

INTRODUCTION:

As more images are captured digitally, there is a need of programs, which can recognize images in a database , is demanding. For example, it may be necessary to find all tumours in a database , cyclones in a satellite images, or a particular face in photographs. The common speciality of such problems can be called as "given *subimage*1, *subimage*2. . . *subimagen*, which are examples of the images of interest, find all images which contain this object. " Examples of this kind include image detection problem where the task is to find all vehicles in an image. Unlike most of the current work in the image recognition area, where the aim is to detect only objects of a single class, the aim of the work in this paper is to recognise multiple images of a different classes in a image databases .
In todays era, neural networks and genetic algorithms are very challenging methods of solving image mining Problems. The use of neural networks in object recognition and classification has been explored in many application. These applications include defence applications, face recognition, fruit classification, character recognition, and medical imaging. The types of the neural networks used include multilayer feed forward networks, backpropagation network,self organizing maps and higher order networks. The efficiency of a genetic algorithm strongly depends on the parameter setting: successive populations (generations) have to converge toward what is wished, that is, most often the global optimum of a performance function.

Genetic algorithms for neural networks:

The network weights and biases are encoded into a chromosome. Each chromosome is a part of a population. During the evolutionary process, the genetic operators of selection, crossover, and mutation are applied to these individuals. After each generation of the process, the weights and biases are set from the values which the chromosomes represent. Some accuracy or error measures on the training patterns are then computed and used as the fitness for the genetic algorithm. Neural network is composed of number of units each connected with a link. Neural networks are fault tolerant and are good at pattern recognition and trend prediction.

Methodology:

The approach to solve the problem include the following steps-

1. Image selection
2. Image preprocessing
3. Image transformation and segmentation.
4. Choosing image mining approach: Classification
5. Choosing the mining algorithm: Genetic Algorithm
   - Initialization
   - Selection
   - Crossover
   - Mutation
   - Termination
6. Image mining: patterns of interest found by GA.
7. Evaluation of Patterns - Visualization, removing redundant patterns, etc

The key operation of image processing is feature extraction and selection. In practice, there is much noise and redundancy in most high dimensionality, complex patterns. Therefore, it is sometimes difficult even for experts to determine a minimum or optimum feature set. The objective of this approach is to find a reduced subset among the original N features such that useful class discriminatory information is included and redundant class information is excluded. Feature selection methods aim to extract features which are important in classification.

In image data, the spatial segmentation can be done at region and/or edge level based on the requirements of the application. Color, edges, shape, and texture are the common image attributes that are used to extract features for mining. Feature extraction based on these attributes may be performed at the global or local level. In image mining, the patterns types are very diverse. It could be classification patterns, description patterns, correlation patterns, temporal patterns, and spatial patterns. Intelligently classifying image is an important way to mine valuable information from large image collection.

Feature selection and extraction:

Dimensionality reduction is usually obtained by feature selection or extraction. Feature selection removes some of the features according to a criterion leading to a new set of features with lower dimensionality .

Feature extraction transforms the data in a space of lower dimensionality with an arbitrary function f

$X' = [x1, x2, x3, x4 \ldots\ldots xd]$

$X' = f(X)$ with $f : R^d \longrightarrow R^n$, $n < d$

$X' = xA$

With

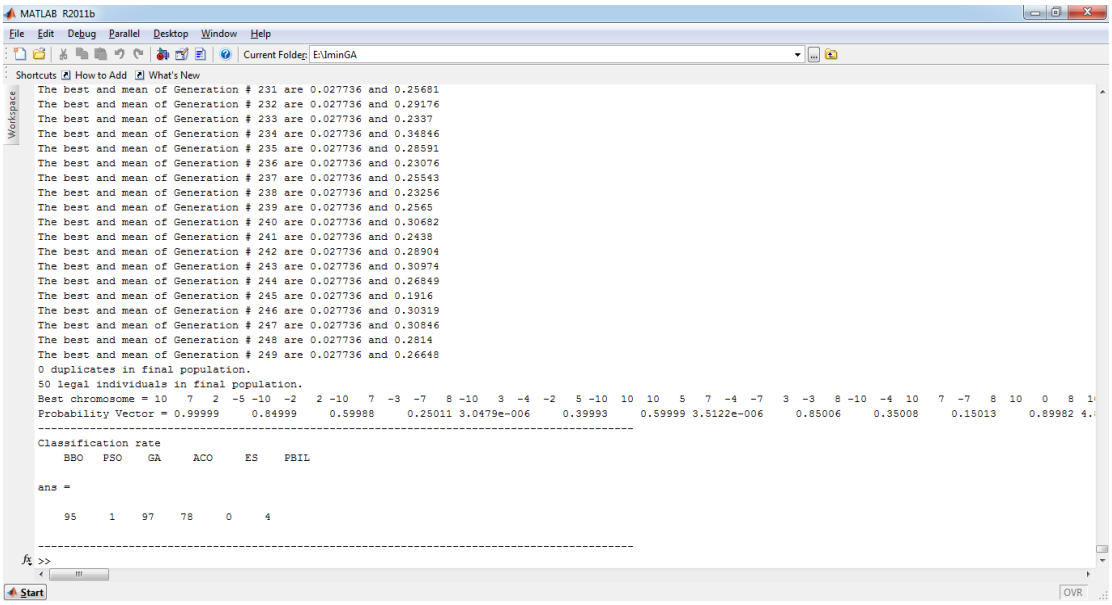
$$A = \begin{pmatrix} 1 & 0 & 0 & 0 \ldots & 0 \\ 0 & 0 & 0 & 0 \ldots & 0 \\ 0 & 0 & 1 & 0 \ldots & 0 \\ 0 & 0 & 0 & 0 \ldots & 0 \\ . & . & . & . & \\ . & . & . & . & \\ 0 & 0 & 0 & 0 \ldots & 1 \end{pmatrix}$$

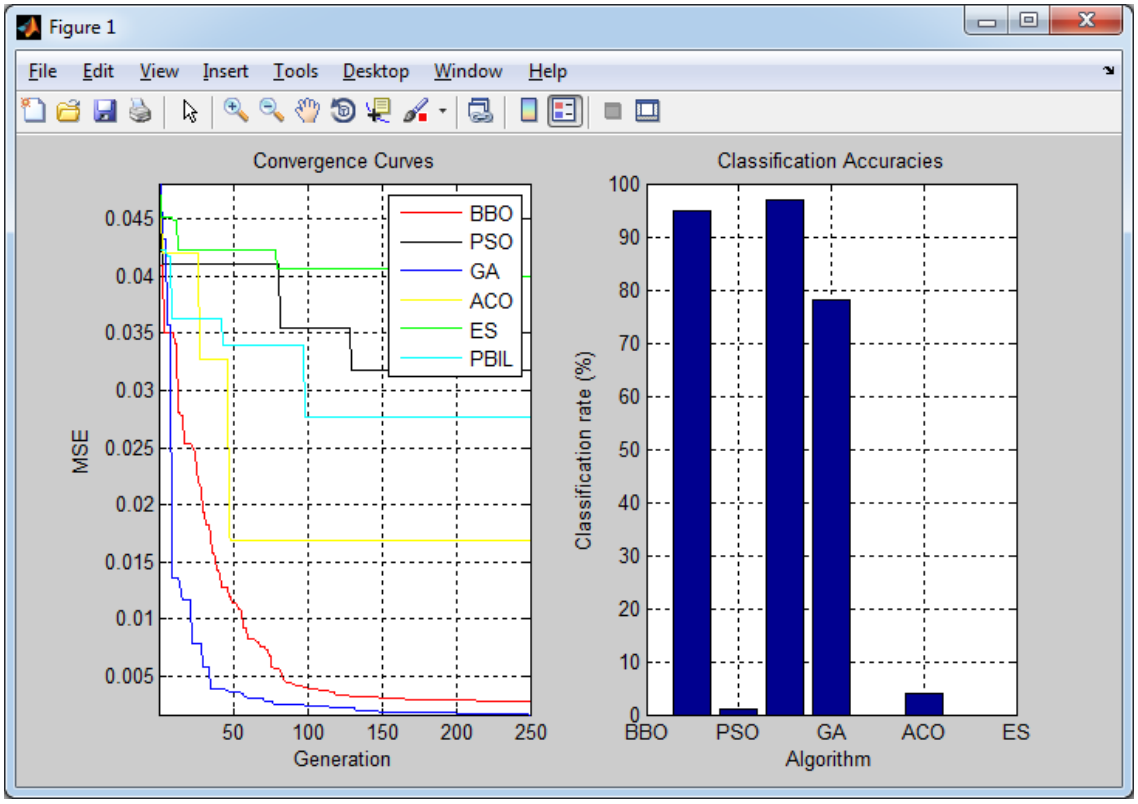
The process of extracting features that are relevent to the problem being addressed in image mining is problem and image data dependent.

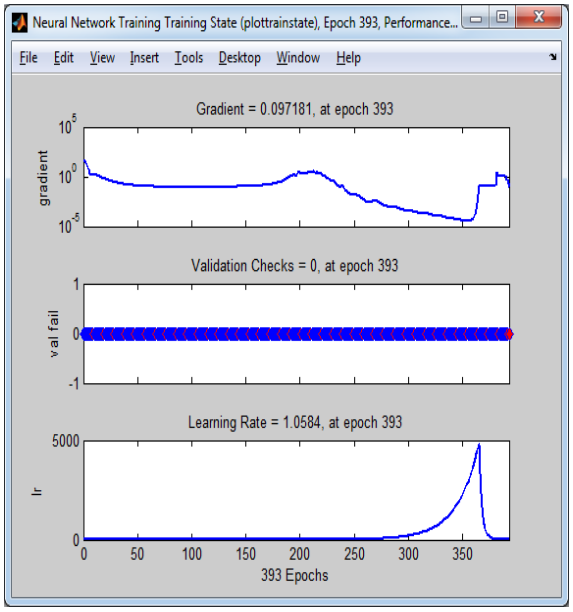
The features that are irrelevant increases the time time complexity of the many algorithm.

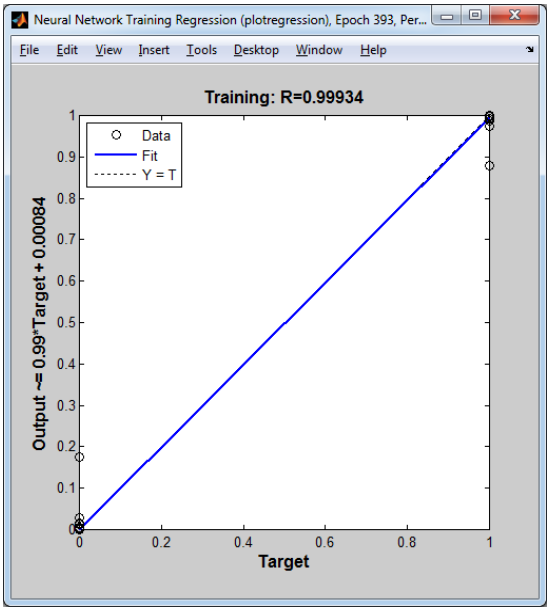
Evolutionary algorithm can be used to adapt solution to changing environments.EA have been used to train or to aid in training of artificial neural network.

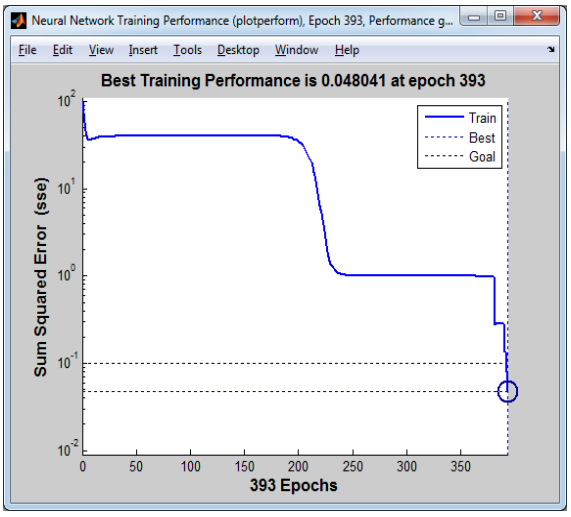
Experimental Results:











Conclusion:

From the experimental result, it is proved that genetic algorithm has highest classification accuracy. Feature redundancy problem is overcome by using genetic algorithm. Epochs are neural network training parameters. They are defined as one complete cycle through the neural network for all cases, which present the entire training set to the neural network. Each time a record goes through the net, it is one trial, one sweep of all records is termed as an Epoch. During each epoch, the order in which the compounds are presented are randomized. This procedure improves the overall performance of the neural network by reducing the training errors.

Genetic algorithm plays an important role in feature extraction and classification. Because of versatility and robustness. GAs are used throughout image processing and appears as a search space optimizer in feature extraction and pattern recognition. Genetic algorithm can be used as very promising optimizing method.

The algorithm allows to perform robust search technique

Future work:

For future work, we will investigate alternative fitness functions for the refinement genetic algorithm and examine this approach on other data sets such as detecting small objects in satellite images.

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