ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)

Vol 3, Issue 12, December 2016

An Optimization Algorithm Inspired By Bird Mating Strategies

[1] Miss.Vishakha Shinde [2] Prof. Harish Barapatre
[1] ME Student [2] Assistant Professor
Department of Computer Engineering, Mumbai University

Abstract: -- **Since last many years it has been observed in contrast to other physiological characteristics the iris pattern have a rich and wonderful structure with the full of complex structure. In between the pupil and sclera iris is present as coloured circular part of the eye. There are Many approaches have been developed for the recognition of iris. It is the process of recognizing a person's as unique identity by analyzing the appropriate pattern of his/her eye. Artificial neural networks have dimensional and multimodal approach which is usually polluted by noises and missing data. One of the IRIS recognition system developed which used local histogram and image statistics method but it failed to locate boundaries of IRIS and also optimization problem which is related to the process of weight training. We are using feed forward neural network. Artificial neural networks (ANNs) are computational modelling tools that are defined as structures comprised of densely interconnected adaptive simple processing elements. They are able to perform massive parallel computations for data processing and knowledge representation. One more advantage is that a learning algorithm is significantly simplified when the RNN model is of the feed-forward type compared to the recurrent type. A RNN model with multiple classes of signals is introduced that can be used in applications associated with the concurrent processing of different streams of information, such as colour image processing.To tackle the complexity of ANN training problem, meta-heuristic optimization algorithms such as genetic algorithm, particle swarm optimization and ant colony optimization have been highly proposed to search for the optimal weights of the network. Here we propose new optimization technique to overcome the existing problems. This technique is BMO (Bird Mating Optimization) which is population based meta-heuristic search method which tries to imitate mating ways of bird species for designing optimum searching techniques. Meta-heuristic algorithms do not use any gradient information, and have more chance to avoid local optima by sampling simultaneously multiple regions of search space.This technique is applied for weight training of neural networks for clarification of human iris.**

Keywords: **BMO ,RNN ,IRIS, artificial neural network.**

I. INTRODUCTION

The pressures on today's system administrators to have secure systems are ever increasing. One area where security can be improved is in authentication. Iris recognition, a biometric, provides one of the most secure methods of authentication and identification thanks to the unique characteristics of the iris. Once the image of the iris has been captured using a standard camera, the authentication process, involving comparing the current subject's iris with the stored version, is one of the most accurate with very low false acceptance and rejection rates. Unlike other biometrics such as the palm, retina, gait, face and fingerprints, the characteristic of the iris is stable in a person's lifetime. Iris patterns are chaotically distributed and well suited for recognizing persons throughout their lifetime with a single conscription. It provides more accuracy in that.The iris of the human eye which is a thin circular diaphragm lies between the cornea and the lens. Figure 1 shows the structure of the human eye. The eye has a perforation at the centre made by the pupil. The iris controls the overall amount of light entering through the pupil by adjusting the sphincter and the dilator muscles. It calculates the average radius of the human iris is 12mm. The iris is layered with the epithelial tissues at the bottom which have dense pigmentation cells. The next layer above it is the stromal layer which determines the colour of the iris. They have the blood vessels and pigmentation cells. The outermost layer which is visible has two zones. Also due to the epigenetic nature of the iris pattern the two eyes of the same individual contain has completely different and independent iris pattern. Same is the case of identical twins which possess uncorrelated iris patterns.

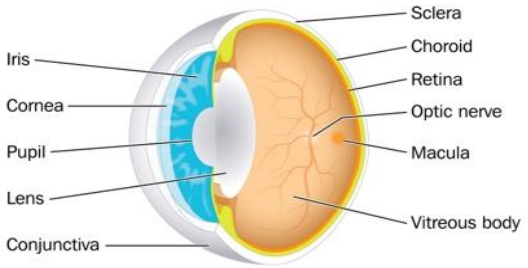

Fig.1 Structure of the human eye

II. LITERATURE SURVEY

In this section, an overview of existing techniques are provided.The objective of this survey is clearly understand the limitations/disadvantages of existing schemes.

The Random Neural Network (RNN) has received considerable attention and has been successfully used in a number of applications. In this review paper authors have focused on the feed-forward RNN model and its ability to solve classification problems. What is unique about the random neural network compared to other neural network models in the literature is that in random neural network the activity of a neuron is either a binary variable or a continuous variable, is that each neuron is represented by its non-negative potential and a neuron is considered to be in its ''firing state'' if its potential is positive; thus in the RNN the representation of a state of a neuron is more granular than in other neural network models in the literature. In the RNN, signals are transmitted from one neuron to another neuron in the form of spikes of a certain rate, which represents more closely how signals are transmitted in a biophysical neural network. The learning algorithm is significantly simplified when the RNN model is of the feed-forward type. A few of the major RNN applications are a novel communications system where a RNN is used for routing network packets. The RNN model has been applied in various image processing problems such as texture generation, image segmentation, image enhancement and fusion, and image and video compression. Pattern recognition and classification is another area, where we see many RNN-based applications: A target recognition system is developed in an RNN is used in to discriminate land mines[1].Biometrics recognition is one of the leading identity recognition in the world today. Iris recognition is very effective for person identification due to the iris' unique features and the protection of the iris from the environment and aging. This paper presents a simple methodology for pre-processing iris images and the design and training of a feed forward artificial neural network for iris recognition. Three different iris image data partitioning techniques and two data coding techniques are proposed and explored. Brain- Maker simulations reveal that recognition accuracies as high as 93.33% can be reached despite our testing of similar irises of the same colour. We also experiment with various number of hidden layers, number of neurons in each hidden layer, input format (binary vs. analog), percent of data used for training v/s testing, and with the addition of noise. Our recognition system achieves high accuracy despite using simple data pre-processing and a simple neural network. One technology is neuro-fuzzy networks. Many types of artificial neural networks exist including feed-forward neural networks, radial basis function (RBF) networks, Kohonen self-organizing networks, recurrent networks, stochastic neural networks, modular neural networks, dynamic neural networks, cascading neural networks, and neuro-fuzzy networks[2]. One of the basic challenges to robust iris recognition is iris segmentation. To represent the iris, some researchers fit circles, ellipses or active contours to the boundary pixels of the segmented iris. In order to get an accurate fit, the iris boundary must first be accurately identified. Some segmentation methods operate on a pre-processed gray-scaled image, while others use a binary edge image with threshold. The Hough transform is a popular method used to search for circular or elliptical patterns within the image. Many irises are slightly elliptical, and suffer from eyelid/eyelash occlusion and speculation reflections. Often the pupil and iris centres are not co-located. Each of these issues can cause a segmentation error. This research uses of a feature saliency algorithm to identify which measurements, used in common iris segmentation methods, jointly contain the most discriminatory information for identify the iris boundary. Once this feature set is identified, an artificial neural network is used to near-optimally combine the segmentation measurements to better localize and identify boundary pixels of the iris. In this approach, no assumption of circularity is assumed when identifying the iris boundary. 322 measurements were tested and eight were found to contain discriminatory information that can assist in identifying the iris boundary. For occluded images, the iris masks created by the neural network were consistently more accurate than the truth mask created using the circular iris boundary assumption[3].Because search space in artificial neural networks (ANNs) is high dimensional and multimodal which is usually polluted by noises and missing data, the process of weight training is a complex continuous optimization problem. This paper deals with the application of a recently invented meta-heuristic optimization algorithm, bird mating optimizer (BMO), for training feed-forward ANNs. BMO is a population-based search method which tries to imitate the mating ways of bird species for designing optimum searching techniques. In order to study the usefulness of the proposed algorithm, BMO is applied to weight training of ANNs for solving three real-world classification problems, namely, Iris flower, Wisconsin breast cancer, and Pima Indian diabetes. The performance of BMO is compared with those of the other classifiers. Simulation results indicate the superior capability of BMO to tackle the problem of ANN weight training[6]. BMO is also applied to model fuel cell system which has been addressed as an open and demanding problem in electrical engineering. The promising results verify the potential of BMO algorithm[4].Radial basis function (RBF) neural networks have been broadly used for classification and interpolation regression. So the idea for trying to develop new learning algorithms for getting better performance of RBF neural networks is an interesting subject. This paper presents a new learning method for RBF neural networks. A novel Particle Swarm Optimization (PSO) has been applied in the proposed method to optimize the Optimum Steepest Decent (OSD) algorithm. The OSD algorithm could be used in applications where need real-time capabilities for retraining neural networks. To initialize the RBF units more accurately, the new approach based on PSO has been developed and compared with a Conventional PSO clustering algorithm. The obtained results have shown better and same network response in fewer train iterations which is essential for fast retraining of the network. The PSO–OSD and Three-phased OSD algorithms have been applied on five benchmark problems and the results have been compared. Finally, employing the proposed method in a real-time problem has shown interesting outcomes[5].

III. PROPOSED SYSTEM

Iris recognition is an automated method of biometric identification that uses mathematical pattern-recognition techniques on video images of one or both of the irises of an individual's eyes.The complex random patterns of IRIS recognition are unique, stable, and can be seen from some distance. Iris recognition is a method of identifying people based on unique patterns within the ring-shaped region surrounding the pupil of the eye. The iris usually has a brown, blue, gray, or greenish color, with complex patterns that are visible upon close inspection.

A. Architecture

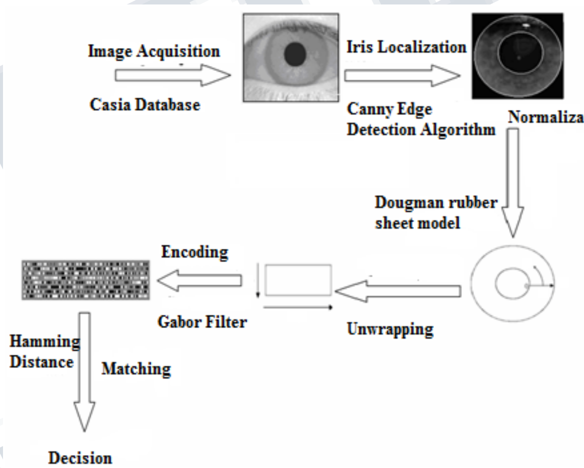

Fig. 2 The overall architecture of System.

Because it makes use of a biological characteristic, iris recognition is considered a form of biometric verification. Retina scanning is a different biometric technology for which iris recognition is often confused with has been supplanted by iris recognition. Iris recognition uses video camera technology to acquire images of the detail-rich, intricate structures of the iris which are visible externally. For convenience purposes such as passport-free automated border-crossings, and some national ID programs the iris recognition systems are used or have been enrolled by several hundred millions of persons in several countries. Fig 1 .shows the structure of human eye. A key advantage of iris recognition is the stability of the iris as an internal and protected.To achieve automated IRIS recognition there are three main tasks:First we must locate the IRIS in a given image. Secondly, it is necessary to encode the IRIS information into a format which is amendable to calculation and computation eg. a binary string. Finally the data must be storable ,to load and compare these encodings. Our system approach targets the three main stages in iris recognition system

- Image pre processing
- Feature Extraction
- Optimization

The user has to select the input image for the system whose recognition has to be done. The image can be captured and then passed on to the system. The input image is verified for validation.Localization is the method of to detect the inner and outer boundary of the iris with the estimate that shape of the iris is circle. To generate templates for accurate matching, iris localization method can be used. To remove eyelid eyelashes occlusions and spectacular reflections which corrupt the iris pattern, and locate the circular iris recognition, this technique is required.The detected iris image by localization is ring shaped but it does not have the same size or width. However, for further processing we need all the templates to be of same size. Hence, we used unwrap iris with segmentation and normalization. Unwrapping the iris means it turns the iris ring into a strip of standard dimension, which can be used for feature extraction. This process begins with determining the number of points of the iris. That will be used to display the iris, how many parts will divide the angle and radius.

B. Algorithm

The steps of BMO algorithm are as follows:

Step 1: Initialization: a society of birds is randomly initialized in the search space.
Each bird is a feasible solution of the problem and is specified by a vector, ~x, with the length of n.
Step 2: Fitness function value: the quality of each bird is computed by putting its elements into the fitness function.
Step 3: Ranking: the birds are ranked based on their quality.
Step 4: classification: birds with the most promising genes are selected as females and the others are chosen as males.

The females are equally divided into two groups so that the better ones make parthenogenetic birds and the others make polyandrous ones.
The males are categorized into three groups.
The males included in the first group that have better genes than the others are selected as monogamous.
The males of the second group are chosen as polygynous.
Step 5: Generating promiscuous birds: the males of the third group are removed from the society and new ones are generated using a chaotic sequence.
The new birds are considered as promiscuous.
Step 6: Breeding: each bird breeds a brood using its own pattern.
Step 7: Replacement: each bird makes a decision to add its brood to the society.
The bird evaluates the brood's quality.
If the brood is in the search space and includes better quality, the bird will abandon the society and the brood will join to it.
Otherwise, the brood will be abandoned and the bird will stay in the society.
Step 8: Steps 3–7 are repeated until a predefined number of generations, gmax, is met.
Step 9: The bird with the best quality is selected from the society as the final solution.

C. Flow Diagram

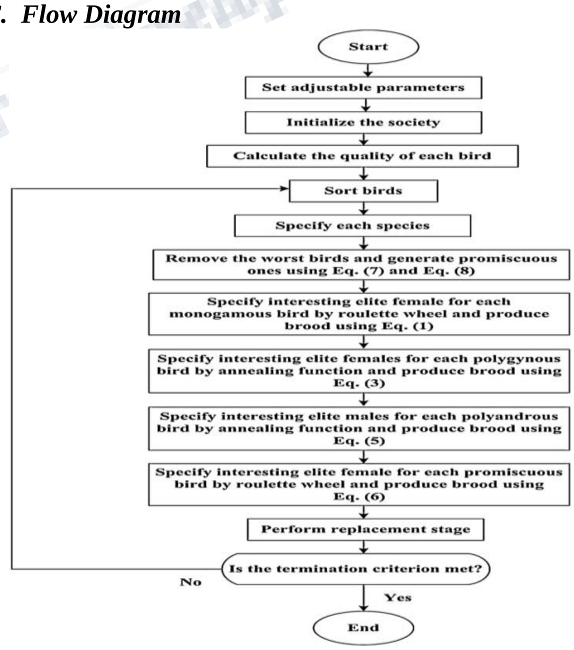

Fig. 3 Flow of algorithm.

IV. CONCLUSION

The method aims at improving the iris recognition and optimization system expected to have higher accuracy and optimized result. The system to be developed uses the combination of algorithm to meet its requirements. The BMO algorithm follows meta-heuristic approach for optimization and then proceeds to follow different algorithm for normalization, feature extraction, template matching. The main goal is to develop a BMO-based learning algorithm to train ANNs. BMO is a recently devised population based optimization algorithm which imitates the mating behaviour of bird species for breeding superior broods and provides different strategies to effectively seek the search space.

The results of the BMO-ANN are promising when we compare its performance with those of the other classifiers.

Acknowledgment

I would like to take this opportunity to thank Prof. Harish Barapatre (Project Guide) , Prof. Vaishali Londhe(HOD) and to all teaching and non-teaching staff of computer Engineering Department of Yadavrao Tasgaonkar Institute Of Engineering And Technology, Karjatfor their encouragement, support and untiring cooperation.

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