International Journal of Innovative Computing, Information and Control
Volume **7**, Number **4**, April **2011**
ICIC International ©2011 ISSN 1349-4198
pp. 1959–1970

INTEGRATION OF SOM NETWORK AND EVOLUTIONARY ALGORITHMS TO TRAIN RBF NETWORK FOR FORECASTING

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Received December 2009; revised May 2010

Abstract. *This paper intends to propose an integrated method which combines self-organizing map (SOM) network with genetic algorithm (GA) and particle swarm optimization (PSO)-based (ISGP) algorithm to train the radial basis function (RBF) network for function approximation. The experimental results for three benchmark problems indicated that such integration can have better performance. In addition, using the proposed ISGP algorithm to exercise oil price forecasting also showed that the proposed algorithm is able to achieve more promising accuracy than the auto-regressive integrated moving average (ARIMA) model and four evolutionary algorithms (EAs) proposed in literatures.*
Keywords: Evolutionary algorithm, Self-organizing map network, Radial basis function network, Genetic algorithm, Particle swarm optimization

1. **Introduction.** Evolutionary algorithms (EAs) are heuristic and stochastic search procedures based on the mechanics of natural selection, genetics and evolution, which allow them to find the global solution for a given problem [48] (e.g., [41]). On the other hand, artificial neural networks (ANNs) are essentially a nonlinear modeling approach that provides a fairly accurate universal approximation to any function [56]. The learning capability and robustness of ANNs, typically in data-rich environment, can come in handy when discovering regularities from large datasets. This can be unsupervised as in clustering or supervised as in classification [46].

Among ANNs, radial basis function (RBF) network is a particular class of multilayer feed-forward ANNs [53]. It has several key advantages which includes finding the input to output map using local approximators, rapid learning while requiring fewer examples, good approximation and learning ability, and is easier to train [39]. The performance of RBF network depends upon the parameters of kernel functions, which are the nonlinear elements of the network. However, how to select a suitable number of hidden layer neurons remains as an open question. A common approach is to start with a predetermined number of hidden units, which is chosen by using a priori knowledge. It usually results in too many hidden units and poor generalization [50].

EAs have been developed to train ANNs which have been employed for many applications. EAs [45] have also been applied to optimize the parameters defining RBF networks [65]. On the other hand, since the self-organizing map (SOM) network can be seen as a