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Soft Computing Techniques in Mobile Adhoc network : A Technical Overview

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ABSTRACT

Mobile ad-hoc network is widely used in various communications due to its easier deployment and cost effectiveness. In recent technological advancement, Manet is used in all types of environment including pervasive computing, Internet of Things, military applications, Disaster recoveries, Vehicle tracking etc. In Manets, the research is going on in the field of Routing such as Hierarchical routing, Zone based routing, Distance based routing etc. Manets in case of sensitive networks has to face the challenge of security and in many cases the existing protocol is enhanced with security using cryptographic techniques. In recent researches, Soft computing techniques like Genetic Algorithm, Fuzzy logic, Neural Networks are employed in Manets in every area of research. We propose an attempt to survey the applications of soft computing techniques in Manet and in particular Artificial Neural Network learning technique. Since Soft computing techniques are efficient for solving complex problems, our focus is towards this survey approach in Manets.

Key Words: Soft computing techniques, Genetic algorithm, Fuzzy logic, Neural network, Mobile adhoc network

INTRODUCTION

Soft computing is a new disciplinary for Artificial Intelligence which induces inductive reasoning for Intelligent systems and for automated systems. It is based on Human behavior models to emulate the human mind as closely as possible. Unlike Hard computing, Soft computing deals with approximate models. Evolutionary computation is a subfield of Artificial Intelligence which involves combinatorial optimization problems. It uses iterative progress and is a class of global search paradigm by generating finite state automata. Genetic Algorithm was one of the evolutionary computing metaheuristic optimization technique. Particle swarm optimization is one of the evolutionary computation technique. Fuzzy logic is another soft computing technique. It is used as a problem solving methodology from small microcontrollers to large scale control systems. It can be used both in hardware and software. Neural Computing is an important new concept which combines the other areas such as Neurology and Psychology. Many Scientists believe that conscious Neural Network is realistic Possibility.[1]. Neural Network is widely used in Forecasting, classification problems. Hybrid systems can be classified as Neuro fuzzy hybrid system,

Neuron genetic hybrid system and Fuzzy genetic hybrid system. The Hybrid systems combines the Partnerships of any two methodologies for problem solving.

Soft Computing Techniques in Manet

Mobile Adhoc network has to face many challenges for effective communication. Due to varying topology, Routing in these networks is very complex. Different types of Routing techniques have been adopted by focusing on shortest stable path. Mobility Prediction, Link Expiration time will be helpful for predicting the future of the nodes. As a result many strategies such as Mobility Management, Location Management are considered in MANETS. Selecting the Optimal Path in Routing is an important factor. While considering the Hierarchical routing, maintaining the stability of clusters is a challenging issue. The aim of good routing to achieve the better Quality of service. R. K. Ghosh et.al considered three central problems such as base station placement, channel assignment and mobility management [2] in their survey. By considering the challenges in Manet, soft Computing Techniques will make an attempt to solve the major challenges to some extent. The use of soft computing techniques in Manets is tabulated as:

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Table I: Survey of Soft Computing Techniques in Manet

S. No.	Soft computing Technique	Authors	Author's Work In MANET
1.	Fuzzy Ant colony	Goswami et al	To select Optimal path
2.	Genetic Algorithm	Yun-Sheng et al.	Multicast QoS based routing approach
3.	Back Propagation Neural Network with Learning automata	Ghiasi and Karimi	To Train Mobile Network parameters
4.	Fuzzy logic	Sung and Wong	Dynamic channel allocation problem.
5.	Genetic approach	Das et al.	Location Management Problem
6.	Hopfield network	Tanu Chawla	Replication in Mobile adhoc network.
7.	Genetic Algorithm	V.Preetha et.al[3]	Prediction of stability of Clusters

ARTIFICIAL NEURAL NETWORK

Artificial neural networks (ANNs) has led to a remarkable pitch in mobile adhoc network research. Artificial Neural Networks are very efficient for supervised and unsupervised learning and reduces the complexity of the problems by prior training but with some uncertainty. The term Neural Network will refer to a circuit of biological neurons. Like Human brain, the neurons will perform the physiological function. ANNs has been used as an alternative to non linear regression and cluster analysis for statistical analysis and data modeling. The main characteristic of ANN is their ability to learn. The learning is performed by adjusting the synaptic weights and the input stimuli and the output response are studied. The adaptation process is learned with the desired output. Neural Network has been categorized as supervised learning network and unsupervised learning network. Perceptron Networks, Adaptive linear Neuron, Multiple Adaptive Linear Neuron, Back Propagation Network, Radial Basis Functions Network, Time delay, Wavelet Neural Network fall under supervised Neural Network. Kohonen self organizing map, Fixed weight competitive nets, Adaptive Resonance Theory Network fall under Unsupervised Learning Network. A feed forward neural network is used for prediction with three layers as input layer, Hidden layer and output layer. The back propagation is the learning method widely used. The weight is adjusted in each node in such a way that the error between the desired output and actual output is reduced. To minimize the mean square Error, Gradient descent method was used. To start the training the initial weights are chosen randomly and then the training

begins. The back propagation algorithm looks for the minimum Error. Hopfield network approach mainly focuses on the energy function containing the objective function. Many Researchers have employed many methods of Artificial Neural Network in Manets but we have listed out only the major work related with ANNS. The remaining part of this paper presents state-of-the-art survey of ANN applications in Mobile adhoc networks. The list of authors and their work in Manet using Artificial Neural Network.

Table II: Survey of Neural Network Technique in Manet

S. No	Authors	NN in MANET
1.	Heni Kaaniche et.al[4]	Mobility Prediction
2.	Jyoti Prakash Singha et.al. [5]	Delay Prediction
3.	S. Gangwar, et.al[6]	Cluster head selection
4.	Manisha et.al[7]	Securing the Manet

Heni Kaaniche et.al. used Neural network for mobility prediction and identified stable paths to improve routing by reducing the overhead and the number of connection interruptions. They employed the multilayer and recurrent neural network using back propagation through time algorithm for training. Jyoti Prakash Singh et.al. have tried to evaluate the applicability and capability of artificial neural network for prediction of end-to-end packet delay in mobile ad hoc network environment. They developed two models on Radial Basis Function (RBF) network and Generalized Regression Neural Network (GRNN). S. Gangwar et.al used the ART network for cluster head selection in Manet. ART1, is an unsupervised learning technique. Manisha et.al. provided enhanced security to Manet using the Back Propagation Method of Artificial Neural Networks and eliminated the use of files for storing the password. ANNS is applied in every area of Manet research especially in the case of future prediction.

CONCLUSION

Manets are facing Complex multiobjective optimization Problems which can be solved by Soft computing Techniques. This paper focuses on the challenges in Manet and listed out the Authors work using soft computing Techniques in Manet. The remaining paper surveyed the different types of Neural Network and the authors work related with Neural Network in Manet. Thus advantages of using soft computing includes prediction, problem solving, and robustness. This survey highlighted the soft computing technique employed in specific research area of MANET.

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