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A Multicast Genetic Routing Protocol Neural Network Approach

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Abstract: - Multicast Zone Routing Protocol (GMZRP) is the most promising and widely accepted and well proved hybrid routing protocol in Mobile Ad-hoc Networks (MANETs) for its excellent results when compared in order to load balance the network. with table-driven demand protocols. Improvement of DPMRP is considered using GA and NN approach is considered in this paper. These enhanced protocols are compared with DPMRP and also with each other for same metrics. From the results it is concluded that MGRP (DPMRP), enhanced using GA approach, provides best results. This study is aimed to provide a set of available paths to the destination using the concept of genetic algorithm This gives us the reduction in the overhead, less jitter and better delivery of packets. We call this new routing protocol as Genetic Routing Protocol (GMZRP). Finally, the implementation of proposed genetic GMZRP is compared with Genetic GMZRP, i.e., GMZRP and the result demonstrates better performance from the proposed protocol. Since the method provides a set of paths from nodes to the destination, it results in load balance to the network.

Keywords: *Ad hoc Network, MANET, Genetic Algorithm, Table-Driven Protocol, On-Demand Protocol, Hybrid Protocol, ZRP, GMZRP*

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1. INTRODUCTION

The new protocol DPMRP, has been introduced in paper Three and its implementation using varied metrics has been considered in specified section. There is always a possibility of optimizing any protocol .In this study we have considered optimization of DPMRP, using two different techniques i) genetic Algorithm approach ii) Neural Network Approach. The DPMRP is enhanced using these two approaches. To justify this we obtained numerical results for the enhanced protocols and compared them with the results obtained by DPMRP for the DPMRP,NN DPMRP and MGRP are compared for load factor, overhead and delay. MGRP gives better results in comparison to both algorithms for overhead and MGRP gives much better results in case of delay, so it can easily be concluded that MGRP considerably improves DPMRP.same metrics .Both these approaches, GA and NN, significantly improves the performance of DPMRP. The rest of the paper is organized as follows:

In section we describe in brief genetic algorithm. This also includes the pseudo code for implementing GA. In Section the implementation of DPMRP using GA is describes. The evaluation of enhanced DPMRP is evaluated for the metrics delay, load and overhead and obtained results are compared with DPMRP results. The results are shown in the form of table and snapshots of graphs which were implemented in MATLAB. There is a significant improvement in the results. Neural Networks are briefly, to the present need, are described in section .In the NN approach we have used back propagation method for optimizing the DPMRP. This section also includes creation of the Network and its training. The resulting NN was used to evaluate DPMRP for this same metrics as used in the previous section. The obtained results show as significant improvement over DPMRP results. In section the three protocols . This paper is organize as follows: In Section 2, we provide a discussion on work related to the existing routing protocols, particurly. the operation of Multicast Zone Routing Protocol (MZRP), and working of genetic algorithm and its features. Section provides pseudo code of proposed new protocol, Multicast Genetic Routing Protocol (MGRP)and its working. Section gives the experimental procedure including the evaluation methodology and simulation environment used for the simulation, and in Section , we present the obtained results . Section 5 includes the conclusions.

2. RELATED WORK

Genetic Algorithm Approach for DPMRP

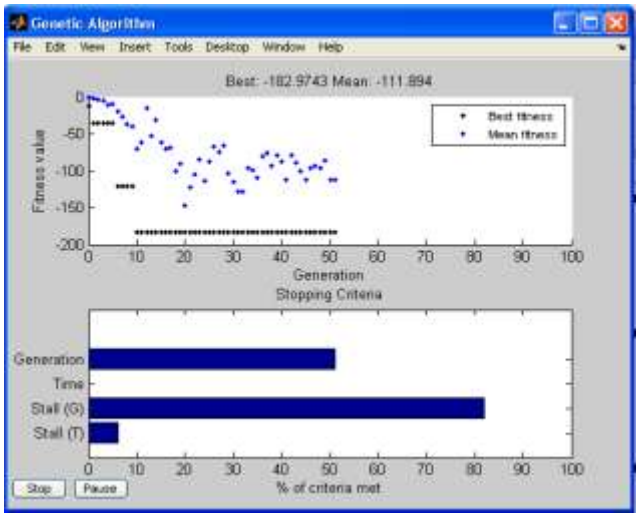
The performance of the proposed algorithm for Multicast Genetic Routing Protocol on different data values is discussed here:

Experiment :

This experiment shows the comparison between DPMRP and proposed MGRP in terms of best fitness and mean fitness by using Rastring's function. All functions are used two variables. The population size is kept at 50 for all the functions and, the crossover and mutation rates are equal to 0.6 and 0.01 respectively. The normal mutation rate is kept low as adaptive mutation to remove duplicates is also applied. The best individual or a random individual is mutated with equally likely (probability = 0.5) to replace the revisited points in the new population. The options have used for GA are real encoding, linear scaling, roulette wheel selection, heuristic crossover and Gaussian mutation. The accuracy of proposed protocol is better for the Rastrinigs benchmark function. It is quite clear from the results that the

performance of the proposed MGRP with adaptive mutation is better than the DPMRP.Fig. shows graphs of the performance comparison between DPMRP and proposed MGRP adaptive mutation in terms of the best fitness and mean fitness. The upper part of graph shows the comparison between best fitness while the lower part shows the comparison between mean fitness. The x co-ordinate of the graph shows the generations throughout the fitness evaluation while y co-ordinate shows the fitness value. Experiments were carried out for 50 generations separately. Some of them are shown here. The fitness of proposed Genetic Algorithm MGRP and DPMRP is plotted. The comparison is done on the basis of best fitness and mean fitness. Best fitness of the population is the minimum score of the population. Mean fitness of the population is the division of total fitness of the population to population size.

Experiments are carried out using two variables and more variables of the benchmarks function and the experimental results obtained demonstrate the effectiveness of the proposed Genetic Algorithm *MGRP*



Graph for Best Fitness and Mean Fitness with GA

shows graphs of the performance of the DPMRP in terms of best fitness and mean fitness. The upper part of graph shows the comparison between best fitness while the lower part shows the comparison between mean fitness. The x co-ordinate of the graph is show the generations throughout the fitness evaluation while y co-ordinate shows the fitness value. Protocol(MGRP) with application of the genetic algorithmic approach for finding the multiple shortest paths (near optimal) improves, DPMRP in order to load balance the network in the case of congestion occurrence. It provides robustness in the case of route failures. This gives the better delivery of packets to the destination and reduces overhead and delays on the network. The MGRP will be definitely a promising protocol of future.

Neural Network Approach

A new modular neural network is proposed for improving and implementing Dynamic Periphery Multicast Routing Protocol. The basic building blocks of the architecture are small multilayer feed forward networks, trained using the Back propagation algorithm. The structure of the modular system is similar to architectures known from logical neural networks. The new network is not fully connected and therefore the number of weight connections is much less than in a monolithic multilayer neural nets. The training algorithm works in two stages and it is easy to implement in parallel. Usage of modular structure the training is very quick for large input vectors. The modular architecture is designed to combine two different approaches of generalization known by well connected and logical neural networks, this enhances the generalization ability, which is especially significant for a high dimensional input space. The evaluation using different real world data sets shows that the new architecture is very useful for high dimensional input vectors. For certain domains the learning speed as well as the generalization performance in the modular system is significantly better than in a monolithic multilayer feed forward network. Step by step creation, training and simulation of neural network is shown in the Figures and described in next paragraphs. Initially the network is created by mentioning the data values . Data values can also be imported from the workspace in case of already available data.

3. RESULTS AND DICUSSION

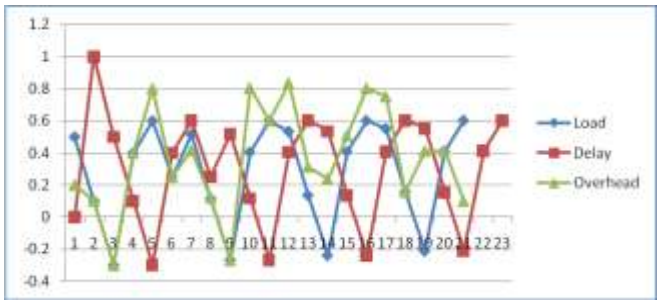
Simulation model and parameters: The Qualnet 5.0 is used to simulate the proposed algorithm. In our simulation, the channel capacity of mobile hosts is set to the same value: 2 Mbps.

It has the functionality to notify the network layer about link breakage.

In the simulation, mobile nodes move in a

500□□00 m rectangular region for various time spans like 50 sec simulation time. Initial locations and movements of the nodes are obtained using the Random Waypoint (RWP) model. We assume each node moves independently with the same average speed. All nodes have the same transmission range of 250 m. In this mobility model, a node randomly selects a destination from the physical terrain. We took out results for various nodes like 25, 50, 75,100 nodes for better analysis of results. It moves in the direction of the destination in a speed uniformly chosen between the minimal speed and maximal speed. After it reaches its destination, the node stays there for a pause time and then moves again. In the simulation, the maximal speed is 10 m

sec□1 and pause time is 5 sec. The various no. of nodes are 25, 50, 75 and 100 is to investigate the performance influence of different topologies. The simulated traffic is Constant Bit Rate (CBR). For each scenario, ten runs with different random seeds were conducted and the results were averaged.



NN Approach Results of DPMRP

Results of load, delay and overhead of the nn approach applied on DPMRP are shown as a graph Fig 5.13. It states that three parameters load, delay and overhead are very close to each other overhead is slightly is greater than load and delay. load and delay do not have much more difference they are approximate close to each other. At low speed DPMRP performs a bit lower than DPMRP NN approach , packet delivery ratio, is nearly 3 to 5% lower for one flow. This is due to the fact that with 1 source and 1 destination, all DPMRP mechanisms like overhearing are not used. Nevertheless, applying NN factor on DPMRP then the speed increases, DPMRP NN provides results better than DPMRP and with multiple flows at 20m/s, DPMRP NN performs up to a maximum of 30% better than DPMRP. This is probably mainly due to the fact that paths are de correlated and overhearing is used, hence, better results are produced. For the average end to end delay of a constant flow from 1 source to 1 destination it is higher for DPMRP, due to the algorithm used in which the protocol search for more specific paths

Conclusion:

DPMRP, the destination node sends reply initially and directly after receiving the request and adds a delay between replies for alternate paths. However, for the more realistic case of ten sources and ten destinations, the average end to end delay is better for DPMRP NN, as more paths are available and de-correlated. Moreover DPMRP achieves better throughput in all realistic cases. The only drawback of DPMRP is the fact that it increases the routing overhead along with the speed as expected, and slightly more than with DPMRP. Nonetheless, even with this drawback, the benefit from applying neural approach is effective and it is a relevant and optimized protocol for DPMRP.

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