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Providing an Effective Strategy in order to Proportional Distribution Nodes Meanwhile Energy Saving Network and Appropriate Coverage in Sensor Network

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Abstract

Wireless sensor networks are characterized by wireless loss links and resource constrained nodes. Energy efficiency is a major concern in such networks. Among the resource constraints, energy is probably the most crucial one since sensor nodes are typically battery powered and the lifetime of the battery imposes a limitation on the operation hours of the sensor network. The main problem of ad hoc networks is Resource constraints. Due to moving of nods, network topology continually changes and routing protocols must be aware of these changes. The central argument, finding dynamic routing protocols which in such an environment, able to find a suitable way to communicate and exchange information between two nodes. In this thesis, an algorithm is proposed that built on multi-streaming strategy, there are multiple paths between both origin and destination and for sending packages all paths are used at the same time.

Key Words

Effective Strategy, Proportional Distribution Nodes, Energy Saving Network, Appropriate Coverage, Sensor Network

I. INTRODUCTION

Due to advances in low-power wireless communications, low-power analog and digital electronics, the development of low-cost and low-power sensor nodes that are small in size has received increasing attention. Sensor nodes have the ability to sense the environment nearby, perform simple computations and communicate in a small region. Although their capacities are limited, combining these small sensors in large numbers provides a new technological platform, called Wireless Sensor Networks (WSNs).

WSNs provide reliable operations in various application areas including environmental monitoring, health monitoring, vehicle tracking system, military surveillance and earthquake observation [1-2]. Although WSNs are used in many applications, they have several restrictions including limited energy supply and limited computation and communication abilities. These limitations should be considered when designing protocols for WSNs. Because of these considerations specific to WSNs, many routing schemes using end-to-end devices and MANETs [3] are inappropriate for WSNs. In sensor networks, minimization of energy consumption is considered a major performance criterion to provide maximum network lifetime. When considering energy conservation, routing protocols should also be designed to achieve fault tolerance in communications. In addition, since channel bandwidth is limited, protocols should have capability of performing local collaboration to reduce bandwidth requirements [4].

The basic method to transfer information from a sensor node to the base is called flooding. In this method, information is disseminated by all the nodes as well as the base node. The broadcasting operation to all over the network consumes too much node resources such as energy and bandwidth. Heinzelman et al. proposed SPIN family protocols that disseminate all the information in the network assuming that all nodes are potential base nodes [5]. However SPIN's data advertisement operation does not guarantee data delivery. In this respect multi-path routing protocols promise advantages. The use of multiple paths to transfer data to the base enhances the reliability of WSNs. Directed diffusion [6] is a candidate method for multi path routing. However, directed diffusion may not be suitable for those monitoring applications which require periodic data transfers.

The optimization of network parameters for a WSN routing process to provide maximum network lifetime might be considered as a combinatorial optimization problem. Many researchers have recently studied the collective behavior of biological species such as ants as an analogy providing a natural model for combinatorial optimization problems [7-10]. Ant colony optimization (ACO) algorithms simulating the behavior of ant colony have been successfully applied in many optimization problems such as the asymmetric traveling salesman [11], vehicle routing [12] and WSN routing [8, 13, and 14].

II. RELATED WORKS

Clustering is an important research topic in the areas of data mining and mobile ad hoc networks (MANET) because clustering improves the performance of many systems. In MANET, clustering can be used to improve the network performance through quality of service metrics such as throughput and delay, in the presence of both mobility and a large number of mobile terminals. A large variety of approaches for ad hoc clustering and routing have been presented in the past by various researchers [1, 2, 3, 4, and 8].

Passive clustering technique proposed by Kwon [10], groups mobile nodes with similar speed into the same cluster, greatly tightens the intra-cluster links and stabilizes the cluster structure in the face of high mobility and perform well in terms of communication complexity. Mobility-aware clustering takes the mobility behavior of mobile nodes into consideration. This is because the mobile nodes' movement is the main cause of changes to the network topology. By grouping mobile nodes with similar speed into the same cluster, the intra-cluster links can be greatly tightened and the cluster structure can be stabilized in the face of mobile nodes. Distributed dynamic clustering algorithm proposed by McDonald and Znati [7] performs well for low mobility networks and degrades the performance of networks with high mobility.

To summarize the operation of the routing scheme, a node having information for the base station initializes the routing task by transferring data in packages to different neighbor nodes. Each node then chooses other neighbor nodes and so on. Thus, paths towards the base are formed and each routing operation supplies some information about optimum paths for the consequent routing tasks. While performing this operation, some agents (artificial ants) are used to achieve efficient routing. This operation is explained in the following section.

III. PROPOSED APPROACH AND EVALUATION

In this work, a cluster agent is used to perform cluster formation, cluster maintenance and cluster head election. Whenever there is change in cluster structure, it receives channel utilization parameter from physical layer indicating the number of collisions, packet dropped and contention window size from MAC layer and neighbor nodes information from network layer. This module adapts the original form of ACO meta-heuristic to first select cluster heads and after this, another new heuristic proposed in this work. All other cluster related activities like cluster head reelection, cluster members re-affiliation is also optimized by ACO meta-heuristic techniques. The cluster structure formed by this module is used by the AODV routing protocol to reduce the routing overheads to improve the overall performance of MANET. The Pseudo code of the proposed system is shown in the Figure 1.

1. For each node Find single hop neighbors
2. Find sender's neighbors
3. Find neighbors of sender's neighbor until reach destination
4. Discover all paths between source and destination
5. Determine a value for each route P*(1/Hop count)*(1/queue length)*(1/traffic load)
6. Select the best route
7. Iterate steps 2 to 6 until network is on\

Figure 1: The Pseudo code of the proposed system

In this work, a cluster based routing algorithm in which ant colony optimization is used for performing route optimization including route discovery and route maintenance. In order to provide effective routing, cluster heads are used to perform routing.

The simulation models that are present in the NS2 library for the performance evaluation of networks have been used for validating the clustering scheme proposed in this work. The NS2 library is a scalable simulation environment for wireless networks. In the simulation scenarios, the distributed coordination function (DCF) of IEEE 802.11 is used as the Medium Access Control (MAC) layer protocol first without pipelining and then with pipelining. The radio propagation range for each node is taken as 250 m, and channel capacity as 4 Mbps. The propagation model used is the two-way propagation model. The random way point model has been used for node mobility and the nodes are placed in random positions.

The proposed scheme has been implemented by adapting ACO meta-heuristic technique for cluster formation and cluster maintenance. We have modified the existing weighted clustering algorithm and adapted the ACO meta-heuristic technique to produce the load-balanced, optimized cluster structure in a large dynamic MANET. Modifications performed in the WCA clustering algorithm and the adaptations of the ACO meta-heuristic technique are explained respectively.

The performance of this proposed cluster based routing algorithms have been analyzed based on performance of routing and overheads involved. Performance of routing and overheads are analyzed separately in high-density wireless networks and low-density wireless networks.

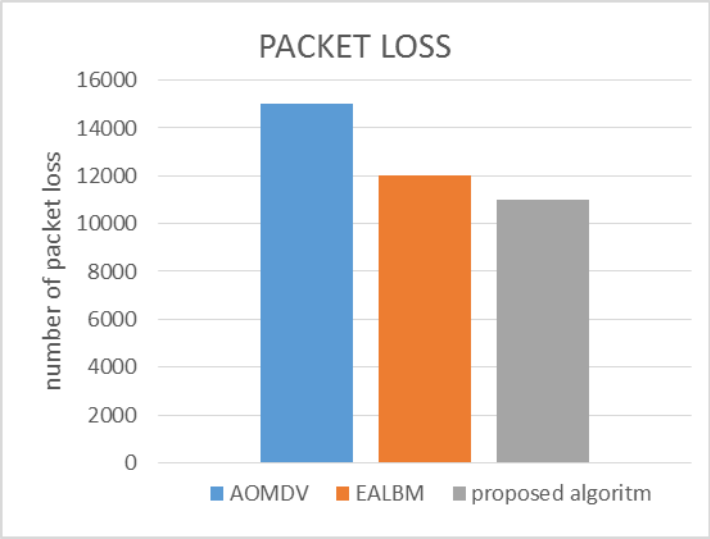

Figure II: The Comparison Evaluation of Proposed Work with Others

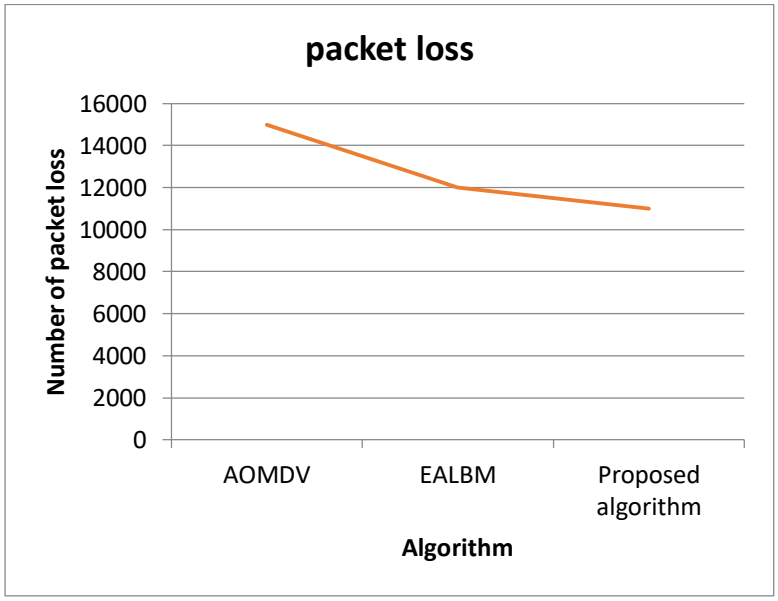

Figure III: The Comparison Evaluation of Proposed System.

IV. Conclusion and Future Issues

In this paper we have presented a new protocol for WSN routing operations. The protocol is achieved by using an ACO algorithm to optimize routing paths, providing an effective multi-path data transmission method to achieve reliable communications in the case of node faults. Energy efficiency is a major concern in such networks. Among the resource constraints, energy is probably the most crucial one since sensor nodes are typically battery powered and the lifetime of the battery imposes a limitation on the operation hours of the sensor network. The main problem of ad hoc networks is Resource constraints. Due to moving of nods, network topology continually changes and routing protocols must be aware of these changes. The central argument, finding dynamic routing protocols which in such an environment, able to find a suitable way to communicate and exchange information between two nodes. In this thesis, an algorithm is proposed that built on multi-streaming strategy, there are multiple paths between both origin and destination and for sending packages all paths are used at the same time.

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