Energy Efficiency mechanisms in MANET using MIMO System: A Review

[1] Jyotsna Tayade, [2]Prof. Nutan Dhande

[1] Research Scholar, Department of Computer Science and Engineering, Agnihotri College of Engineering Wardha

[2] Professor, Department of Computer Science and Engineering, Agnihotri College of Engineering Wardha

Abstract : Mobile ad hoc networks (MANET) are self-creating networks. They contain short radio range and limited bandwidth and they do not have any infrastructure support. There is a sudden change in topology of ad hoc networks. In such type of situation, establishing correct and efficient routes from source to destination is an important design issue in mobile ad hoc networks and its challenging goal is to provide energy efficient routing protocol. Power failure of a node affects overall lifetime of a network. In this paper we review different techniques proposed by authors regarding energy efficiency in MANET systems.

***IndexTerms* - MANET, MIMO, Energy Efficiency.**

I. INTRODUCTION

Now-a-days the use of personal communication devices like personal digital assistants (PDAs), mobile phones and mobile computers are growing rapidly due to progress in technologies and comparatively low cost. These devices get easily access to the network through wireless interfaces [1]. A mobile ad-hoc network (MANET) is a collection of independent nodes. They communicate with each other with the help of radio waves. The nodes in the MANET are mobile in nature i.e. nodes can move from one position to another. The nodes communicate directly with each other within the radio range and the nodes which are far away communicate by some routing algorithms [2]. Each node has wireless interface to communicate with other nodes. In MANET, each node acts both as a router and as a host & even the topology of network may also change rapidly. The organization of ad hoc networks is point-to-point and multihop. Nodes transfer information packets in a store-andforward mode from a source to any arbitrary destination via intermediate nodes. As the nodes are mobile, any change in network topology is communicated to other nodes so that the topology information can be updated or eliminated. It is not possible for all mobile nodes to be within the range of each other [1]. However, all the nodes are close by within radio range. The ad hoc network is infrastructure less i.e. they do not have any fix infrastructure for communication. Fig. 1 shows a sample network of mobile ad hoc network. Fig 1. Mobile Ad Hoc Network In ad hoc networks, each node forward data to other nodes in the network dynamically, based on the network connectivity. This is in contrast to the infrastructure-based networks in which designated nodes, usually with custom hardware and variously known as routers, switches, hubs, and firewalls, perform the task of forwarding the data. All nodes in this network are mobile and they use wireless connections to communicate with various networks [3]. These networks introduced a new art of network establishment and are well suited for environments where either the infrastructure is lost or where deploying an infrastructure is not cost-effective. Ad hoc network supports anytime and anywhere computing. Routing is the process of choosing a path in a network for moving packets form source to destination. It basically involves two processes like finding an optimal routing path and transferring the packets in the internetwork [1]. Routing protocols are broadly categorized as Proactive Routing protocol, Reactive Routing Protocol and Hybrid Protocols. Proactive Routing Protocols are table driven, so they are also called as "Table Driven Routing Protocol". In this protocol, each node maintains the routing table which contains the latest information of the routes of its neighbor nodes in the network [4]. Examples of such protocols are Optimized Link State Routing (OLSR), Destination Sequenced Distance Vector Routing (DSDV), Global State Routing (GSR), etc. Reactive Protocols are called also called as "On Demand Routing Protocol". These protocols do not update the routing information periodically as there is no routing table present for keeping routing information. Each node has route cache [5]. The packets that are forwarded are based on query-reply conversation. This protocol does not maintain route tables like proactive protocol. Examples of such protocol are Dynamic Source Routing (DSR), Ad hoc on Demand Vector (AODV), Location Aided Routing (LAR), Temporally Ordered Routing Algorithm (TORA), etc.

In Hybrid Routing Protocol, combination of both Proactive and Reactive routing methods are used. It is better than the both of the routing protocols when used independently. It takes the advantages of both Proactive and Reactive Protocols [6]. Initially, routing is done with proactive routing protocol and then flooding is done through reactive protocol. Examples of such protocol are Zone Routing Protocol (ZRP), etc.

II. MATERIALS AND METHODS

1.Load Balancing Algorithms in Wireless Sensor Network : A Survey

In this paper, we examine the proposed load balancing algorithms for wireless sensor networks. Load balancing can be used to extend the lifetime of a sensor network by reducing energy consumption. Load balancing using clustering can also increase network scalability. Wireless sensor network with the nodes with different energy levels can prolong the network lifetime of the network and also its reliability. We discuss the improvement to be made for future proposed load balancing schemes. This paper should provide the reader with the basis for research in load balancing schemes for wireless sensor network [2].

2. *Load Balancing in Wireless Sensor Network using Divisible Load Theory*

Optimal load allocation strategies are proposed for a wireless sensor network which is connected in a star topology. The load considered here is of arbitrarily divisible kind, such that each fraction of the job can be distributed and assigned to any processor for computation purpose. Divisible Load Theory emphasizes on how to partition the load among a number of processors and links, such that the load is distributed optimally. Its objective is to partition the load in such a way so that the load can be distributed and processed in the shortest possible time. The existing strategies for both star and bus topologies are investigated. The performance of the suggested strategy is compared with the existing ones and it is found that it reduces the overall communication and processing time if allocation time is considered in the previous strategies [1].

3. *Load Balancing for Achieving the Network Lifetime in WSN-A Survey*

A wireless sensor network is network form of sense compute, and communication elements which helps to observe, events in a specified environment. Sensor nodes in wireless sensor network are depends on battery power they have limited transmission range that's why energy efficiency plays a vital role to minimize the overhead through which the Network Lifetime can be achieved. The lifetime of network, depends on number of nodes, strength, range of area and connectivity of nodes in the network. In this paper authors are over viewing techniques which are used in wireless sensor network for load balancing. Wireless sensor network having different nodes with different kind of energy which can be improve the lifetime of the network and its dependability. This paper will provide the person who reads with the groundwork for research in load balancing techniques for wireless sensor networks[7].

4. *Literature Survey on Energy Efficient Clustering and Routing in Wireless Sensor Networks*

Wireless Sensor Network has very important applications in remote environmental monitoring areas. The one of the main issues about sensor networks is energy efficiency in communication and broadcasting informa12tion on network. Various energy efficiency schemes which are helps to extend the life time of sensor network's like Clustering, Routing and load balancing also introduces the deferent techniques of clustering in WSN[12].

5. *Review on Load Balancing in Wireless Sensor Network*

In wireless sensor networks routing is a challenging issue due to hardware constraints such as power, memory and computing capabilities. Wireless sensor networks are a large scale network which consists of thousands of nodes. A sensor manages the task of data sending and routing of data. Due to increases load on nodes, a loss of packet starts which degrade the performance of network. For increases the life time of network and reduce the packet lose equal distribution of load is necessary. Various load balancing strategies are discussed for equal distribution of load in the network[8].

6. *A Survey on Flow Balanced Routing in Wireless Sensor Networks*

Wireless Sensor Networks (WSNs) consists of a large number of sensor nodes which are densely deployed. Energy conservation and coverage preservation are two important performance metrics for a WSN. Routing is important in WSN in order to reduce the energy consumption of the sensor nodes. Multipath routing techniques enable the use of multiple alternative paths and also the energy consumption of each sensor node get balanced. Hence it helps in increasing the network lifetime. In many routing protocols, cluster formation is done at each round. Most of the multipath routing techniques does not consider the full coverage over a longer period. Hence the routing protocol which considers the overlapping degree in choosing a Cluster Head(CH) needs to be developed to provide full coverage for longer time. Event to sink directed clustering scheme form clusters only towards the sink which avoids unnecessary cluster formation. The Backbone network can be constructed by using the Load Balanced Connected Dominating Set(LBCDS) in order to balance the energy consumption of sensor nodes. The energy efficient wake up scheduling can be used to reduce the energy consumption of sensor nodes. Since the CH's at higher level have large amount of data than CH's at lower level, the wake-up time of CH's at higher level is set to be higher than the CH's at lower level, which decrease the delay and also increases the network lifetime[9].

7. *Survey on Clustering Algorithms of Wireless Sensor Network*

Wireless sensor network is collection of sensor nodes. These nodes can communicate by transferring data to neighbor node. Nodes also have some resources those are limited. In this paper author discuss the different clustering algorithms for efficient utilization of resources. Also discuss the quality parameters of nodes. And gives the proposed solution method "Distributed Weighted Clustering Algorithm" for energy efficient and scalable network[10].

8. *A Literature Survey on Security and Clustering in Wireless Sensor Networks*

Wireless sensor networks are often used for monitoring sensitive data. Therefore security is a significant issue in WSNs. We point out the constraints, security requirements and attacks in WSNs. Clustering is the concept which increases the network scalability and decreases the energy consumption in WSNs. This article presents importance of clustering and clustering algorithm in WSNs. We first outline the basics of wireless sensor networks and general notion of cluster that is how the clusters are formed and its communication. Also we highlight merits, demerits and issues of clustering protocols in wireless sensor networks[11].

9. Literature Survey on Energy Efficient Clustering and Routing in Wireless Sensor Networks.

Wireless Sensor Network has very important applications in remote environmental monitoring areas. The one of the main issues about sensor networks is energy efficiency in communication and broadcasting information on network. This paper presents various energy efficiency schemes which are helps to extend the life time of sensor network's like Clustering, Routing and load balancing also introduces the deferent techniques of clustering in WSN[15].

10. Comparative Study of Load Balancing Techniques for Optimization of Network Lifetime in Wireless Sensor Networks

In wireless sensor networks, sensors or nodes are generally battery powered devices. These nodes have limited amount of initial energy that are consumed at different rates, depending on the power level. For maximizing the lifetime of these nodes, most routing algorithm in wireless sensor networks uses the energy efficient path. These energy efficient routing algorithms select a best path for data transmission and consume less energy. But a single best path puts extra load to a specific node causing lower lifetime. The lifetime of Wireless Sensor Networks (WSN) is crucial .In this paper, we have compared some strategies that balance the energy consumption of these nodes and ensure maximum network lifetime by balancing the load as equally as possible [15].

11. An Overview of Energy Consumption Techniques in Wireless Sensor Networks

A Wireless Sensor Network (WSN) could be a wireless network consisting of spatially distributed autonomous devices that use sensors for watching and recording the physical conditions of the surroundings and organizing the collected information at a central location. Energy Consumption is a very difficult problem in a WSN because the batteries of wireless sensor nodes have very restricted capacities. Due to this problem, every solution elaborated for these networks should be aimed at minimizing the energy consumption. This paper provides the short overview of the energy consumption techniques and algorithms for calculating energy-efficient topologies for wireless sensor networks[17].

III. CONCLUSION

The paper has represented various routing schemes in mobile ad hoc networks which result in reducing the energy consumption of the network thereby increasing its lifespan. The bio inspired algorithms namely ant colony optimization and firefly algorithm have been used to optimize the performance of the network in terms of lesser energy depletion. In future, this study will be used to further improve the performance of the network.

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