Efficient Energy-Aware Cooperative Group Clustering Data Gathering Algorithm in Wireless Networks

Mrs.M.SANTHALAKSHMI,M.SC.,M.C.A.,M.Phil.,PhD.,

HOD cum ASST.PROF.DEPARTMENT OF COMPUTER APPLICATION,
BHARATHIYAR ARTS AND SCIENCE COLLEGE(W),
THALAIVASAL, ATTUR SALEM (DT).

Mrs. P.KAVITHA M.C.A.,M.Phil.,BEd.,PhD.,

HOD cum ASST.PROF.DEPARTMENT OF COMPUTER SCIENCE
BHARATHIYAR ARTS AND SCIENCE COLLEGE(W),
THALAIVASAL, ATTUR. SALEM (DT).

***Abstract*— Now days, hot topic among mobile researchers is to optimize the power consumption in every aspect of the mobile devices. The optimization can be carried out by means of some applications and communication techniques. We are trying to optimize a power efficient routing technique for wireless networks in this project. We have proposed a routing algorithm which tries to minimize the power consumption in transmitting a packet from the source to the destination, while trying to maximize the lifetime of the network by avoiding nodes that have a shorter lifetime remaining. Discovering paths show the way to consume minimum energy. In addition to this, discovering path which does not use energy depleted nodes has lead to conflicting objectives and discovered that the proposed algorithm surpassed as the best known algorithm in mobile optimizing literature. Here we are using the energy-aware algorithm and the cooperative routing algorithm is incorporated through the inclusion factor for both the required cooperative transmission power.**

***Index Terms*—Energy Consumption, Wireless Sensor Networks, transmission power**

I. INTRODUCTION

There are other issues connected to this study such as power management using sleep and wake up mechanisms [17]][20] and clustering [13][21][22] for energy efficiency. There are many solutions for these issues in the literature. However, the path taken here is indeed inclusive. That is, the solutions proposed in this thesis can co-exist with them. In the next section, we list all the contributions of this thesis and explain each of them Contributions of the Thesis there are two concepts behind our contributions in this thesis.

In a mobile communication system at least one of the transceivers is mobile. It may be on board a vehicle that can move at high speeds, or it may be a handheld unit used by a pedestrian. Basic types of systems include base/mobile, peer-to-peer, repeater, and mobile satellite systems. In a base/mobile system, a base station connected to a public network communicates with a mobile unit. This gives the mobile unit access to the public network. More than one mobile at a time can be supported if a different channel (such as a narrow band of spectrum) is assigned to each user.

First, we believe that it is necessary to bring energy-efficiency to different layers of the communication stack, making it a Green Stack". We believe that designing energy-efficient and energy-aware schemes for only one layer s not effective. Energy-efficiency of other layers must also be aken into account.

Second, while we design an energy-efficient mechanism for one layer, we need to consider the impact of other layers on that layer to provide a cross-layer optimization from an energy-efficiency viewpoint. Keeping these two aspects in mind, we develop a suite of communication schemes which together form a platform for energy-efficient and energy-aware communication in wireless multi-hop networks. In other words, our proposed platform considers different layers of the communication stack taking into account cross-layer dependency between them from energy-efficiency viewpoint. We list our contributions as follows: we propose routing schemes for finding the most energy-efficient routes between any two nodes of the network. To this aim, we consider the impact of the physical layer, data link layer, and transport layer on energy-efficient routes. The energy-efficient routing schemes are then enhanced with the capability to balance the traffic load between nodes according to their available battery energy. The proposed schemes could be deployed at the network layer. We propose a neighbor discovery mechanism for the data link layer in the form of a network topology control algorithm.

The proposed algorithm keeps the maximum transmission power of nodes as low as required for multi-hop connectivity of the network. We analyze the expected duration that two nodes in a wireless multi-hop network with a random topology could communicate with each other from a transport layer viewpoint Consumption of transceiver circuit Link level energy consumption Maximum. Wireless technology is a truly revolutionary paradigm shift, enabling multimedia communications between people and devices from any location. It also underpins exciting applications such as sensor networks, smart homes, telemedicine, and automated highways.

Various modulation, coding, and signal processing schemes are then discussed in detail, including state-of-the-art adaptive modulation, multi carrier, spread spectrum, and multiple antenna techniques. The concluding chapters deal with multi user communications, cellular system design, and ad-hoc network design. Design insights and tradeoffs are emphasized throughout the research.

There might be a link between any two nodes with a certain probability, regardless of their distance with each other. Furthermore, the existence of a link between two nodes is independent of the existence of a link between another pair of nodes. Nevertheless, in a wireless multi-hop network, there cannot be a link between two nodes which are outside each other's transmission range. Moreover, links are locally correlated with each other. That is, there is a high probability that a link exists between two nodes which have a common neighbor. A geometric random graph consisting of N nodes is constructed by distributing N points uniformly on a square area and adding edges to connect any two nodes for which their Euclidean distance to each other is less than a predefined value.

II. Co-operative Energy Aware Mechanism

Now days, hot topic among mobile researchers is to optimize the power consumption in every aspect of the mobile devices. The optimization can be carried out by means of some applications and communication techniques. We are trying to optimize a power efficient routing technique for wireless networks in this project. We have proposed a routing algorithm which tries to minimize the power consumption in transmitting a packet from the source to the destination, while trying to maximize the lifetime of the network by avoiding nodes that have a shorter lifetime remaining.

Having Intention to maximize network lifetimes, the paths for message flows are chosen in such a way that the total energy consumed along the path is minimized while avoiding energy depleted nodes. Discovering paths show the way to consume minimum energy. In addition to this, discovering path which does not use energy depleted nodes has lead to conflicting objectives. We have put forward a two-phased energy-aware routing strategy that balances these two conflicting objectives by transforming the routing problem into a multi-metric widest path problem. Finally we have discovered that the proposed algorithm surpassed as the best known algorithm in mobile optimizing literature. Moreover, a simple but insightful relationship between the total energy required along a path and the minimum remaining energy of a node along the path has been established in this paper.

We have intended a combined energy-aware and cooperative routing algorithm to prolong the network lifetime. The energy-aware algorithm and the cooperative routing algorithm are incorporated through the inclusion factor for both the required cooperative transmission power. With the aim of determining the optimal route, the residual energy of the transmitting node in the cost function is utilized. Its performance can be analyzed, by implementing our proposed algorithm and some existing routing algorithms to the same network topology with the same list of randomly chosen source and destination nodes until the networks are partitioned. In conclusion simulations illustrates that the projected new algorithm can increase the network using energy-aware cooperative algorithm.

III. Related Works

A. Packet Propagation Speed

Classical routing strategies for mobile ad hoc networks forward packets on a pre-defined route (typically obtained by a shortest path routing protocol). Research has high-lighted the interest in developing opportunistic routing schemes, where the next relay is selected dynamically for each packet and each hop. This allows each packet to take advantage of the local pattern of transmissions at any time.

The objective of such opportunistic routing schemes is to minimize the end-to-end delay required to carry a packet from the source to the destination. In this paper, we provide upper bounds on the packet propagation speed for opportunistic routing, in a realistic network model where link conditions are variable. We analyze the performance of various opportunistic routing strategies and we compare them with classical routing schemes. The analysis and simulations show that opportunistic routing performs significantly better. We also investigate the effects of mobility. Finally, we present numerical simulations that confirm the accuracy of our bounds.

B. Scalable Routing Protocols

The growing interest in Mobile Ad Hoc Network techniques has resulted in many routing protocol proposals. Scalability issues in ad hoc networks are attracting increasing attention these days. In this paper, we will survey the routing protocols that address scalability. The routing protocols we intend to include in the survey fall into three categories:

- Flat routing protocols,
- Hierarchical routing approaches, and
- GPS augmented geographical routing schemes.

The paper will compare the scalability properties and operational features of the protocols and will discuss challenges in future routing protocol designs

With the advance of the wireless communication technologies, small size and high performance computing and communication devices have been increasingly used in daily life and computing industry.

Routing in ad hoc networks faces extreme challenges from node mobility/ dynamics, potentially very large number of nodes, and limited communication resources (e.g., bandwidth and energy). The routing protocols for ad hoc wireless networks have to adapt quickly to frequent and unpredictable topology changes and must be parsimonious of communications and processing resources. Due to the fact that bandwidth is scarce in MANET nodes and that the population in a MANET is small, as compared to the wireline Internet, the scalability issue for wireless multihop routing protocols is mostly concerned with excessive route.

Both types find shortest paths to destinations. In distance-vector routing (DV), a vector containing the cost (e.g., hop distance) and path (next hop) to all the destinations is kept and exchanged at each node. DV protocols are generally known to suffer from slow route convergence and tendency of creating loops in mobile environments. The Link-state routing (LS) algorithm overcomes the problem by maintaining global network topology information at each router through periodical flooding of link information about its neighbors. Mobility entails frequent flooding.

C. Routing in Flat Network

The protocols that we review here fall into two categories, namely, proactive routing and on-demand routing. Many proactive protocols stem from conventional link state routing. On-demand routing, on the other hand, is a new emerging routing philosophy in the ad hoc area.

It differs from conventional routing protocols in that no routing activities and no permanent routing information is maintained at network nodes if there is no communication, thus providing a scalable routing solution to large populations. A. Proactive Routing Protocols Proactive routing protocols share a common feature, i.e., background routing information exchange regardless of communication requests. The protocols have many desirable properties especially for applications including real time communications and QoS guarantees, such as low latency route access and alternate QoS path support and monitoring. Many proactive routing protocols have been proposed for efficiency and scalability.

IV. Co-operative Clustering Algorithm

The problem of finding minimum-energy data gathering trees is NP-complete, by applying a reduction to set cover. Moreover, a heuristic based on a combination of a shortest path tree augmented by travelling salesperson paths is proposed. We continue their work by establishing a strict classification of coding strategies. Furthermore, we provide an approximation algorithm in case of self-coding and an optimal one for the foreign coding strategy.

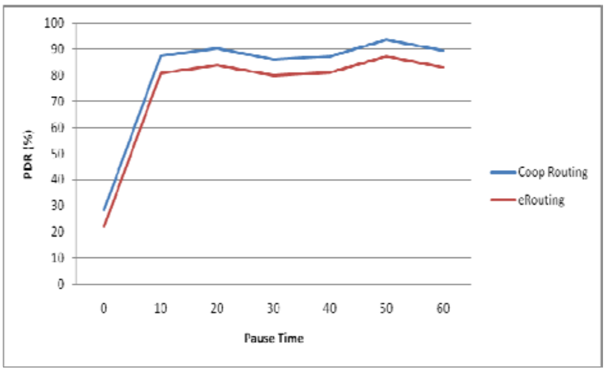
During the design of data gathering protocols for wireless networks, researcher has identified the importance of data aggregation to improve energy efficiency. In Directed Diffusion is proposed, a protocol in which s create gradients of information in their respective neighborhoods. The sink node requests data by broadcasting interests. If interests fit gradients, paths of information flow are formed and data is aggregated on the way to reduce communication costs. The key idea is to reduce the number of nodes communicating directly with the sink by forming randomized clusters. Each cluster-head encodes data arriving from nodes in its cluster, and sends an aggregated packet to the sink. However, the main drawback of the protocol is the requirement that all nodes must be able to directly communicate with the sink.

In cluster formation phase, an energy-efficient distributed clustering scheme is proposed to form a coverage-efficient WN. The wireless networks have been extensively deployed and researched. One of the major issues in wireless networks is a developing energy-efficient clustering protocol. Clustering algorithm provides an effective way to prolong the lifetime of a wireless networks. In the paper, we compare several clustering protocols which significantly affect a balancing of energy consumption. And we propose an Energy-Efficient cooperative Group Clustering algorithm which provides a new way of creating grouped clusters. Each node sets the waiting time. This waiting time is considered as a function of residual energy, number of neighborhood nodes. It uses waiting time to distribute cluster heads. We also propose a group (Unbalanced) clustering mechanism to solve the hot-spot problem.

The proposed scheme provides stochastic end-to-end delay guarantees, instead of average delay guarantees, to delay-sensitive burst traffic sources. Via a cross-layer design approach, the scheme selects the routes based on a geographical on-demand ad hoc routing protocol and checks the availability of network resources by using traffic source and link-layer channel modeling, taking into consideration the IEEE 802.11 characteristics and node interactions.

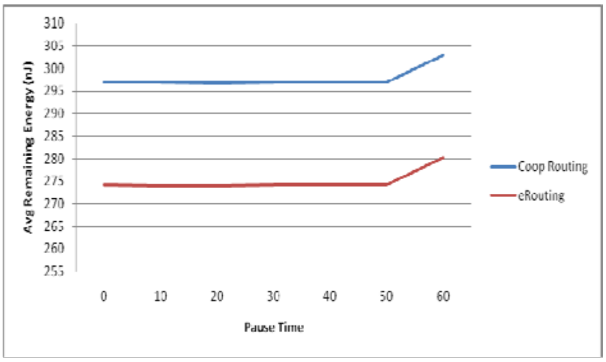
V. Experimental Result

We tested our proposed approach in the network simulator-2 tool and we show some of the experimental result for the tested parameters. Our experimental result is shown as the graphical representation as follows:



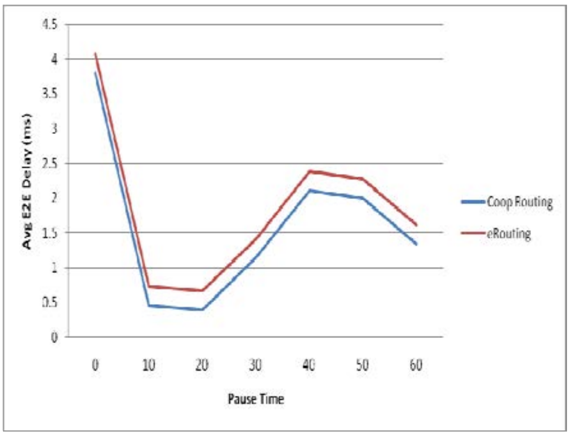
Graph shows the comparison for the pause time with the PDR

The enhanced protocol provides better performance than the original. Pause time provides considerable improvement of avg remaining time in all scenarios. This indicates that Pause time is more resistive in stressful situation than avg remaining time. This is due to the following reasons. The first is that it uses transmit power control. The transmit power control reduce the collision rate of the packets. Even the stress (number connections and traffics) is high; every data packet must be transmitted with appropriate power level.



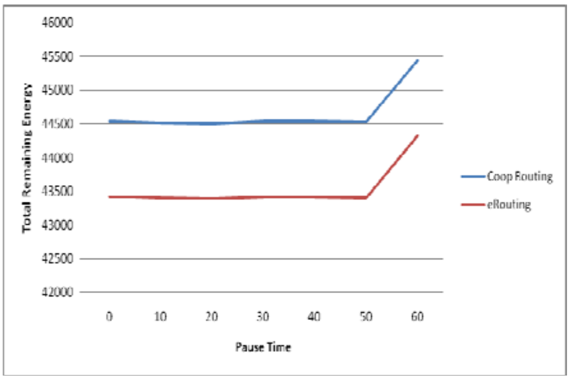
Graph shows the comparison for the pause time with the Average Remaining Energy

This is one of the metrics that used to analyze the energy consumption. This metric addresses mainly the end-to-end energy consumptions to deliver the data packets. It consumes less energy than DSR to deliver the packet. The first is, implementation of the transmit power control. The transmit power control assigns the minimum transmit power to deliver the packet to the next hop. This mechanism saves unnecessary energy consumption due to maximum power level of transmission in DSR.



Graph shows the comparison for the pause time with the Average E2E Delay

The objective is to reduce the E2E Delay time by implementing minimum transmit power control and load balance on base of residual battery energy of the nodes. Accordingly, E2E Delay time is used to analyze the load balance of the routing protocol to extend the network lifetime. The E2E Delay time are analyzed for different scenarios with different number of connections and traffics. The E2E Delay time results of the two routing protocols show that EEDSR provides better variances than DSR. These values are comparable with the variance of AODV for similar scenarios. This is due the fact that EEDSR routes have to be selected not only to deliver packet with minimum energy consumption but also to distribute the load based on the residual energy levels and queue lengths of the nodes.



Graph shown between Pause Time and Total Remaining Energy

This metric used to analyze the network partitions as shown on the figures, Pause Time. This is the overall results of many energy efficiency issues incorporated on Pause Time. The network life time of Pause Time is better than DSR due to the following main reasons. Implements the transmission power control which saves energy consumption. Transmission power control reduces the number of retransmissions.

VI. CONCLUSION AND FUTURE WORK

We have intended a combined energy-aware and cooperative routing algorithm to prolong the network lifetime. The energy-aware algorithm and the cooperative routing algorithm are incorporated through the inclusion factor for both the required cooperative transmission power. With the aim of determining the optimal route, the residual energy of the transmitting node in the cost function is utilized. Its performance can be analyzed, by implementing our proposed algorithm and some existing routing algorithms to the same network topology with the same list of randomly chosen source and destination nodes until the networks are partitioned. In conclusion simulations illustrates that the projected new algorithm can increase the network using energy-aware cooperative algorithm.

In future we design a wireless sensor network protocol to provide energy efficient communication, since most of the nodes in sensor networks have limited battery power and it is not feasible to recharge or replace the batteries. The idea is sensor nodes dynamically create on-off schedules such that the nodes will be awake only when they are needed. This also limits the collisions, therefore the energy consumed during retransmissions. Although, it seems best way to limit consumed energy and the main consideration should be energy efficiency, the other QoS issues have to be considered. The delivery of the packets by scheduling the sleep schedules of the nodes between source and destination. A link between two nodes will be active if and only if both nodes are active. The path selection has to be carefully engineered, because the algorithm affects the latency and power consumption.

VII. REFERENCE

[1] N. Baken, N. van Belleghem, E. van Boven, and A. de Korte., \Unravelling 21st century riddles -universal network visions from a human perspective," The Journal of The Communication Network, vol. 5, no. 5, pp. 11{20, 2007.

[2] C. K. Toh, Ad Hoc Mobile Wireless Networks: Protocols and Systems. Prentice Hall, 2002.

[3] S. Basagni, M. Conti, S. Giordano, and I. Stojmenovic, Mobile Ad Hoc Networking. Wiley-IEEE Press, 2004.

[4] A. Hac, Wireless Sensor Network Designs. John Wiley and Sons, 2003. 4

[5] J. Zheng and A. Jamalipour, Wireless Sensor Networks: A Networking Perspective. Wiley, 2009.

[6] V. Lesser, C. L. Ortiz, and M. Tambe, Distributed Sensor Networks: A Multiagent Perspective. Kluwer, 2003.

[7] I. G. M. M. Niemegeers and S. M. Heemstra De Groot, \Research issues in ad-hoc distributed personal networking," Wireless Personal Communications, vol. 26, no. 2-3, pp. 149{167, 2003. 5, 107

[8] M. Jacobsson, I. Niemegeers, and S. H. de Groot, Personal Networks: Wireless Networking for Personal Devices. Wiley, 2010.

[9] E. Aarts and J. Encarnao, True Visions: The Emergence of Ambient Intelligence. Springer, 2006. 6

[10] W. Mohr et al., The Book of Visions 2000 - Visions of the Wireless World. Wireless Strategic Initiative, November 2000. 7 271 272 BIBLIOGRAPHY

[11] J. Vazifehdan, M. G. Hawas, R. Hekmat, and I. Niemegeers, \Design of dependable personal networks," in 3rd international workshop on adaptive and dependable mobile ubiquitous systems (ADAMUS '09), pp. 1{6, 2009.

[12] M. Jacobsson, Personal Networks -An architecture for self-organized personal wireless communications. PhD thesis, Delft University of Technology, 2008.

[13] Y. Gu, Personal Networks: Mobility and Clustering. PhD thesis, Delft University of Technology, 2010.

[14] J. Zhou, Impact of Wirelsss Link Quality across Communication Layers. PhD thesis, Delft University of Technology, 2010.
[15] M. Ghader, Service Discovery and Use in Personal Networks. PhD thesis, University of Surrey, 2008.