International Journal of Soft Computing and Engineering (IJSCE)
ISSN: 2231-2307, Volume-1, Issue-ETIC2011, January 2012

Power Efficiency Metrics for Geographical Routing In Multihop Wireless Networks

Gowthami.A, Lavanya.R

***Abstract* - A number of energy-aware routing protocols are proposed to provide the energy efficiency of routes in multihop wireless networks.A Localized Energy-Aware Restricted Neighborhood routing (LEARN), can guarantee the energy efficiency of its route if it can find the route successfully. The study of its critical transmission radius in random networks can guarantee that LEARN routing finds a route for any source and destination pairs asymptotically almost surely. Extending this proposed routing into three-dimensional (3D) networks by deriving its critical transmission radius in 3D random networks. In geographical routing schemes ,where each network node is assumed to know the coordinates of itself and all its adjacent nodes, and each message carries the coordinates of its target. The LEARN technique is to find the efficient path, and propose and analyze several randomized geographic routing algorithms which work well for 3D network topologies. For all networks graphs, present a technique to geographically capture the surface of holes in the network, which leads to 3D routing algorithm and heuristic algorithm shows performance analysis in the wireless networks.**

Index terms* — *LEARN Routing, Geographic Routing, Heuristic Algorithm, Energy Efficiency, Network Lifetime, 3D networks

I. INTRODUCTION

Numerous energy aware routing protocols [2], [3], [4], [6] have been proposed recently using various techniques (transmission power adjustment, adaptive sleeping, topology control, multipath routing, directional antennas, etc). Most of the energy-aware routing methods takes into account the energy-related metrics instead of traditional routing metrics such as delay or hop count.The energy conservation and scalability are the two critical issues in designing protocols for multihop wireless networks, because wireless devices are usually powered by the batteries only and have limited computing capability. A localized routing algorithm, called the Localized Energy-Aware Restricted Neighborhood routing (LEARN), can guarantee the energy efficiency [2] of its route if it can find the route successfully. The study of its critical transmission radius in random networks can guarantee that LEARN routing finds a route for any source and destination pairs. Extending the proposed routing into three-dimensional (3D) networks and derive its critical transmission radius in 3D random networks. In geographic routing schemes [8],[9],[12], each network node is assumed to know the coordinates of it and all adjacent nodes, and each message carries the coordinates of its target. The LEARN technique [12],[14] is to find the efficient path, and propose and analyze several randomized geographic routing algorithms which work well for 3D network topologies.

For all networks graphs, present a technique to geographically capture the surface of holes in the network, which leads to 3D routing algorithm and the heuristic algorithm shows performance analysis in wireless networks. Implementation for designing routing protocols [1],[6],[8] for multihop wireless networks can achieve both energy efficiency by carefully selecting the forwarding neighbors and high scalability by using global information to make routing decisions. The energy efficient path is monitored by the monitoring node and sends the data through multihop wireless networks.

The localized routing is not forwarding the data to the other regions by using the geographical location [15],[16] to forward the data to other regions using LEARN techniques. The secured transmission of data is to be proposed by heuristic algorithm and the spike values is generated the graph and shows the comparison of existing techniques and proposed techniques through performance analysis. Numerous energy aware routing protocols have been proposed recently using various techniques (transmission power adjustment, adaptive sleeping, topology control, multipath routing, directional antennas, etc).The proposed energy-aware routing methods take into account the energy-related metrics instead of traditional routing metrics such as delay or hop count.

The selection of optimal energy route, those methods usually need the global information of the whole network, and each node needs to maintain a routing table as protocol states. In opposition to these table-driven routing protocols, several stateless routing protocols, particularly, localized geographic Routing protocols have been proposed to improve the scalability. In those localized routing protocols, with the assumption of known position information [10], the routing decision is made at each node by using only local neighborhood information.The routing decision does not need any dissemination of route discovery information, and no routing tables are maintained at each node. The Previous

Manuscript received January 09, 2012.
Gowthami.A, Department of Computer Science,Prathyusha Institute Of Technology And Management, Thiruvallur, India, +919585704366 (gowthamicool.a@gmail.com).
Lavanya.R, Department of Computer Science, Prathyusha Institute Of Technology And Management, Thiruvallur, India, +919445632366 (lavi.ramakrishnan@gmail.com).

localized routing protocols are energy inefficient, i.e., the total energy consumed by their route could be very large compared with the optimal. Recently, several energy-aware localized routing protocols [6] takes the energy consumption into consideration during making their routing decisions.

II. RELATED WORK

A. Existing Technologies

The critical transmission radius[14],[15] of LEARN-G routing protocol will be exactly same as the traditional greedy routing method since at last using the greedy routing to find the forwarding node if LEARN fails. The localized routing protocols, with the assumption of known position information, the routing decision is made at each node by using its local neighborhood information. The localized routing is greedy routing where the current node finds the next relay node which is nearest to the destination. Many routing protocols used this approach, such as greedy face routing (GFG).Although the face routing or greedy face routing can guarantee the packet delivery on planar networks and some localized routing[8] protocols can guarantee the delivery if certain geometry structures are used as the routing topology, none of them guarantees the ratio of the distance travelled by the packets over the minimum possible.The data transmission between source and destination is not secured.

Transmission ranges of the packet are loss due to weak energy in the networks. Minimizing network lifetime due to energy loss in any of the neighbor nodes [4],[6]. Time delay is there in localized routing method as it greedily picks the neighbor node and minimizes the energy in the destination node. The packet transmission in the networks can be communicated by single hop broadcasting in 2d networks. In the greedy routing algorithm current node selects its data based on distance and sends the data to its neighbor to the destination node are the drawbacks of the existing system .

B. Localized Routing

The geometrical nature of the multihop wireless networks allows the localized routing protocols. The localized routing is a greedy routing where the current node always finds the next relay node which is nearest to the destination [8],[9]. Though greedy routing (or its variation) is used, it is easy to construct an example where greedy routing will not succeed to reach the destination but fall into a local minimum. To guarantee the packet delivery, face routing is proposed by its idea to walk along the faces (using the right hand rule to explore each face) which are intersected by the line segment between the source and the destination. The face routing guarantees to reach the destination after traversing at most edges when the network topology is a planar graph.One improvement is to combine greedy routing and face routing to recover the route after greedy method fails in local minimum.

C. Energy Efficient Routing

As energy is a scarce resource which limits the life of wireless networks, a number of energy efficient routing protocols have been proposed recently using a variety of techniques[2],[4]. The Classical routing algorithm ise adapted to take into account energy-related criteria rather than classical metrics such as delay or hop distance. Most of the proposed energy-aware metrics are defined as a function of the energy required to communicate on a link or a function of the nodes remaining lifetime. By Using the realistic models for wireless channel fading as well as radio modulation and encoding, they derived the optimal power control strategy over a given link. The proposed a local power-efficiency metric for localized routing which is very similar to the energy mileage.

III. PROPOSED METHODOLOGIES

The 3D wireless network has received significant attention due to its wide range of potential applications (such as underwater sensor networks). The design of networking protocols for 3D wireless networks is surprisingly more difficult than that for 2D networks [8],[9]. For example, to guarantee packet delivery of 2D localized routing, face routing can be used on planar topology to recover from local minimum. However, there is no planar topology concept anymore in 3D networks. There is no deterministic localized routing algorithm for 3D networks that guarantees the delivery of packets. For energy efficiency [2],[6], an example of a 3D network where the path found by any localized routing protocol to connect two nodes s and t has energy consumption asymptotically at least in the hydraulic[14],[15].

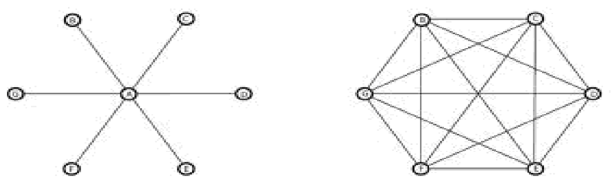

Figure 1. Hierarchical Network structure

Therefore,by extending the proposed LEARN routing into a 3D energy efficient routing.. The restricted region is a 3D cone defined using the parameter. The difference is face routing cannot be extended in to 3D does not guarantee packet delivery.The path efficiency of 3D LEARN routing is straightforward. However, the critical transmission radius of 3D LEARNS is different [14],[15] with 2D's LEARNS. By definition, routing can always find a forwarding node inside the 3D cone region. Generally, by assuming the network is distributed in a convex and compact 3D region with volume D, and the transmission radius is r. The most popular localized routing [12] is greedy routing where the current node always finds the next relay node who is the nearest to the destination.

A. Proposed Technologies

In proposed methodology, a partial topology knowledge forwarding for sensor network, where each node selects the shortest energy-weighted path based on local knowledge of topology. By assuming the neighbourhood discovery protocol provides each node the local knowledge of topology within certain range[13],[14]. The linear programming formulation method is to select the range which minimizes the energy expenditure of the network. Since the solution of the linear programming problem is not feasible in practice, they also proposed a distributed protocol to adjust the topology. The definition of energy mileage provides us the insight in designing energy efficient routing. When it is possible, the forwarding link that has larger energy mileage should be used. In addition, to save the energy consumption, the total distance travelled should be as small as possible.

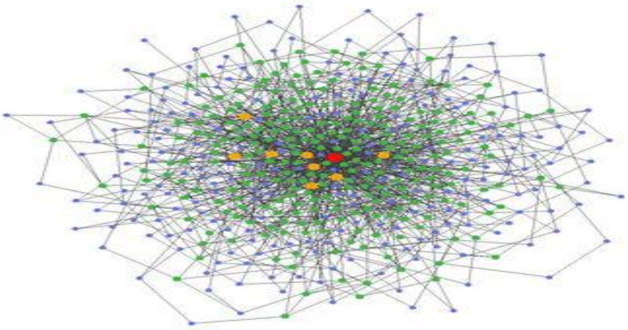

Figure 2. Connection of all nodes in multiple paths using geographical locations

The energy-aware routing methods takes into account the energy-related metrics instead of traditional routing metrics such as delay or hop count. The proposed routing can be applied to three-dimensional (3D) networks and derive its critical transmission radius in 3D random networks. The energy mileage provides insight [14] in designing energy efficient routing. The selected forwarding link that has the larger energy mileage should be used. In addition, to save the energy consumption, the total distance traveled should be as small as possible. The Classical routing algorithm is adapted to take into account energy-related criteria rather than the classical metrics such as delay or hop distance. Most of the proposed energy-aware metrics are defined as a function of the energy required to communicate on a link or a function of the nodes remaining lifetime [2]. However, for minimizing the global consumed energy of selected route, most of minimum energy routing algorithms are centralized algorithms.

IV. ALGORITHM USED

A. Heuristic algorithm

The heuristic algorithm is proposed to show the security analysis in wireless networks. The power-aware localized routing which combines the cost metric based on remaining battery power at nodes and the power metric based on the transmission power related to distance between nodes. This Paper present three constructive heuristic algorithms two of them based on Prim's and Kruskal's algorithms for the minimum spanning tree problem and one algorithm based on the local global approach. The first heuristic algorithm for the GMST problem is based on Kruskal's algorithm and is a greedy algorithm. Given a set of objects, the greedy algorithm attempts to find a feasible subset with minimum objective value by repeatedly choosing an object of minimum cost among the unchosen ones and adding it to the current subset provided that the resulting subset is feasible.

In heuristic algorithm for the GMST problem based on Kruskal's algorithm,it works by repeatedly choosing an edge of minimum cost among the edges, not chosen so far and adding this edge to the "current generalized spanning forest" i.e. a forest that spans a subset of nodes which includes at most one node from each cluster.

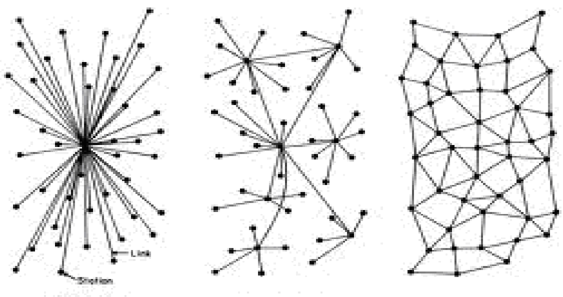

Figure.3. Centralized, Decentralized, Distributed Networks

When an edge is selected all the nodes from the clusters which contains the end nodes of that edge are deleted. The algorithm terminates when the current generalized spanning forest becomes connected. In the 3d networks all the nodes are communicated by the forward the data to the destination through geographical location. These nodes are directly accessing the security link through heuristic techniques.

V. PERFORMANCE EVALUATION

By implementing 3d networks in the geographical location is to find the energy efficient and all the results is showed by the simulation results. The energy consumption is uniform and the packet transmission is accurate through heuristic algorithm set of values. These values can be showed the average and maximum energy consumption that is calculating the performance analysis by the 3d networks. The total energy consumption of all the predefined values is calculating and has the length efficiency by the t and r symbols of the graphical representation.

When considering the energy efficiency, all heuristic methods can achieve better path efficiency than simple greedy method. In smaller restricted region it leads to better path efficiency, however it has the lower delivery ratio. There is a trade-off between path efficiency and packet delivery.The lowest energy performance [2],[3] because it has to retransmit several times due to the high packet loss rate. The T-pac [2] shows better energy performance because its energy mileage is higher and it saves the energy by using the power control. The proposed algorithm shows the highest energy performance even though it forwards packets through more hops than others.

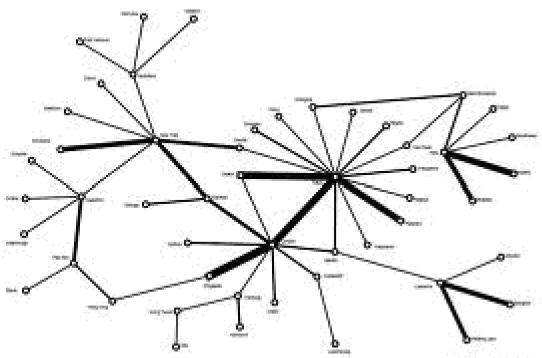

Figure 4. Energy Consumption in Multiple Paths

The reason is that the T-cut [2] and the T-pac consume a lot of energy because of many retransmissions. The above diagram represents the multipath communication between the 3d networks and sends the data to the restricted region of the destination node. Apart from the packets transmission range the time constraint also measured by the distance that data can be transferred between sources to destination.

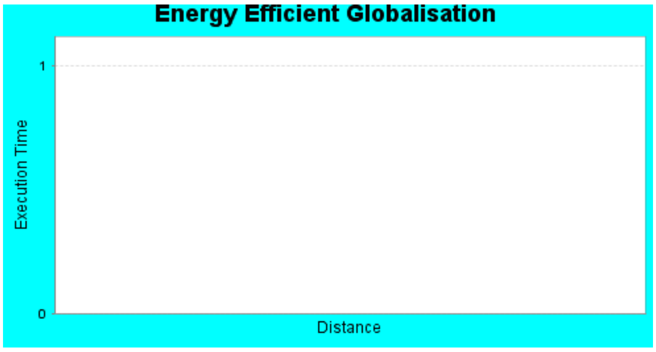

Figure.5. Design of Performance Evaluation Graph for Energy Efficiency

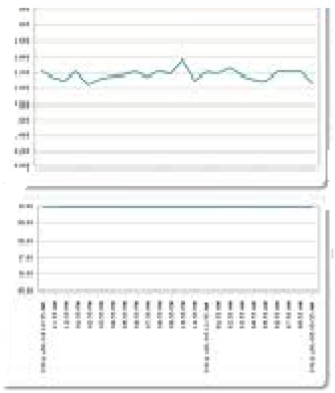

Figure 6. Performance Evaluation Graph For Energy Efficiency

The total energy consumption value is to find the accurate results that can be showed the heuristic values. The production of the transmission rate, distance improvement and timing constraint is showed by the real time simulations in the 3d networks. The heuristic techniques is applied directly through the performance gradation and shows the localized routing is have the minimum energy consumption in the 2d networks and it also shows the power consumption is efficient in the 3d networks applied through geographical locations. The results show that the proposed algorithm can efficiently mitigate the performance degradation in the 3d networks.

VI. CONCLUSION

A proposed technique is localized energy aware restricted neighbourhood routing protocol for wireless networks. Thus, by theoretical proof [14] the LEARN routing protocol is energy efficient if it can find a path. And also calculates its critical transmission radius [15] for the successful packet delivery.Extend the proposed routing method into 3D networks. The mathematical formulation also extends to any routing protocol in which the region to find the next hop node by an intermediate node is compact and convex. By conducting extensive simulations to study the performance of the LEARN routing. To the best of our knowledge, new localized routing method is the first localized routing protocol that has theoretical guarantee of energy efficiency of the generated routes in random networks with high probability.

REFERENCES

[1] K. Kar, M. Kodialam, T. Lakshman, and L. Tassiulas, "Routing for Network Capacity Maximization in Energy-Constrained Ad-HocNetworks," Proc. IEEE INFOCOM, 2003.

[2] J.-H. Chang and L. Tassiulas, "Energy Conserving Routing in Wireless Ad-Hoc Networks," Proc. IEEE INFOCOM, 2000.

[3] Q. Li, J. Aslam, and D. Rus, "Online Power-Aware Routing in Wireless Ad-Hoc Networks," Proc. ACM Mobicom, 2001.

[4] Q. Dong, S. Banerjee, M. Adler, and A. Misra, "Minimum Energy Reliable Paths Using Unreliable Wireless Links," Proc. ACM Int'l Symp. Mobile Ad Hoc Networking and Computing (MobiHoc), 2005.

[5] T. Melodia, D. Pompili, and I.F. Akyildiz, "Optimal Local Topology Knowledge for Energy Efficient Geographical Routing in Sensor Networks," Proc. IEEE INFOCOM, 2004.

[6] I. Stojmenovic and S. Datta, "Power and Cost Aware Localized Routing with Guaranteed Delivery in Wireless Networks," Wireless Comm. and Mobile Computing, vol. 4, no. 2, pp. 175-188,

[7] I. Stojmenovic and X. Lin, "Loop-Free Hybrid Single-Path/ Flooding Routing Algorithms with Guaranteed Delivery for Wireless Networks," IEEE Trans. Parallel and Distributed Systems, vol. 12, no. 10, pp. 1023-1032, Oct. 2001.

[8] J. Kuruvila, A. Nayak, and I. Stojmenovic, "Progress and Location Based Localized Power Aware Routing for Ad Hoc and Sensor Wireless Networks," Int'l J. Distributed Sensor Networks, vol. 2, pp. 147-159, 2006.

[9] P. Bose, P. Morin, I. Stojmenovic, and J. Urrutia, "Routing with Guaranteed Delivery in Ad Hoc Wireless Networks," ACM/ Kluwer Wireless Networks, vol. 7, no. 6, pp. 609-616, 2001.

[10] F. Kuhn, R. Wattenhofer, Y. Zhang, and A. Zollinger, "Geometric Ad-Hoc Routing: Of Theory and Practice," Proc. ACM Symp. Principles of Distributed Computing (PODC), 2003.

[11] C.-P. Li, W.-J. Hsu, B. Krishnamachari, and A. Helmy, "A Local Metric for Geographic Routing with Power Control in Wireless Networks," Proc. IEEE Comm. Soc. Sensor and Ad Hoc Comm. And Networks (SECON), 2005.

[12] K. Seada, M. Zuniga, A. Helmy, and B. Krishnamachari, "Energy-Efficient Forwarding Strategies for Geographic Routing in Lossy Wireless Sensor Networks," Proc. ACM Int'l Conf. Embedded Networked Sensor Systems (Sensys), 2004.

[13] F. Kuhn, R. Wattenhofer, and A. Zollinger, "Asymptotically Optimal Geometric Mobile Ad-Hoc Routing," Proc. Sixth Int'l Workshop Discrete Algorithms and Methods for Mobile Computing and Comm. (Dial-M), 2002.

[14] Y. Wang, W.-Z. Song, W. Wang, X.-Y. Li, and T.A. Dahlberg, "LEARN: Localized Energy Aware Restricted Neighbourhood Routing for Ad Hoc Networks," Proc. IEEE Comm. Soc. Sensor and Ad Hoc Comm. and Networks (SECON), 2006.

[15] P. Gupta and P.R. Kumar, "Critical Power for Asymptotic Connectivity in Wireless Networks," Stochastic Analysis, Control, Optimization and Applications: A Volume in Honor of W.H. Fleming, W.M. McEneaney, G. Yin, and Q. Zhang, eds., Springer, 1998.