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Data Aggregation Protocol for Efficient Congestion Control

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***Abstract*— The paper introduces an energy efficient routing approach with properties of MST and shortest path tree based routing schemes called Localized Power-Efficient Data Aggregation Protocols which provides better data aggregation. The proposed scheme uses the advantages of the powerful LMST structure and provides simple solutions to the known problems in route setup and maintenance because of its distributed nature. The algorithm is appropriate for systems where all the nodes are not in direct communication range of each other. While aggregation there may be a chance of collision due to more than one source node and sink node. By congestion control approach we can decrease this traffic load and packet loss. We show through simulations that our algorithm outperforms some alternatives.**

***Index Terms*— MST, LMST, Traffic Load, Packet Loss.**

I. Introduction

Geometric structures like "chain" of planar and such connected structures: MST (minimum spanning tree), LMST (local minimum spanning tree), RNG (relative neighborhood graph), GG (Gabriel graph), PDT (partial Delaunay triangulation), and DT (Delaunay triangulation). MST and DT are global structures, while LMST, RNG, GG, and PDT are constructed based only on local knowledge. Topologies efficiently computed using the location information of one-hop neighbors.

LMST is computed as follows: First, each node determines its one-hop neighbors and computes an MST for that set of nodes,based on the distance between nodes as the weight of the edges. After computing the MST of the neighbors, each node i selects the edges (eij) where node j is a direct neighbor of node i in its MST. The resulting structure is a directed graph. The structure can be converted to an undirected one in two ways . First way is to include edge (eij) only when both nodes i and j include that edge ($LMST^-$). The second way is to include that edge when either node i or node j includes it ($LMST^+$).

MST of a graph is a subgraph of its LMST. Although the LMST structures are defined based on euclidean distances. An important advantage of using LMST is that they can be constructed very efficiently in a localized manner. Node deletions and additions do not globally change the structure. Only local changes in the structure are required and they can be efficiently computed when a node fails or when a new node is introduced to the network.

A wireless sensor network is a resource constraint network, In which all sensor nodes have limited resources. There are so many techniques to reduce energy consumption. Data aggregation, clustering, etc. are some of the techniques that are used for those purposes. Because with the help of data aggregation we reduce the energy consumption by eliminating redundant data in WSN, when wireless sensor network deployed in remote area or hostile environment.

In order to save resources and energy, data must be aggregated, and avoid amounts of traffic in the network. The aim of data aggregation is that eliminates redundant data transmission and enhances the life time of energy in wireless sensor network. Data aggregation is the process of one or several sensors then collects the detection result from other sensor. The collected data must be processed by sensor to reduce transmission burden before they are transmitted to the base station or sink. Data aggregation is very crucial techniques in wireless sensor network.

With the help of data aggregation process we can enhance the robustness and accuracy of information which is obtained by entire network, certain redundancy exists in the data collected from sensor nodes thus data fusion processing is needed to reduce the redundant information.

An aggregation tree specifies, how the data packets from all the sensors are collected, aggregated and transmitted to base station. It is a directed tree rooted at the base station and spanning all the sensors.

II. EXISTING SYSTEM

In [1] Antoine Gallais, David Simplot Ryl, Ivan Stojmenovic and Jean Carle proposed several localized sensor area coverage protocols for heterogeneous sensors, each with arbitrary sensing and transmission radii. The approach has a very small communication overhead since prior knowledge about neighbor existence is not required. Each node selects a random time out and listens to messages sent by other nodes before the time out expires. Sensor nodes whose sensing area is not fully covered (or fully covered but with a disconnected set of active sensors) when the deadline expires decide to remain active for the considered round and transmit an activity message announcing it. There are four variants in the approach, depending on whether or not withdrawal and retreat messages are transmitted. Covered nodes decide to sleep, with or without transmitting a withdrawal message to inform neighbors about the status.

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After hearing from more neighbors, active sensors may observe that they became covered and may decide to alter their original decision and transmit a retreat message. Simulations show a largely reduced message overhead while preserving coverage quality for the ideal MAC/physical layer. Compared to an existing method (based on hello messages followed by retreat ones and where excessive message loss contributed to excessive coverage holes), this approach has shown robustness in a model with collisions and/or a realistic physical layer.

In [2] Chalermek Intanagonwiwat, Deborah Estrin, Fabio Silva, John Heidemann and Ramesh Govindan described the directed-diffusion paradigm for designing distributed sensing algorithms. Directed diffusion has the potential for significant energy efficiency. Even with relatively unoptimized path selection, it outperforms an idealized traditional data dissemination scheme like omniscient multicast. Diffusion mechanisms are stable under the range of network dynamics .For directed diffusion to achieve its full potential, careful attention has to be paid to the design of sensor radio MAC layers. All nodes in a directed-diffusion, based network are application aware. This enables diffusion to achieve energy savings by selecting empirically good paths and by caching and processing data in-network (e.g., data aggregation). Here they explore and evaluate the use of directed diffusion for a simple remote-surveillance sensor network analytically and experimentally. Thus they indicated that directed diffusion can achieve significant energy savings and can outperform idealized traditional schemes under the investigated scenarios.

In [3] Cunqing Hua and Tak-Shing Peter Yum proposed a model for data data aggregation along with routing protocol to maximize the network lifetime. By exploiting the special structure of the, sensor network, they have proposed a smoothing approximate function to overcome the non differentiability of original optimization problem so that the distributed solution is possible. The optimality conditions are derived and a distributed algorithm is designed accordingly. The model integrate data aggregation with the underlying routing scheme and present a smoothing approximation function for the optimization problem. Thus the proposed scheme can significantly reduce data traffic and improve the network lifetime. The distributed algorithm can converge to the optimal value efficiently. The distributed algorithm can converge to the optimal value efficiently under all network configurations.

III. PROPOSED SYSTEM

L-PEDAP protocol is a localized, self organizing, robust, and energy-efficient data aggregation tree approaches for sensor networks, which we call Localized Power-Efficient Data Aggregation Protocols (L-PEDAPs) based on LMST , that can approximate minimum spanning tree and can be efficiently computed using only position or distance information of one-hop neighbors. The actual routing tree is constructed over these topologies.

There are three parameters that we can change to see the effect: number of nodes N, maximum transmission radius R, and side length of the square area l. The parameter that depends on these three parameters and that gives direct intuition about the scenario is the density d, which is defined as the average number of neighbors per node. On this network, we repeated the experiments on LMST with three alternative parent selection strategies. We compared the methods in terms of the lifetime they provide for the first node (normalized lifetime) and how well they approximate the PEDAP tree (approximation percentage).

To construct a sparse and efficient topology over the visibility graph of the network in a distributed manner. The sparse topology is efficient for energy-aware routing. In this work, we choose LMST .It is based on one hop neighbour information.

The topology have several nodes. Each node information is converted in to Packet.

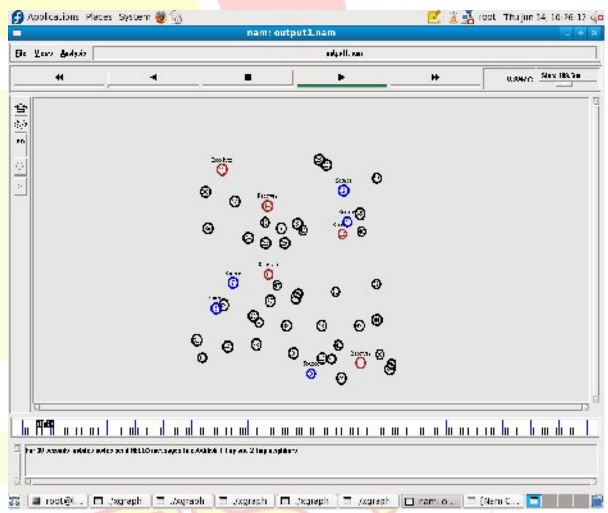

Fig.1. Configuring the nodes

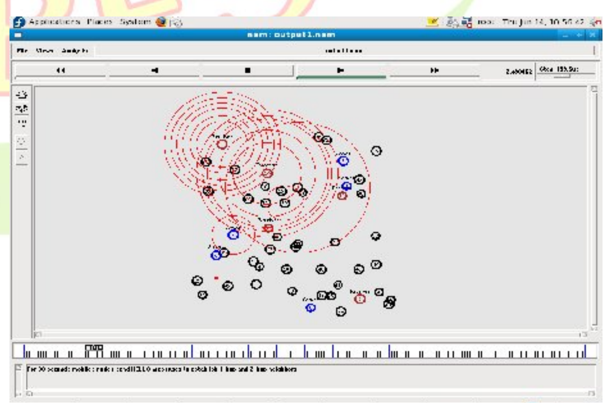

Fig.2. Aggregated data is transmitted to sink node

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IV. CONCLUSION

The paper introduces an energy efficient routing approach with properties of MST and shortest path tree based routing schemes called Localized Power-Efficient Data Aggregation Protocols which provides better data aggregation. The proposed scheme uses the advantages of the powerful LMST structure and provides simple solutions to the known problems in route setup and maintenance because of its distributed nature. The algorithm is appropriate for systems where all the nodes are not in direct communication range of each other. While aggregation there may be a chance of collision due to more than one source node and sink node. By congestion control approach we can decrease this traffic load and packet loss. We show through simulations that our algorithm outperforms some alternatives.

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