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An Energy Efficient Method for WSN's

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ABSTRACT:On demand routing protocols provide scalable and cost effective solutions for transferring packets in mobile ad hoc networks (MANET). A wireless sensor network is a collection of distributed nodes to monitor and also to transmit their data from sensor network to a sink node. In wireless sensor network, sensor nodes are located nearby to each other and also communicating with each other through data routing. In wireless sensor network, the data routing takes place in non-aggregated manner will require more energy. Energy conservation is the major issue in wireless sensor network. In this work we propose Improvised data routing with in-network aggregation algorithm which can address this energy consumption issue. It uses data aggregation technique and it can be effective in routing. Thus data aggregation is useful for increasing data accuracy, elimination of data redundancy, reduction of communication load along with reducing energy consumption.

KEYWORDS: Data aggregation, in-network aggregation, cluster, routing, energy efficiency.

I. Introduction

Wireless sensor networks are consisting of the ad-hoc network in which nodes have sensing capabilities. Due to high density of Wireless Sensor Networks, nodes which are having same data will require more energy consumption. To reduce this data redundancy, various algorithms and protocols are used. In the data gathering process routing gives an important scenario. An important task in sensor network is to efficiently deliver event data to the sink node. By using data aggregation, energy can be saved in wireless sensor networks.

Routing algorithms are facing challenges like how to guarantee the delivery of sensed data, while node failures and interruptions in communication. Data aggregation aware routing protocols are having features like reduce number of messages, maximum number of overlapping routes, high aggregation rate and reliable data transmission [1].

With the increase in the size and average route length, scalability becomes an issue for the current ad hoc routing protocols. Table-driven pro-active routing protocols [10] that require periodic advertisement and global dissemination of connectivity information are not suitable for large networks [11]. On-demand routing protocols are efficient for routing in large ad hoc networks because they maintain the routes that are currently needed, initiating a path discovery process whenever a route is needed for message transfer. AODV [12] and DSR [13] are two prominent ad hoc routing protocols that have used this approach. In AODV, the routing table at the nodes cache the next hop router information for a destination and use it as long as the next hop router remains active (originates or relays at least one packet for that destination within a specified timeout period).

The goal of this work is to optimize the path dynamically between the source and destination, to enhance the performance of routing, efficient data aggregation and reduce energy consumption.

II. Related work

A key component for in-network data aggregation is the design of a data aggregation aware routing protocol. Synchronization of data transmission among the nodes is done in data aggregation.

In these algorithms, a node usually does not send data as soon as it is available since waiting for data from neighbouring nodes may lead to better data aggregation opportunities. This will improve the performance of the algorithm and save energy.

Data correlation is exploited and aggregation is performed at intermediate nodes reducing size and the number of messages exchanged across the network in data aggregation. In data gathering a considerable number of communication packets can be reduced by in-network aggregation, resulting in a longer network lifetime [1]. Thus, various algorithms have been proposed to provide data aggregation during the routing in WSNs [8]. Some of them are

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Tree Based Approaches - In Shortest path tree (SPT) data aggregation scheme , each source sends its information to the sink along the shortest path between the two, and overlapping paths are combined to form the aggregation tree [14]. In Greedy incremental tree (GIT), a shortest path is established for only the first source to the sink whereas each of the other sources is incrementally connected at the closest point on the existing tree [16]. The GIT algorithm establishes an energy efficient path.

Cluster Based Approaches - As per the tree based approaches, cluster based schemes also consists of a hierarchical organization of the network. Special nodes referred to as cluster - heads, are elected to aggregate data locally and forward the result of such aggregation to the sink node. In Information fusion based role assignment (InFRA) algorithm, when multiple nodes detect the same event, they organize themselves into clusters. Then the cluster - heads aggregate data from all cluster members and send event data towards the sink. Since all nodes may not directly reach the sink node, the notification packets are relayed in a multihop fashion [17].

A disadvantage of the InFRA algorithm is that for each new event that arises in the network, the information about the event must be flooded throughout the network to inform other nodes about its occurrence and to update the aggregated coordinators - distance. This procedure increases the communication cost of the algorithm and, thus, limits its scalability. DRINA algorithm is also a cluster - based approach.It builds a routing tree with the shortest paths that connect all source nodes to the sink while maximizing data aggregation.

Dynamic data aggregation aware routing protocol (DDAARP) for WSN's uses the sink node for processing and configuration of the routes,whose main contribution is that the routes created by DDAARP does not depend on the order of events and are not held fixed during the occurrence of events[8].
In AODV [18] a novel algorithm for finding the on demand route is proposed. In this each mobile host operates as a specialized router and routes are obtained as needed with little or no reliance on periodic advertisements. It provides loop – free routes even while repairing broken links. Because it does not require global periodic routing advertisements, the demand on the overall bandwidth available to the mobile nodes is substantially less than in those protocols that do necessitate such advertisements. The drawback of this protocol is that it only used for efficient path formation but there is no concern for security.

III. PROBLEM DEFINITION

The reliability and its offensiveness can abrupt the scenario of wireless networks. The preventive measures are so effective and sufficient such as they can handle scenario. The applicable effects can be given prominently, but the routing and its application workload can disrupt the route broadcasting. So it can be cumbersome job to navigate the route request with corresponding to route response. Data aggregation is difficult in wireless networks, as energy conservation is a key issue in WSN's.
Redundant data can be aggregated at intermediate nodes by reducing the size and number of exchanged messages and thus decreasing communication costs and energy consumption.

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IV. PROPOSED SOLUTION

The proposed improved data routing with in-network aggregation algorithm (IDRINA) is used to reduce the energy consumption and also application workload is get reduced by it. This algorithm is efficient for data aggregation. Fig.1 shows the proposed system architecture.

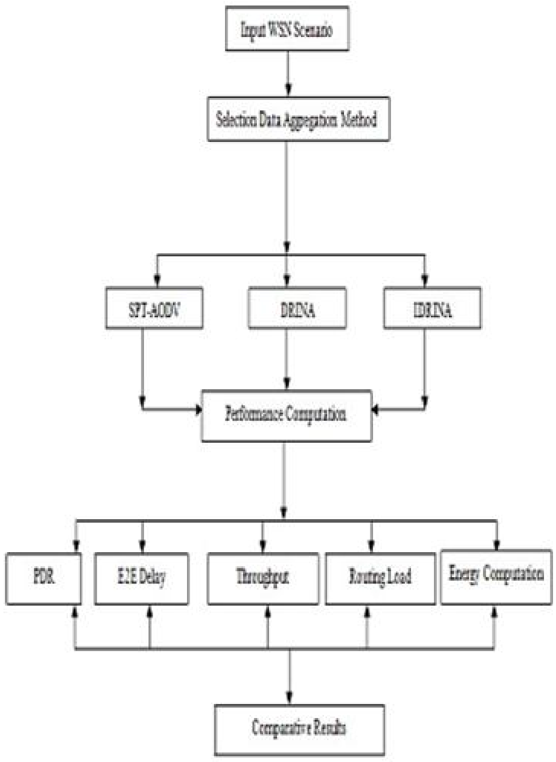

Fig.1 System Architecture

In this work we are going to implement three modules viz. SPT-AODV, DRINA algorithm from the base paper and the proposed IDRINA algorithm. We will compare the results of these three algorithms by considering different factors such as packet delivery ratio (PDR), end to end delay, throughput, routing overhead and energy computation.
Due to redundant data in the networks and maximum number of messages energy conservation became major issue in WSNs. Hence IDRINA algorithm is used for solving this issue.

V. PROPOSED ALGORITHM

For a packet P, we use hc(P) and lvl(P) to represent the two additional fields of the packet, respectively. The algorithm needs to access other fields in a packet, such as the source, destination, sender and sequence number. Similarly, in the algorithm, they are represented by s(P), d(P), nid(P) and seq(P). We use s-d(P) to represent the source-destination pair of the flow that the packet belongs to. An overhear table is maintained at each node.

IDRINA Algorithm

When node i overhears packet P,
BEGIN

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1. Lookup s-d (P) in overhear table;
2.IF no match, add entry e0: s-d(e)=s-d(P), seq(e)=seq(P), ov-list(e) initialized with first entry <hc(P),lvl(P),nid(P)>. GOTO END;
3. (Assume a match is found at entry e.) IF seq(P)<seq(e), ignore P. GOTO END;
4.IF seq(P)>seq(e), update e as the following: seq(e)=seq(P), ovlist(e) reset as having only one entry< hc(P); lvl(P); nid(P) >. GOTO END;
5.IFseq(P)==seq(e), do the following:
5-1.Add entry < hc(P); lvl(P); nid(P) > into ovlist(e);
5-2.IF ovlist(e) has three entries A, B, C satisfying the following conditions, a better sub-path is found.
1)hc(C)==hc(B)+1==hc(A)+2;
2)lvl(node i)_MAX(lvl(A),lvl(C));
3)(lvl(node i)-lvl(B)) _2. Activate this new subpath. Delete entry e from overhear table. GOTO END;
5-3.IF ovlist(e) has two entries A and B, such that hc(B)==hc(A)+1 and lvl(node i) _ MAX(lvl(A),lvl(B)+2), add this indicator I in the Waiting Indicator list: candidate(I)=B,seq(I)=seq(e), s-d(I)=s-d(e). GOTO END;
5-4.IF ovlist(e) has two entries B and C, such that hc(C)==hc(B)+1 and lvl(node i) _ MAX(lvl(B)+2,lvl(C)), node i broadcast one SHORT informing packet Q as follows: candidate(Q)=B, seq(Q)=seq(e) s-d(Q)=s-d(e); When node i receives a DRINA informing packet Q, BEGIN
1. Compare fields of Q with any valid entry in Waiting Indicator list;
2. IF there is no match, ignore packet Q; ELSE a better subpath is found. Activate this new.

VI. EXPERIMENTAL RESULTS

The experimental results are shown in figures given below. The proposed IDRINA algorithm will reduces the energy consumption.

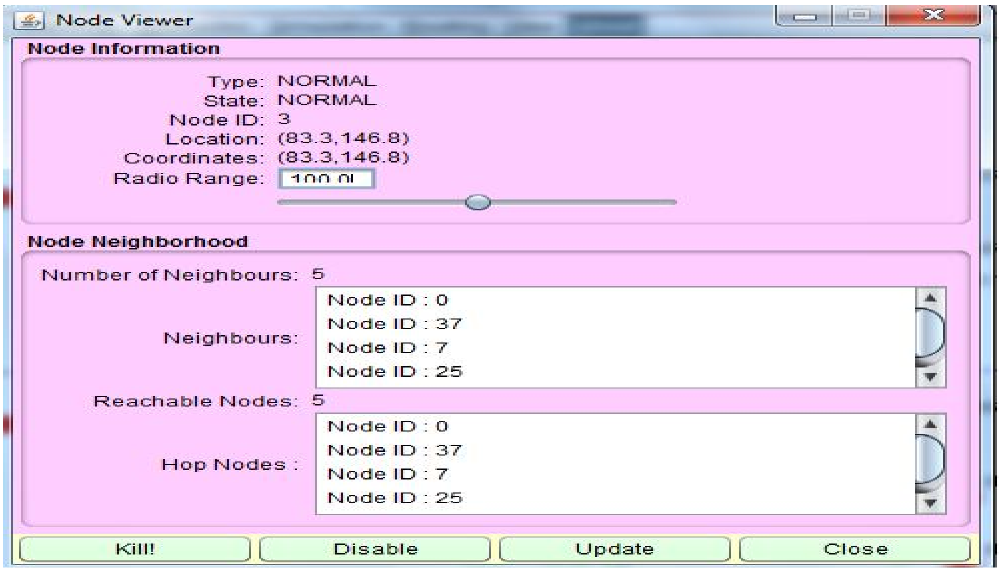

Fig.2 Node Viewer

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Figure 3 shows the output screen for nodes in the network and a connection among them. Cluster formation and packet transformation is done in this fig.

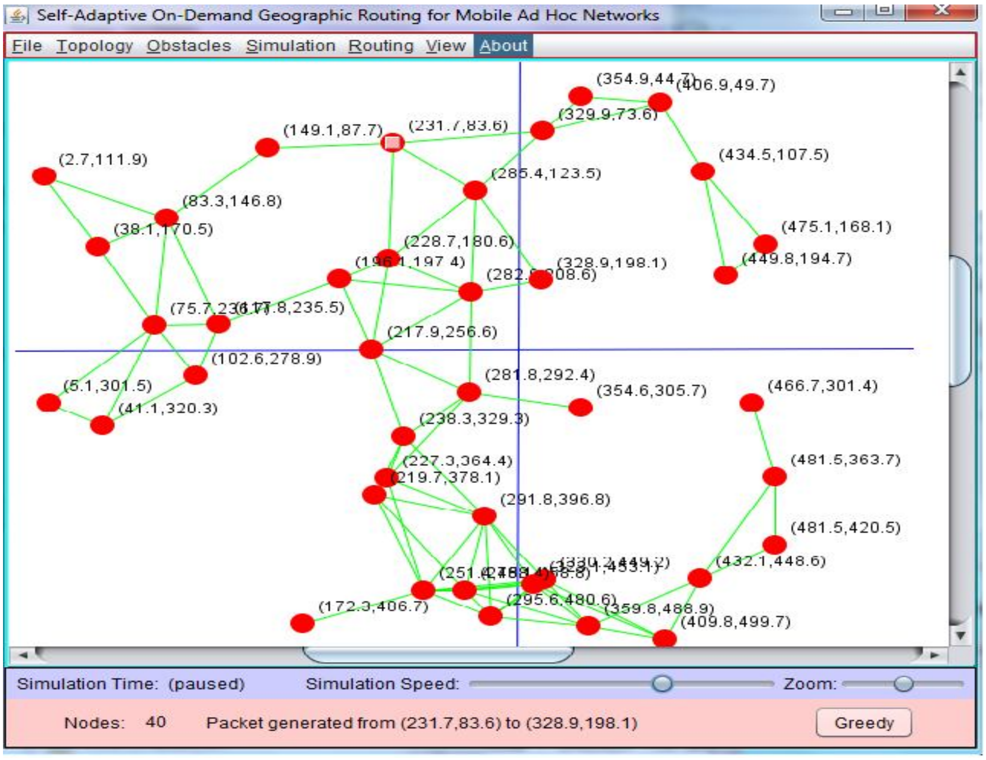

Fig.3 Packet Routing

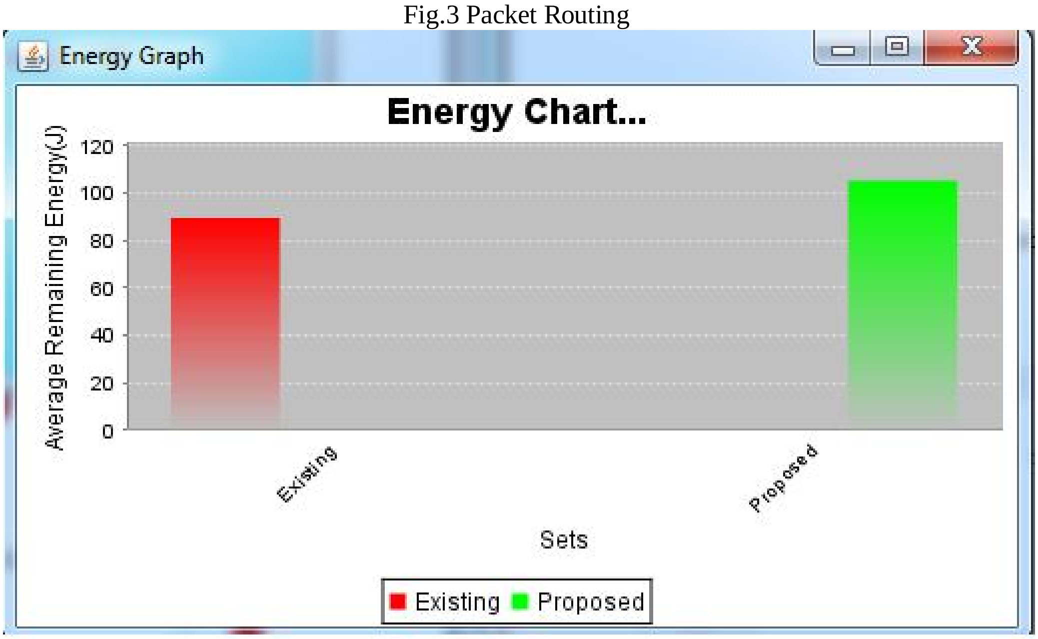

Fig.4 Energy Graph

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VII.CONCLUSION AND FUTURE SCOPE

WSNs are data-driven networks that usually produce a large amount of information that needs to be routed, often in a multihop fashion, toward a sink node, which works as a gateway to a monitoring centre. To define and address various issues in routing, to gather data and also to add preventive measures this routing plays an important role. Energy efficiency is get increased by reducing the energy consumption, reducing number of messages and reliable data aggregation is done.
The future work can be proceed to enhance the IDRINA in different aspects of routing, security and efficiency.

VIII.ACKNOWLEDGMENT

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BIOGRAPHY

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