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An Effective And Reliable Data Routing Using Aggregation Technique In WSN

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***Abstract:* -- Of Wireless Sensor Networks (WSNs) is used in many applications for precise monitoring. These networks contain high density nodes which lead to redundant data while sensing an event. The key issue in WSNs is energy conservation. Data fusion and aggregation is utilized to save energy. The size and number of exchanged messages is reduced by aggregating the redundant data at intermediate nodes. This will decrease energy consumption and communication costs. In this work, a novel DRINA (Data Routing for In-Network Aggregation) is proposed. It contains some key aspects like depleted number of messages for setting up a routing tree, maximized number of super-imposed routes, high aggregation rate, and reliable data aggregation and transmission. The proposed DRINA algorithm is compared with two other known interpretations: the Information Fusion-based Role Assignment (In FRA) and Shortest Path Tree (SPT) algorithms. The outcome of the system clearly denote that the routing tree built by DRINA yield the best aggregation quality in contrast to other algorithms in unconventional situations and in different key aspects required by WSNs.**

***Keywords*: - Routing protocol, in-network aggregation, wireless sensor networks**

I. INTRODUCTION

Wireless sensor networks (WSNs) consists of spatially distributed autonomous devices that cooperatively sense physical or environmental conditions such as temperature, sound, vibration, motion, pressure, or pollutants at different locations. Due to high density of nodes, it is likely that redundant data will be detected by nearby nodes while sensing an event. Since energy conservation is a key issue in WSNs, data fusion and aggregation is exploited to save energy. Redundant data is aggregated at intermediate nodes, reducing the size and data of exchanged messages, thus reducing the communication cost and energy consumption.

A.Applications of WSNS

WSN is deployed in different classes of applications for accurate communication and manufacturing. A wireless sensor network (WSN) extends our capability to explore, monitor and control the physical world. It is especially useful in catastrophic or emergency scenario where human participation may be too dangerous. Data logging is done in WSN. Wireless sensor networks are also used for the collection of data for monitoring of environmental information, this can be as simple as the monitoring of the temperature in a fridge to the level of water in overflow tanks in nuclear power plants. The statistical information can then be used to show how systems have been working. The advantage of WSNs over conventional loggers is the "live" data feed that is possible.

B. Classification of Routing Protocols In WSN

Routing Protocol is used to find valid routes between communicating nodes. It is an autonomous collection of network users that communicate relatively over bandwidth constraint wireless link. The design space for routing algorithm for WSN is quite large and we can classify the routing algorithms in many ways. The routing protocols could be broadly classified as follows:

- ***Node centric Routing Protocols***

  In node centric routing protocol the destination is specified based on the numerical addresses as in identifiers of the nodes. But it is not commonly expected communication type.

- ***Data Centric Routing Protocols***

  In data centric routing, the sink sends queries to certain region and waits for data from the sensor located

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in the selected regions. Since the data is being requested through queries, attribute based naming is necessary to specify the properties data. Here data is usually transmitted from every sensor node within the deployment region with significant redundancy.

- ***Location Aware Routing Protocols***

The nodes know where they are in the geographical region in location aware routing protocol. Location information can be used to improve the performance in routing and provide new type of services.

- ***QoS based Routing Protocols***

In Qos based routing protocol, data delivery ratio, latency and energy consumption is mainly considered. To get a good quality of service, the routing protocol must possess more data delivery ratio, less latency and less energy consumption.

- ***Hierarchical Routing Protocols***

In hierarchical (cluster) protocol, different nodes are grouped to form clusters and data from nodes belonging to single cluster can be combined (aggregated). The cluster based approach has several advantages, like scalable, energy efficient in finding routes and easy to manage.

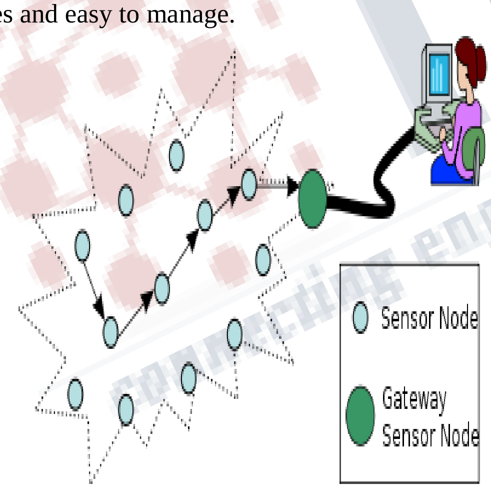


Fig1. Data aggregation aware routing, a key algorithm for data-driven WSNs.

II RELATED WORK

In [1], I.F. Akyildiz stated that the wireless sensor network consists of various sensor nodes which sense the environment and forward the sensed data to the sink node. Near the sink node all its energy is consumed which is hot-spot problem. Mobile sink is used, where a sink node is provided mobility which gathers information from the sensor nodes using 1-hop communication there by reducing a hot-spot problem and increases network lifetime and decreases energy consumption. A detailed comparison of surveyed routing protocols is also presented. In [2],

H.S. Abdel Salam used a network skeleton that is constructed immediately after network deployment and provides a topology that makes the network more tractable. The skeleton provides sensors with coarse localization information that enables them to associate their sensory data with the geographic location in which the data was measured. By hypothetically tiling the deployment area using identical hexagons, the construction algorithm clusters sensors into hexagons depending on the location. In [3],

L .Villa data will be aggregated while flowing from multiple sources to a specific node named sink. The construction of routing trees aware of the data aggregation has a considerable cost and solutions in the literature are not efficient for scenarios where the events are of short duration. This paper presents the Dynamic Data-Aggregation Aware Routing Protocol (DDAARP) for wireless sensor networks. It reduces the number of messages necessary to set up a routing tree, maximize the number of overlapping routes, selects routes with the highest aggregation rate, and performs reliable data aggregation transmission. In [4],

F. Huused an intelligent timer and some high-level knowledge of the network to implement an efficient aggregation timing control protocol. Our protocol aims to dynamically change the data aggregation period according to the aggregation quality. A request from the data sink will include the maximum latency for a certain number of reports. If this number of reports can be returned in less time than the maximum, then the maximum time will not be reached. In [5],

C. Efthymiou discussed the problem of energy-balanced data propagation in wireless sensor networks. The energy balance property guarantees that the average per sensor energy dissipation is the same for all sensors, during the entire execution of the protocol. The author precisely estimate the probabilities for propagation of data one-hop towards the final destination (the sink), or to send data directly to the sink. This randomized choice balances the (cheap) one-hop transmissions. In [6],

I. Chatzigiannakis has done the research on smart dust from a basic algorithmic point of view. "Sleep-Awake" protocol is used for information propagation that explicitly uses the energy saving features (i.e. the alteration of sleeping and awake time periods) of the smart dust particles. It is noted that the study of the interplay of these parameters allows us to program the smart dust network characteristics accordingly. In [7],

O. Youn is high light the challenges in clustering a WSN, discuss the design rationale of the different clustering approaches, and classify the proposed approaches based on their objectives and design principles. The author further discusses several key issues that affect the practical deployment of clustering techniques in sensor network applications.

III AN EFFICIENT & RELIABLE ROUTING USING DATA FUSION AND AGGREGATION TECHNIQUE (DRINA)

DRINA algorithm is used for better simulation results. As a result of implementing DRINA best aggregation quality is achieved. It maximizes the number of overlapping routes, high aggregation rate, reliable data aggregation and transmission. It reduces the number of messages for setting up a routing tree. In this work, a novel Data Routing for In-Network Aggregation, called DRINA is proposed. The main goal of our proposed DRINA Algorithm is to build a routing tree with the shortest paths that connect all source nodes to the sink while maximizing data aggregation.

The DRINA algorithm can be divided into three phases. In Phase 1, the hop tree from the sensor nodes to the sink node is built. In this phase, the sink node starts building the hop tree that will be used by Coordinators for data forwarding purposes. Phase 2 consists of cluster formation and cluster-head election among the nodes that detected the occurrence of a new event in the network. Finally, Phase 3 is responsible for both setting up a new route for the reliable delivering of packets and updating the hop tree.

A. Node functionalities

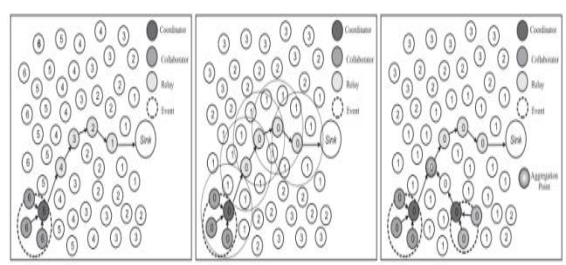
The proposed system considers the following roles in the routing infrastructure creation:

- ♣ Collaborator: A node that detects an event and reports the gathered data to a coordinator node.
- ♣ Coordinator : A node that also detects an event and is responsible for gathering all the gathered data sent by collaborator nodes, aggregating them and sending the result toward the sink node.
- ♣ Sink: A node interested in receiving data from a set of coordinator and collaborator nodes.
- ♣ Relay : A node that forwards data toward the sink.

Fig2. High level diagram for event occurrence

IV EXPERIMENTAL DESIGN

The main goal of our proposed system is to build a best routing path with the energy efficient paths that connect all source nodes to the sink while maximizing data aggregation when Multiple Group event occurred in a network. To achieve this, this system need a group of network nodes with unique identity and location details and node functionalities. This module helps to build such group of network node and these details are maintained in a separate table. When user press the show node button, all the details are fetched from the table and converted into graphical format and visualized it to the user.



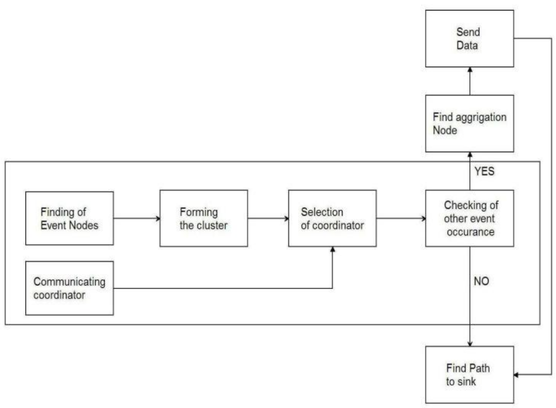
(a) Example of the routing tree to 1 event (b) Update of the hop tree (c) Example of the routing tree to event

Fig 3.Example of establishing new routes and updating the hop tree.

IV CONCLUSION

DRINA routing infra-structure tends to maximize the aggregation points and use fewer control packets to build the routing tree. DRINA does not flood a message to the whole network whenever a new event occurs. It has some key aspects required by WSNs aggregation aware routing algorithmssuch as a reduced number of

HIGH LEVEL DIAGRAM FOR EVENT OCCURANCE



messages for setting up a routing tree, maximized number of overlapping routes, high aggregation rate, and reliable data aggregation and transmission. The obtained results clearly show that DRINA outperformed the other algorithms for all evaluated scenarios.

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