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Receiver based Geographic Routing Protocol in Mobile Sensor Networks

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Abstract: **This paper discussed about receiver based geographic routing protocol in mobile sensor networks. Which will be a solution to the challenges of routing in mobile wireless sensor networks (MWSNs). As it is geographic the protocol needs to find location information to maintain a gradient field even in highly mobile environments. It uses blind forwarding to propagate data through the network to create route diversity. The Sender broadcasts the message to find the reciver. The receiver determines if progress elligible and sets a timer for retransmission for acknowledgment. If another retransmission is heard at the same time it will cancel the timer. The receiver Keeps heard messages in a cache as a queue.The decision to forward the packets is done by receiver, based on some conditions that will be discussed later in this paper.**

Key Words: Mobile Wireless Sensor Networks, gradient field, blind forwarding, route diversity

I.INTRODUCTION

Communication in sensor networks is hindered by the limited energy capacity of the individual sensor nodes. Consequently, reducing the total number of packets transmitted throughout the network is essential for power conservation. A sensor network is composed of a large number of sensor nodes that are densely deployed either inside the phenomenon or very close to it. The position of sensor nodes need not be predetermined. They are randomly deployed in network. Sensors are radio enabled nodes with simple transducers connected to a microcontroller used for transmitting and receiving packets. The microcontroller controls all the operations of a sensor node. Routing protocol, which defines how data is passed from the sensors to the sink. The nodes can cause frequent changes in topology. This dynamic topology in mobile wireless sensor networks (MWSNs) causes problems for routing protocols, since there is no fixed path from source to sink. As such, the problem of routing in a MWSN will be an alternative solution to those protocols designed for static WSNs. The receiver based geographic routing protocol uses location information to find the nodes location using gradient. The sender holds the receiver address and it broadcasts the information in its range. All the nodes perform blind forwarding for finding the receiver location using the mobilizer field in a sensor node. The location is not fixed and keeps not changing dynamically each node updates the routing table periodically. If the node is out of range it communicates based on clusters

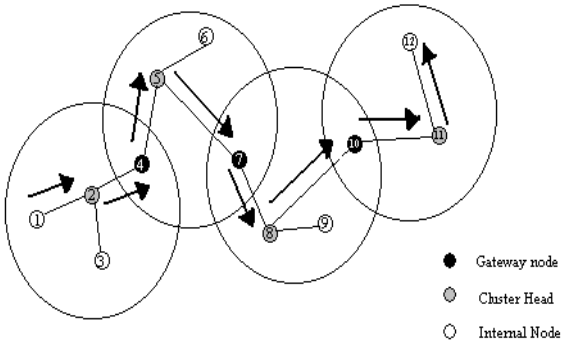

Figure 1.1 Finding the receiver using clusters

In the above figure 1.1 node1 needs to find the location of node12. But node12 is not within range of node1. So it uses clusters to forward the data. The node1 sends the information to cluster head node2 and then to gateway node. The gateway node sends the information to next head and repeats the same till it finds the receiver i.e node12.

II. RELATED WORK

According to the authors Akyildiz, I.F., Su, W., Sankarasubramaniam, Y. 'A survey on sensor networks', Proposed that recent advancement in wireless communications and electronics has enabled the development of low-cost sensor networks. The sensor networks can be used for various application areas (e.g., health, military, home). For different application areas, there are different technical issues that researchers are currently

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resolving. The current state of the art of sensor networks is captured in this article, where solutions are discussed under their related protocol stack layer sections.

With the design and analysis of delay-tolerant networks (DTNs) deployed for free-roaming animal monitoring proposed by the authors Ehsan, S., Bradford, K., Brugger, M., at 'Design and analysis of delay-tolerant sensor networks for monitoring and tracking' subjects that information is either transmitted or carried to static access-points by the animals whose movement is random. In such mobility applications, routing is done in a store-carry-and drop manner, each node has a buffer size and data loss due to buffer overflow depends on access-point density. Sufficient access-point density conditions are derived to ensure that the data loss rates are not to be below a given threshold.

Unmanned aerial vehicles (UAVs) are used to cover large areas for searching targets. Sensors on UAVs are used to find location of targets on the ground. Unmanned ground vehicles (UGVs) are used to locate ground targets, but they are not able to move rapidly or pass through obstacles such as buildings or fences. Mobile sensor networks (MSNs) are often used for monitoring large areas of interest (AoI) in remote and hostile environments which are highly dynamic in nature.

MSNs usually consist of limited number of sensor nodes. In order to cover large areas, the mobile nodes have to move dynamically in an environment to monitor the area dynamically. MSNs that are controlled by most of the previously proposed dynamic coverage algorithms lack adaptability to dynamic environments or display poor coverage performances due to considerable overlapping of sensing coverage. As a new class of emergent motion control algorithms for MSNs, are enabled MSNs to self-organize in an environment and provide better dynamic coverage performances. In this paper we describe

1. Architecture and flow diagram.
2. Techniques used and algorithm.
3. Results and discussion.

III. PROPOSED SYSTEM

1. Architecture and flow diagram

In this kind of routing, sensor nodes are addressed by means of their locations. The distance between neighboring nodes can be estimated on the basis of incoming signal strengths. Relative coordinates of neighboring nodes can be obtained by exchanging such information between neighbors. Alternatively, the location of nodes may be available directly by communicating with a satellite, using GPS (Global Positioning System), if nodes are equipped with a small low power GPS receiver. To save energy, some location based schemes demand that nodes should go to sleep if there is no activity. More energy savings can be obtained by having as many sleeping nodes in the network as possible. The problem of designing sleep period schedules for each node in a localized manner. And finally finds the receiver's location based on the gradient as shown in figure 3.1.1 all the requests are stored in a queue. The Receiver decide whether to forward or not to forward the packets.

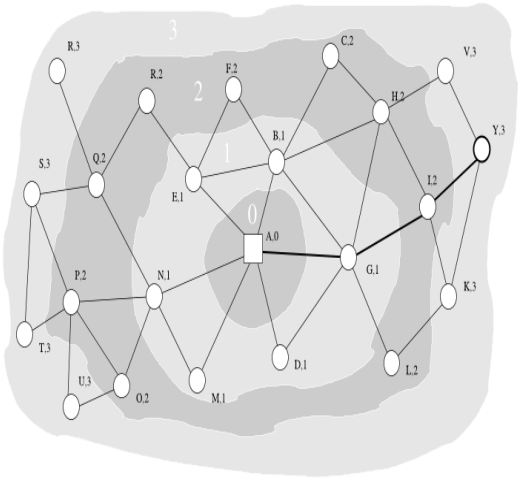

Figure 3.1.1 Gradient based routing in WSN

Receiver determines if elligible (progress) is possible with in that range or not in range. If it is within range it will forward the packet which is distant from it. If the distant s same between the two nodes it sets a prority bit.

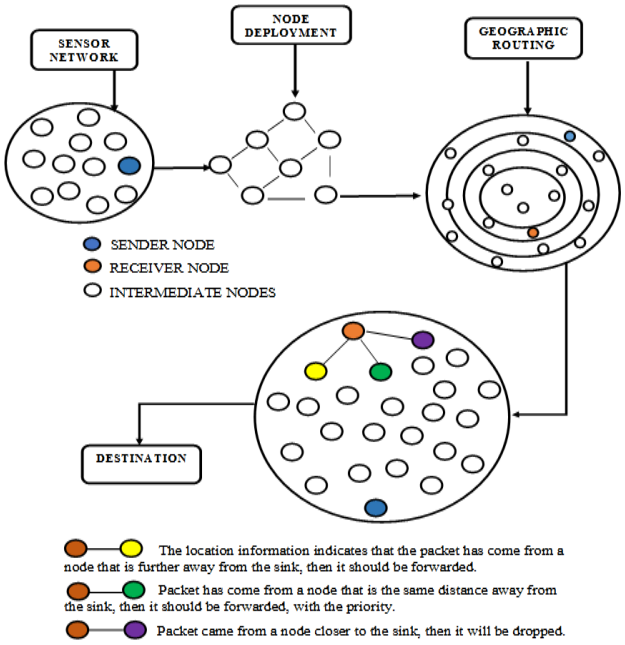

Figure3.1.2: Architecture diagram of receiver based geographic routing protocol in mobile sensor networks

The prority bit with field 1 will be added to the path. If the request heard is very near to the node it will drop the packet. And the receiver sets a timer for retransmission. If a new request is heard, it stores the request in queue and when the queue is full it drops the request. During the retransmission to the sender if a new retransmission occurs from the other neighbours it will cancel timer. It keeps the heard messages in a cache. And the path is created and data is transfered based on receivers condition. The data flow diagram figure.

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3.13 depicts the control of the protocol

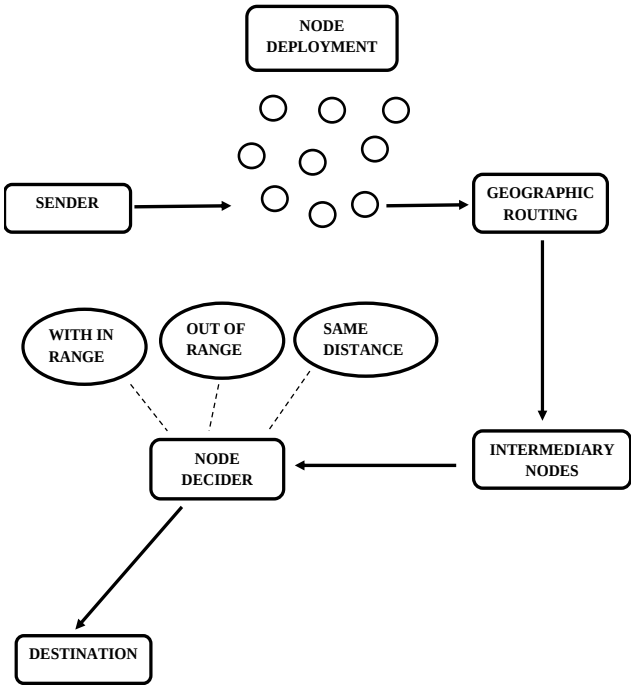

Figure 3.1.3: Flow diagram of receiver based geographic routing protocol in mobile sensor networks

The sender broadcasts the message by blind forwarding technique. Based on the gradient field the geographic routing is done to find the receiver. Based on all the intermediate nodes the receiver stores the requests in a queue. The node decider decides to which the data to be forwarded based on three conditions.

- If the request had come from the node that is far away to the sink the data should be forwarded.
- If the request had come from the node that is same distance to the sink the data should be forwarded based on the priority.
- If the request had come from the node that is closer to the sink the data should be forwarded

2. TECHNIQUES USED AND ALGORITHM

2.1 Techniques

- DSDV Protocol:

Destination sequenced distance vector (DSDV). The Destination-Sequenced Distance-Vector (DSDV) Routing Algorithm is based Bellman Ford Routing Algorithm. Every mobile station maintains a routing table that lists all available destinations, the number of hops to reach the destination and the sequence number assigned by the destination node. The sequence number is used to distinguish the routes from new ones and thus avoid the formation of loops. The stations periodically transmit their routing tables to their immediate neighbors. A station also transmits its routing table if a change has occurred in its table from the last update sent. The update can be both time-driven and event-driven. The routing table updates can be sent in two ways a "full dump" or an incremental update. A full dump sends the full routing table. In an incremental update only those entries from the routing table are sent that has a metric change since the last update and it must fit in a packet. If there is space in the incremental update packet then those entries may be included whose sequence number has changed.

- Forwarding data:

This protocol uses blind forwarding to transmit packets, which means that the decision to forward a packet is made by the receiving node, rather than the transmitting node.

- Gradient metric:

The location information can be from any available geographic positioning technique. Each node's distance from the sink is quantized, such that an integer value can be used as a gradient.

- Packet priority:

Packets with the priority bit set are designated as priority packets, whereas packets with the priority bit cleared are designated as diversity packets. If the priority bit is set to 1 the request is added to the buffer queue of the node.

2.2 ALGORITHM

- Sender broadcasts message to all the neighbours using blind forwarding.
- Finds the receiver using location gradient
- Receiver determines if it is elligible for (progress).
- Receiver sets a timer for retransmission of data to receiver.
- Keep messages heard in a queue.
- If another retransmission is heard, when the queue is full cancel timer.
- Eastablish a route to the sender by using intermediate nodes.
- Transfer the packets to receiver based on recivers decesion.

IV.RESULTS AND ANALYSIS

Packet delivery ratio(PDR)

Wireless Sensor Network consists many QoS parameters. These include throughput, packet delivery ratio (PDR), delay and energy consumption. The reporting rates are varied for each of these parameters. The packet delivery ratio is the ratio of number of packet received to the number of packets sent in network.

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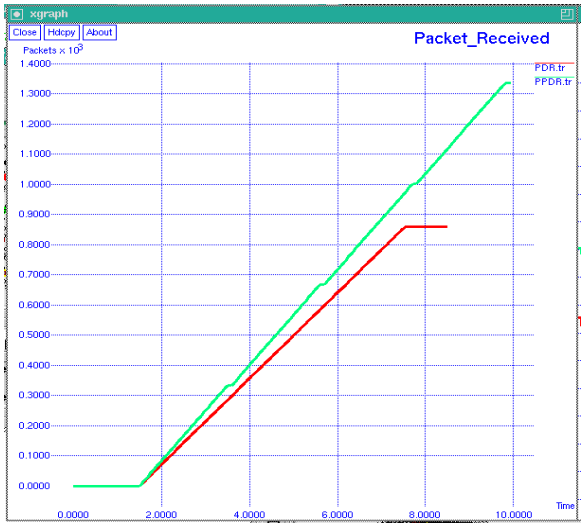

Fig IV.1 packet delivery ratio(PDR) in receiver and sender based

The packet delivery ratio(PDR) is high compared to sender based as shown in figure IV.1 It is nearly 20 to 25 percent high. The green graph indicates receiver based and red graph indicates sender based in mobile sensor networks.

Energy Efficiency: The lifetime of a sensor network can be extended by jointly applying different techniques. For example, energy efficient protocols are aimed at minimizing the energy consumption during network activities.

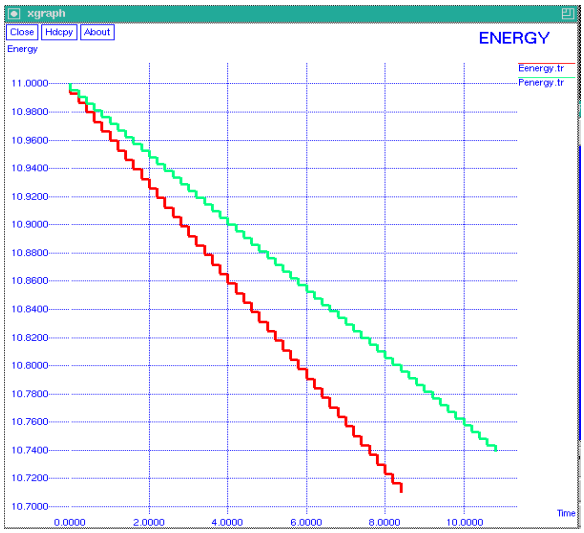

Fig IV.2 Energy consumption in receiver and sender based

However, a large amount of energy is consumed by node components (CPU, radio, etc.) even if they are idle. The energy consumption is less compared with sender based. The green graph indicates receiver based and red graph indicates sender based in mobile sensor networks.

V. CONCLUSION

Receiver Based Forwarding is a good technique for many applications. In this paper we had described the architecture, algorithm and techniques behind it. In receiver based we have many multiple paths for data transmission. The packet delivery ratio (PDR) is nearly 20 to 25 percent is high compared to sender based. Energy consumption is low when compared to sender based. Hop count between sender and receiver little lesser than sender in most of the cases, in some cases it is same as sender based algorithm. This type of receiver based algorithms can be used in remote systems this protocol works 2~3 times better in less density networks and has higher latency in low networks.

Advantages of proposed algorithm

- No link estimation for routing the packets from one node to the other.
- It is more reliabile as it is having more number of paths (Multiple paths).
- Less retransmissions required to send the lost packets.
- Works better in low dense networks.
- Increases the network lifetime and node lifetime.

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