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   RESEARCH METHODOLOGY

   RESULTS & DISCUSSION

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SIMULATION BASED STUDY AND INVESTIGATING THE THROUGHPUT OF WSN BY GRID BASED PATH PLANNING

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ABSTRACT

Wireless networks are networks which provide users with connectivity regardless of their actual physical location. Wireless networks are networks that do not involve cables. It is a technique that saves the cost of cables for networking and helps entrepreneurs and telecommunication networks in specific premises in their installations. The transmission system is usually implemented and administrated via radio waves where the implementation takes place at physical level. In the wireless networks there are two infrastructures used for communication in the networking environment that was fixed infrastructure and Ad hoc networks. In the fixed infrastructure the node has no mobility but in the second case shows the mobility. This paper uses grid based network (use Ad hoc type) for providing better path planning and updated messages to and fro in order to achieved the throughput of the WSNs. we are using an AODV protocol that employing in the sensor nodes networks and worked on both heterogeneous and homogenous networks. The aim of this paper to modeled the grid sensor networks. The main challenge of this paper is to work on the IEEE 802.15 standard and provides a packet forwarding approach from source node to destination node. The final direction of this paper has to avoid broadcasting problem by using effectively path planning approach.

KEYWORDS

grid based path planning, wireless networks.

1. WSN

A wireless sensor network is a network which consists of a number of sensor nodes that are wirelessly connected to each other as shown in fig.1. This small, low-cost, low-power, multifunctional sensor nodes can communicate in short distances. Each sensor node consists of sensing, data processing, and communication components. A large number of these sensor nodes collaborate to form wireless sensor network. A WSN usually consists of tens to thousands of such nodes that communicate through wireless channels for information sharing and cooperative processing. To ensure scalability and to increase the efficiency of the network operation, sensor nodes are often grouped into clusters. A sensor node is battery powered and is equipped with integrated sensors, data processing capabilities, and short-range radio communications.

FIG.1: COMMUNICATING SENSOR NODES

1.1 SENSOR NODES

Wireless sensor networks (WSNs) consist of a large number of tiny, cheap, computational, and energy-constrained sensor nodes that are deployed in network service area. Due to wireless nature, it is easy to add more sensor nodes or move deployed nodes for better coverage and reach.

2. AODV PROTOCOL

In reactive routing protocols the routes are created only when source wants to send data to destination whereas proactive routing protocols are table driven. Being a reactive routing protocol AODV uses traditional routing tables, one entry per destination and sequence numbers are used to determine whether routing information is up-to-date and to prevent routing loops.

The maintenance of time-based states is an important feature of AODV which means that a routing entry which is not recently used is expired. The neighbors are notified in case of route breakage. The discovery of the route from source to destination is based on query and reply cycles and intermediate nodes store the route information in the form of route table entries along the route. Control messages used for the discovery and breakage of route are as follows:

- Route Request Message (RREQ)
- Route Reply Message (RREP)
- Route Error Message (RERR)
- HELLO Messages.
- Route Request (RREQ)

A route request packet is flooded through the network when a route is not available for the destination from source. The parameters are contained in the route request packet are presented in the following table:

TABLE1.1 ROUTE REQUEST PARAMETERS

Source Address	Destination Address	Destination Sequence no.	Hop Count	Life Time

A RREQ is identified by the pair source address and request ID, each time when the source node sends a new RREQ and the request ID is incremented. After receiving of request message, each node checks the request ID and source address pair. The new RREQ is discarded if there is already RREQ packet with same pair of parameters.

A node that has no route entry for the destination, it rebroadcasts the RREQ with incremented hop count parameter.

A route reply (RREP) message is generated and sent back to source if a node has route with sequence number greater than or equal to that of RREQ.

- Route Reply (RREP)

On having a valid route to the destination or if the node is destination, a RREP message is sent to the source by the node. The following parameters are contained in the route reply message:

TABLE1.2.ROUTE REPLY PARAMETERS

Source Address	Source ID	Source Sequence no.	Destination Address	Destination Sequence no.	Hop Count

- Route Error Message (RERR)

The neighborhood nodes are monitored. When a route that is active is lost, the neighborhood nodes are notified by route error message (RERR) on both sides of link.

3. PROBLEM FORMULATION

In this research work, created a WSN grid network where graph G(V,E) , in which V is the set of all the nodes in the network and E consists of edges presented in the graph. An edge e = (u,v) , $e \in E$ exists if the Euclidean distance between node u and v is smaller than r , where r is the radius of the coverage of nodes and assumed all links in the graph is bidirectional, and the graph is in a connected state. Given a node i , time t is recorded since it receives the broadcasted message for the first time, and t = 0 . The majority of the previous work on routing techniques in MANETs has focused on homogenous MANETs. In a Wireless Sensor Network (WSN for short), individual sensor nodes, or sensors, are constrained in energy, computing, and communication capabilities. Typically, sensors are mass-produced anonymous commodity devices that are initially unaware of their location. Once deployed, sensors should self-organize into a network that works unattended.

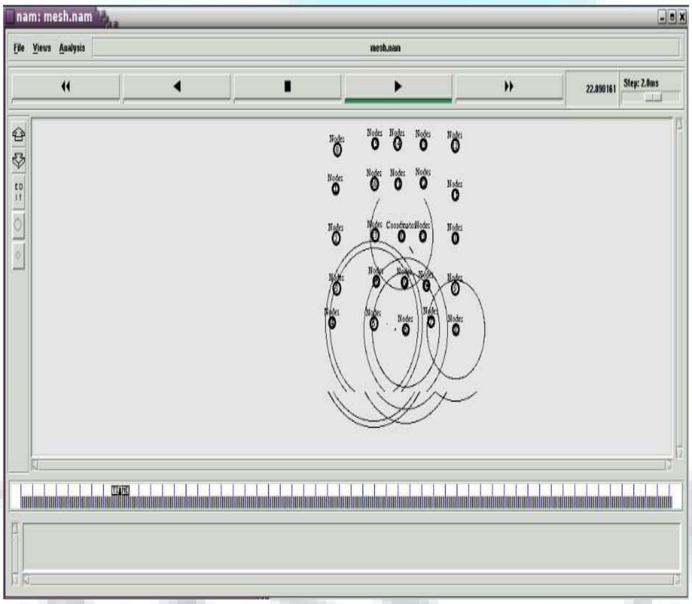
4. SIMULATION RESULTS

In this section, we present simulation results and investigating the Throughput in coming sections. The throughput measures the data packets (in bytes) delivered to a source node to the destination node.

4.1 SIMULATION SETUP

The nodes are uniformly and randomly deployed in the simulator as shown in fig.2. In addition, they form a connected stationary network. We simulated a network of 25 static nodes placed randomly in a 700 m · 700 m area. We used one coordinator node that senses the other nodes during transmission of packets. This coordinator further helps to link up the node if the destination can't received the packets due to link failures. The radio propagation range was 250 m and the channel capacity was 2 Mbps (the data rate used for broadcast in 802.11 MAC protocol). The simulation duration was 150 s. The Two Ray propagation model was used.

FIG.2: WSN GRID BASED SCENARIO



4.2 RESULTS

To verify the effectiveness of the throughput of WSNs, the TCP metrics for unicast is observed in our simulation study, we performed experiments on a 25-node wireless mesh network scenario as shown in above figure. Our implementation is based on the AODV specification.We implemented AODV protocol in the WSN network and enhanced it with the different link-quality. The AODV at each node can deliver data packets for all unicast addresses to the applications running on the node. The simulation graphs as shown in subsections 4.2.1. NS2 network simulator is used to evaluate the performance of grid based WSN. Simulation parameters are given in the following table:

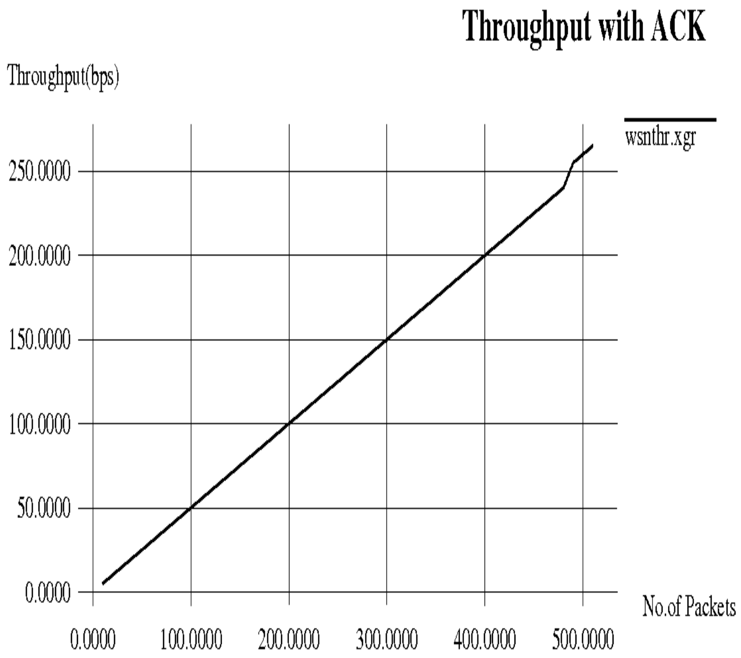
TABLE 4.1: PARAMETER USED IN SIMULATION

Parameter	Value
Area	1000*1000 meter
No. of Nodes	25
Radio Type	802.15
Data Rate	2 Mbps
Data Link Layer Protocol	802.15 MAC
No. of Channels	01
Antenna Model	Omni directional
Simulation Time	150s
Routing Protocol	AODV

4.2.1 THROUGHPUT OF WSN

The Throughput of a packets send by the sender node to the destination node that was calculated by the number of packets sent and received with observed the throughput with Kbps. The total number of active nodes was 25 that send and received the packets and observed that the packet sending ratio is 95%. The throughput that was achieved from this paper was better on other WSN published paper.

FIG.3: THROUGHPUT OF WSN



We performed the test on a 10-node balanced grid based network on the test bed, with the topology as shown in Figure 2.it shows that properly choosing the grid based sensors will improve the performance of the overall throughput of the network. We observed from the graph the arrangement of the sensors nodes achieving higher throughput and better than other paper because of we use a coordinator that link up the connection when it sees that link was down/broke. From the figure 3 it achieves more than 20 kbps throughput for transmitting 500 packets and resultant achieving higher throughput. The performance always decreased when the contention of the channel is affected by many factors such as the error rate, traffic model, and the type of connection (TCP or UDP).

5. CONCLUSION AND FUTURE WORK

In this paper, we have studied the link-quality routing metrics for high-throughput in grid based mesh networks. We first discussed the unicasting routing and how data packets are transmitted at the link layer, and then showed accordingly how to adapt routing metrics for unicast routing to be used in WSNs. We studied the performance of different metrics via extensive simulation and experiments on a mesh network test bed, using ADOV as a representative unicast protocol.

It should also be noted that the future directions of work must also be carried to develop highly scalable and large applications which might require an additional component i.e.an coordinator or router between the different clusters to scale up the application.

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