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Heuristic Approach for Potential Node Forwarders to Achieve QOS in WSN

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ABSTRACT: The main thing of this paper is for energy saving and maximizing the network lifetime in WSN. Problem in energy-efficient routing protocol is to find the minimum energy path as well as increasing network lifetime between the source and destination to achieve Quality of Service (QOS). This paper consists of not only finding the minimum energy efficient from source node to destination node, but also involves residual energy of the whole network. In this paper the algorithm used is energy saving–Opportunistic routing (ENS-OR) algorithm which cannot give much information using 1-D queue network. So, this paper proposes a greedy algorithm for energy saving and maximizing the network lifetime based on two-Dimensional (2-D) Queue network to achieve the QOS for energy saving as increasing the network lifetime. Therefore greedy algorithm prolongs the network lifetime and finds the high potential relay node.

KEYWORDS: Energy efficient route; AOMDV; QOS; WSN; network lifetime; 2-D Queue; Greedy Algorithm

I. INTRODUCTION

Wireless Sensor network is a wireless network that consists of distributed sensor nodes that monitor physical or environmental events or phenomena, such as temperature, sound, vibration, pressure or motion at different location. The first development of WSN was first motivated by military purposes in order to do battlefield surveillance [1]. There are four basic components in any WSN: (a) a group of distributed sensor nodes; (b) an interconnecting wireless network; (c) a gathering-information base station (Sink); (d) a set of computing devices at the base station (or beyond) to interpret and analyse the received data from the nodes. Sensor networks are envisioned to be deployed in the physical environment in order to monitor a wide range of environmental phenomena.

The main purpose of energy efficient route i.e. greedy algorithm is to decrease the energy consumption and maximize the network lifetime. These algorithms are not just related to maximize the total energy consumption of the route but also to maximize the life time of each node in the network to increase the network lifetime. Each sensor node has a separate sensing, processing, storage and communication unit. The position of sensor nodes need not be predetermined. This allows random deployment in inaccessible terrains or disaster relief operations. This WSN focuses on the residual energy level of entire network or individual battery energy of a node.

II. RELATED WORK

In this paper we address the maximizing network lifetime and decrease the energy consumption by using greedy algorithm based on 2-Dimensional (2-D) Queue network. According to their equation retransmission time is proportional to residual battery energy. A network is connected if any active node can communicate with any other active node, possibly using intermediate nodes as relays. Once the sensors are deployed, they organize into a network that must be connected so that the information collected by sensor nodes can be relayed back to data sinks or controllers. Selecting a minimal set of working nodes reduces power consumption and prolongs network lifetime. AOMDV protocol used in the greedy algorithm which is a multipath version derived from AODV [2]. As transmitting data consumes the much more energy than the other task of sensor nodes, energy saving optimization is realized by finding the minimum energy path between the source and sink in WSN. Lifetime of the path is used as a fitness function. AOMDV inspired multipath routing protocol which reduces the energy efficient and interference by requiring all the relay nodes to retrieve the timing information of their neighboring nodes. In the procedure of data transmission,

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each relay nodes finds its energy consumption and forward the packets to the next hop relay nodes. In order to overcome this problem, the energy efficient route i.e. greedy algorithm proposed for energy saving and maximizing the network lifetime. Energy consumption analysis is conducted on the proposed 2-D queue network, where data are delivered to the sink node through hop-by-hop connected relay nodes. While all these routing methods is to improve energy efficiency of the individual relay node or the whole network can minimize the energy consumption, it is equally important to focus on other objectives such as network lifetime and residual energy of relay nodes. Only active nodes can take part in rout selection and remaining nodes can be idle. The lifetime of a node is calculated and transmitted along with energy efficient route. Here all the sensors in generated sensor cover must be connected to some designated base station (BS) with the help of some relay nodes. They proposed static heuristic for the given coverage problem. Also proposed a heuristic solution based on 2-Dimensional (2-D) Queue network for energy saving as well as maximizing the network lifetime. The greedy algorithm is used to create one new concept called Energy Equivalent node (EEN) to conduct the optimal energy based on the optimal transmission distance for maximizing the network lifetime.

III. PROPOSED GREEDY ALGORITHM

A. *Design Considerations:*

- Initial residual energy in Jules for each node.
- Nodes are able to calculate its residual energy.
- Compute the energy consumed of relay node.
- Generate the node Id and residual energy.
- Calculate number of nodes and distance between the nodes.

B. *Description of the Proposed Greedy Algorithm:*

Aim of the proposed Greedy algorithm is to reducing the energy consumption and maximizes the network life by using energy as well as cost parameters. The greedy algorithm is consists of two main steps.

Step 1: Calculating residual Energy:

The residual energy of each relay node equation is given below.

Residual energy= initial energy- consumed energy

Computing the energy consumed of a node $E = E_{tx} + E_{tr}$

Step 2: Forwarder set selection for optimal energy strategy:

In potential node that the energy consumption functions is convex with respect to the number of hops *n*. We canachieve optimal energy strategy by choosing optimal hops to determine optimal transmission distance In addition, factors such as energy-balanced of a network and the residual energy of nodes are also considered while selecting the available next-hop forwarder.

The following parameters are newly added:

-sleep Power: power consumption (Watt) in sleep state

-transition Power: power consumption (Watt) in state transition from sleep to idle (active)

-transition Time: time (second) used in state transition from sleep to idle (active)

We assume that node *h* is sending a data packet to sink, and *h* + *i* is one of neighbors of node *h*. If it is closer to the estimated result in and has more residual energy, the neighboring node *h* + *i* can be a forwarding candidate, then the Network can obtain better energy usage. Moreover, these eligible candidates rank themselves according to their distances from the EEN and the residual energy of each node as:

$$P(h+i) = \left\{ \begin{matrix} (d_{h+i} - d_h)\left[\frac{1}{|d_{h+i} - d_{op}|} + (E_{h+i} - \varsigma)\right] \\ (h+i) \in F(h),\ -R \le i \le R \end{matrix} \right\}$$

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Where $d_{h+i} - d_h$ is the distance between node h and neighbor node h+i, E_{h+i} denotes the residual energy of node h+i and ς denotes the value of energy threshold. F(h) is the selected forwarding candidate set of node h. The larger the value of p (h +i) is the higher priority of the node will be. Only the forwarder candidate with the highest priority is selected as the next forwarder.

IV. PSEUDO CODE

Step 1: **for** i=0 to num_of_nodes
Step 2: Initialize Relay nodes
Step 3: Enable random motion
Step 4: Nodes Energy.
Step 5: Define initial node position
Step 6: Initialize agent
Step 7: Attach agent to node.
Step 8: **End for**

V. SIMULATION RESULTS

This simulation result specifies the details of the snapshots of the project. The snapshots defines how the proposed work has been implemented. The snapshots of the project discussed as follows.

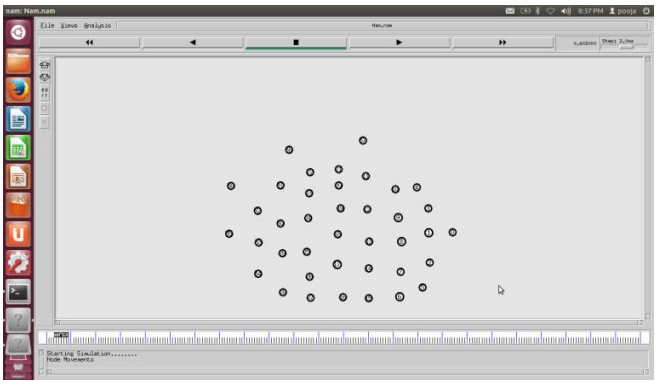

Fig 2: creation of nodes

Fig 2 shows the creation of nodes; here first we are sending the random node deployments i.e. sending the neighbour node request. For all node it will go for the neighbour node request.

Fig 3: Neighbor node request will create base station.

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Fig 3 shows the creation of base station, in this figure after sending the neighbour node request, it will go for the controller node i.e. base station, becouse this basevstation will controll the complete whole network from sounce to destination node.

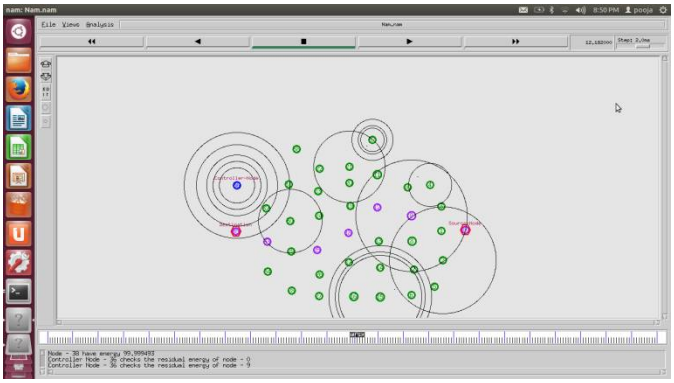

Fig 4: Base station calculate the residual energy for all the nodes.

Now base station will calculate the cost values, after calculating the cost values source node will send the root request(sending the packets). From this route requst base station will calculate the energy which is having high residual energy as shown in the fig 4. For all the nodes base station will calculate the energy.

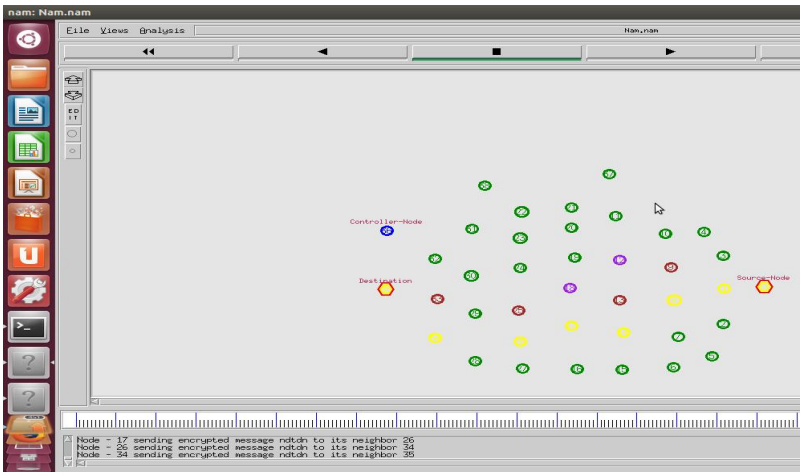

Fig 5: 2-D Queue of Greedy forwarding.

After checking all the nodes for a perticular route base station will check for the energy. Then it will show for the greeedy path using two Dimensional (2-D) Queue network as shown in the figure 5.

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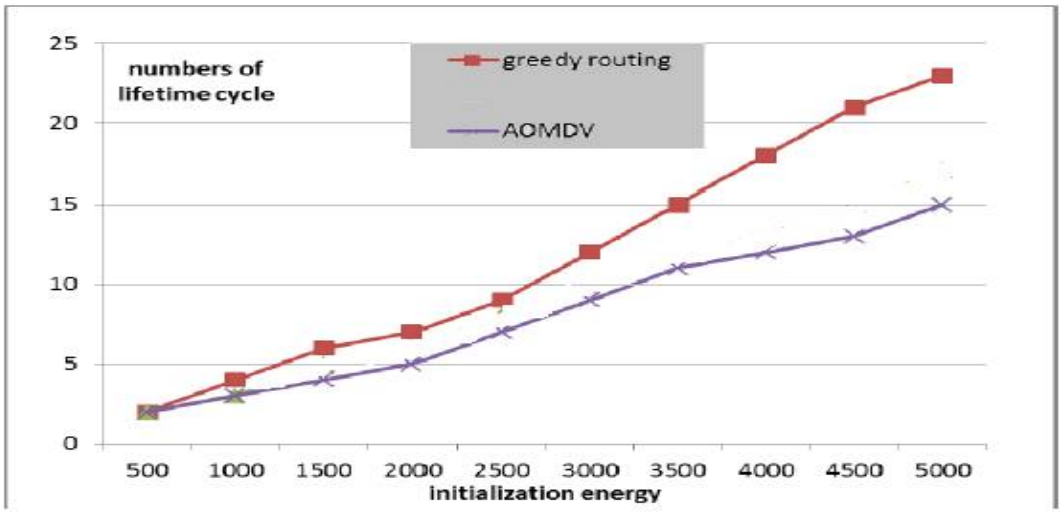

Fig.6. The relationship between the network lifetime cycle and initialization along with the routing protocols

The first experiment shows the relationships between the network lifetime and the initial energy capacity for different routing protocols. The network lifetime is measured in a cycle that each sensor node transmits 100 bits to the sink node, until the remaining energy of any one sensor node cannot send any further packet. The results of 120 sensor nodes are shown in Figure 6. The results show that the number of network lifetime cycles increases along with the increasing initial energy capacity, which is consistent with our intuition. The proposed greedy algorithm outperform AOMDV. Greedy algorithm use better transmission for our energy efficient routing method balance energy consumption of a WSN by adaptively transmitting data over multiple paths. As a result each node could transmit more data by extending the lifetime of a WSN.

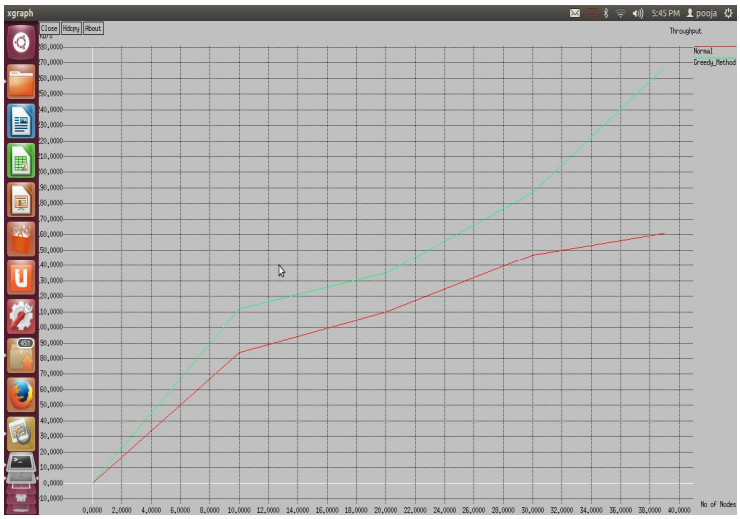

Fig 7: greedy method with increasing throughput to achieve QOS.

In the figure 7 experiment, throughput can be increased in the greedy path. Therefore if this throughput increases, then we can achieve the Quality of Service (QOS) using multipath i.e. 2-D Queue network.

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VI. CONCLUSION AND FUTURE WORK

The simulation results showed that the proposed greedy algorithm performs with relay nodes for better transmission for the maximum number of hops metric. The proposed greedy algorithm provides reducing the energy efficient path for data transmission and maximizes the lifetime of entire network. By distributing the sensed data to multiple paths, the energy consumption of each sensor node can be balanced to prolong network lifetime. We can increase the number of nodes and analyze the performance. In the future, the proposed routing algorithm will be extended to sleep mode and therefore a longer network lifetime can be achieved.

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