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Efficient Surveillance in Wireless Sensor Networks Using Sink Mobility

Revathy. M, Sai Prashanthi. S, Shanthini. SP, Arthi. B
Department of Information Technology, Easwari Engineering College, Ramapuram, Chennai, Tamil Nadu, India

ABSTRACT

The WSN helps in easy monitoring and controlling in the areas of surveillance. With the environment becoming more and smarter, it is essential to maintain the overall lifetime of the network. The sink that serves as the center spot is equipped with enormous energy. When these sinks are more in number and not stationary, it increases the overall performance thereby preventing much of the mote and data failure. In this paper, energy aware mechanism is proposed to reposition the sinks in optimum number of steps. Thus the congestion can be routed away effectively. This approach is found to be better than it's contemporary.

Keywords: Wireless Sensor Networks, Sinks, Surveillance, Network lifetime

I. INTRODUCTION

A Wireless Sensor Network (WSN) is a wireless network consists of spatially distributed autonomous devices using sensors to monitor physical or environmental conditions. It incorporates a gateway that provides wireless connectivity back to the wired world and distributed nodes. These networks are collections of small devices, known as motes, with limited computational power i.e, 1-100th of the computing power of a PDA.

Sensor networks inter-network with an IP core network via a number of gateways. A gateway routes user queries to appropriate nodes in a sensor network and at times aggregate and summarize to users who have requested it or are expected to utilize the information. A sensor network performs a set of high-level information processing tasks such as detection, tracking, or classification. Measures of performance for these tasks are well defined, including detection of false alarms or misses, classification errors, and track quality.

Sensor networks provide a bridge between the real physical and virtual worlds. Each device monitors some aspects of its environment, and communicates its observations through other devices to a destination where data from the network is gathered and processed. Some special components in routing based networks are routers, designed to compute, calculate and distribute the routing tables.

The radio frequencies are used for the communication purposes. The WSNs are well known for their resilience, mobility, heterogeneity, scalability, low cost, concurrent processing and security. Some of the challenges to this wireless network are accuracy, time synchronization, data collection, etc.

The organization of this document is as follows. In Section 2 (**Methods and Material**), I'll give detail of any modifications to equipment or equipment constructed specifically for the study and, if pertinent, provide illustrations of the modifications. In Section 3 (**Result and Discussion**), present your research findings and your analysis of those findings. Discussed in Section 4(**Conclusion**) a conclusion is the last part of something, its end or result.

II. METHODS AND MATERIAL

The main components of the proposed system are clearly depicted below. Zigbee is used for memory relted operations. EARA is the Energy Aware transmission Range Adjusting.

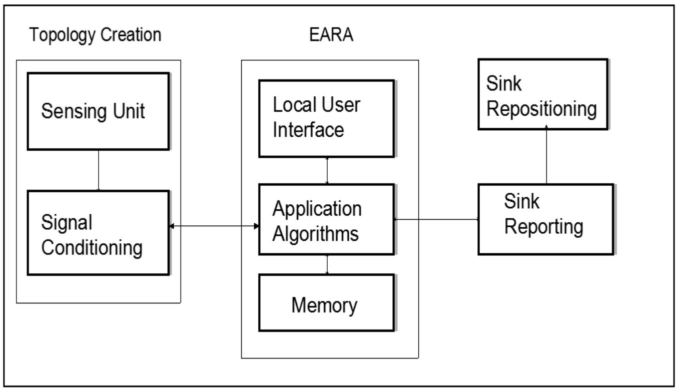

Figure 1: System architecture.

The algorithms used are two in number. The MCP - maximum computation path is the protocol that finds the best suitable path based on

1. The node with high energy
2. The path with overall maximum energy

Greedy finds the correct number of relocating steps for the base station. A node should remember the location of its neighbors within one hop. Routing is done dynamically. This succeeds if the network is so dense. Thus perimeter is used to find the route in case of void nodes using right hand thumb rule. But the latter alone cannot be used due to its longest path. Thus if one fails, the other compensates.

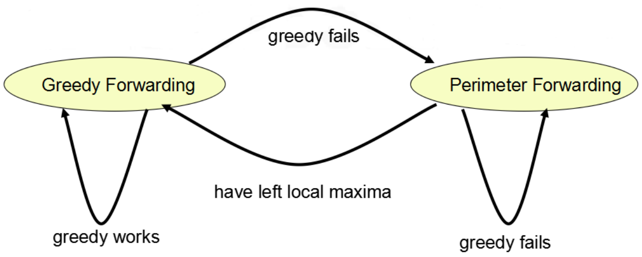

Figure 2 : Protocols Used

Start

1. *Determine the total coverage area of n sensors*
2. *Select the no. of multi sinks , m*
3. *split the area into 'm' sections*
4. *Position the mobile sinks and let their energy be s_i*
5. *Compute the neighbour nodes for each sensor n_i by sending 'hello' message*
   - *Calculate the distance , d_i*
   - *Compute their energy, e_i*
6. *Adopt greedy and perimeter stateless routing protocol to compute the optimum shortest path to the nearest sink*
   - *Update the best shortest path*
   - *Sense data and report to sink*
7. *Determine the residual energy after every transmission*
8. *If(e_i < s_i) or if($\Sigma e_i < s_i$)*
   - *Move the sink*
   - *Move sink towards the last-hop relays (involved in packet transmitting) to improve lifetime.*
9. *Run to check the performance and depict it graphically*

Stop

Figure 3. Algorithm

III. RESULTS AND DISCUSSION

The complete picture of the wireless network with a static sink, a mobile sink and multiple mobile sinks are depicted here. The results are obtained based on the simulation in NS2.

A set of 100 sensors are plotted to form a grid network in a 1500 x 1500 area.The sink is equipped with 300 units of energy while the other nodes have 100 units. The transmission loss is taken to be 0.01.

A. Static Sink

The sink remains stationary throughout. It remains constantly tied to a single mote. This eventually results in around 17 failure nodes.

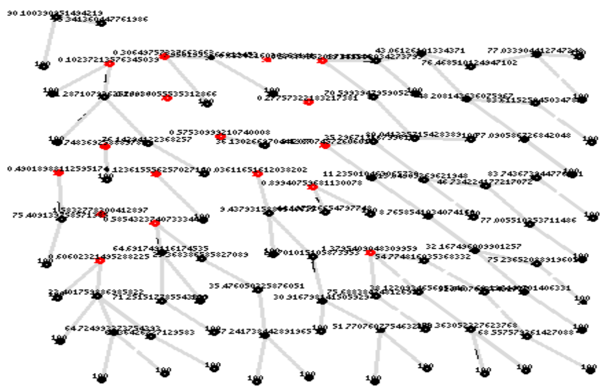

Figure 4. Simulation window of immobile sink and its network

B. A Mobile Sink

The sink can move at a radius of 300m and the nodes communicate data at a radii of 100m. In this case, the failure nodes correspond to 6.

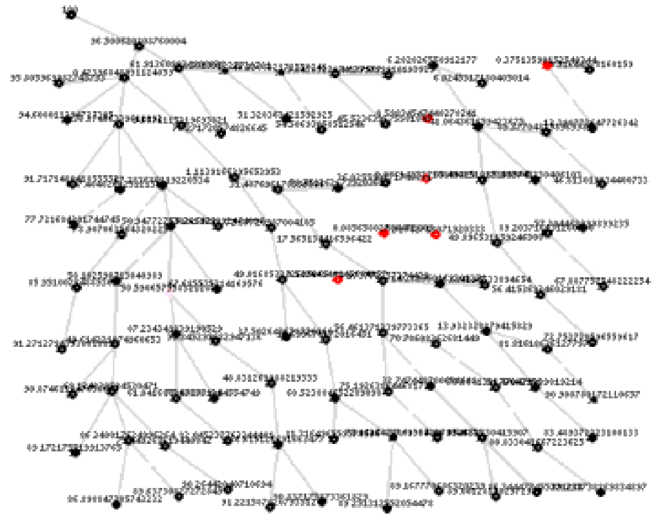

Figure 5. Simulation window of one mobile sink and its network.

C. Two Mobile Sinks

To this network, one more sink is added to monitor the entire coverage. This reduces the failure nodes to just 1 in number.

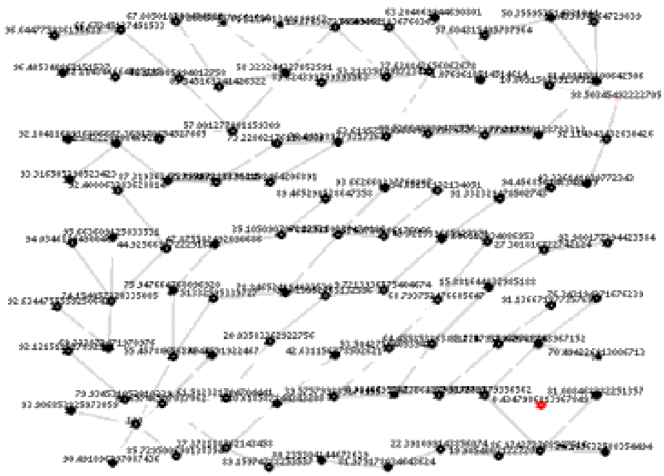

Figure 6. Simulation window of two mobile sinks and its network

D. Performance Analysis

All the three scenarios are taken here and their performance is studied using Xgraph.

1) Case: The nodes that drain much of their energy ultimately becomes inactive after a while. Thereby the entire route is cutoff from the main stream leading to dormant performance of the entire network.

2) Case: Here as the sink is mobile, the entire network gets re-configured when there is a need. Though better when compared to the former, this also covers only area upto 300m.

3) Case: In this situation, with two sinks the entire area is easily patrolled. The network re-arranges accordingly. This considerably boosts the overall performance.

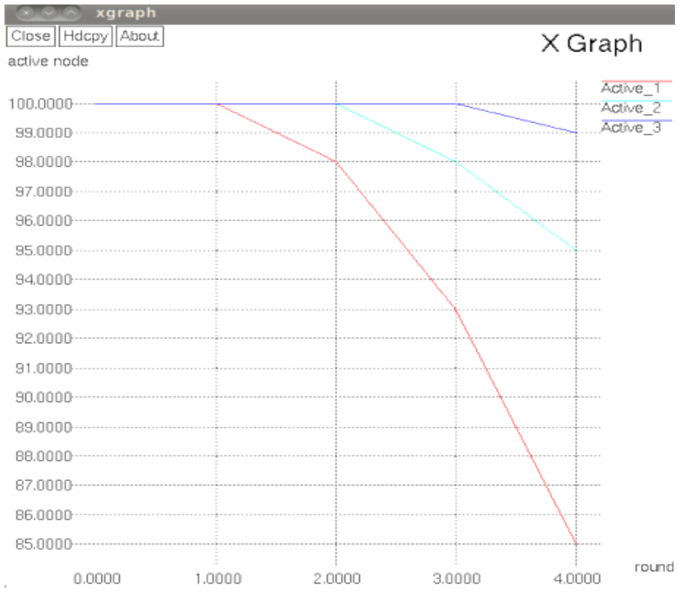

Figure 7. Performance Graph

E. Time Analysis

The total time a node is seen to be active is calculated. Cases 2 and 3 are taken into consideration. On an average when the number of sinks increases, the time to live also rises up.

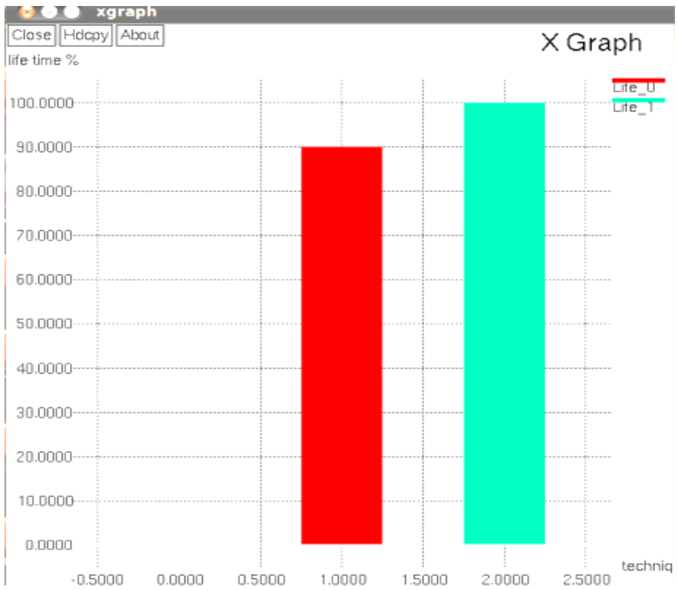

Figure 8. Time Graph

F. Energy Analysis

Based on the amount of residual energy left behind, the case 3 is found to outlive the former.

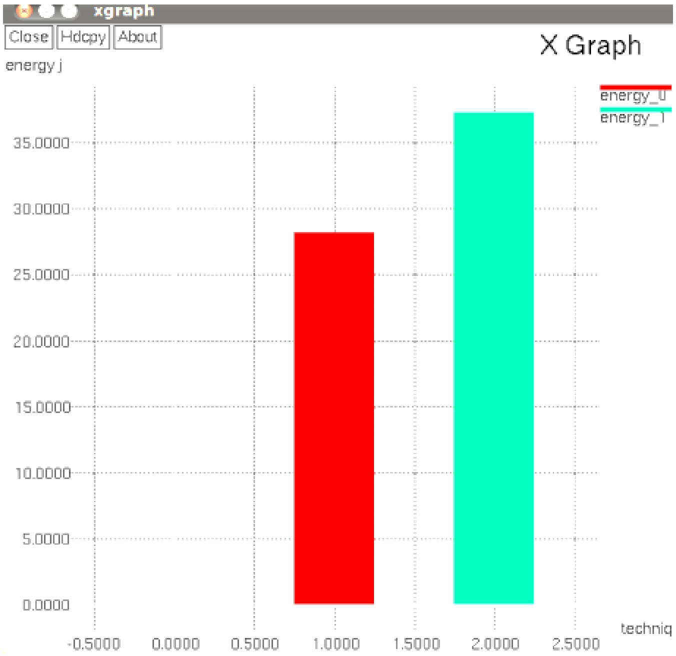

Figure 9. Energy Graph

IV.CONCLUSION

Thus the art of surveillance can become more befitting using this strategy. The proposed model basically computes the shortest path using MCP, then applies greedy and perimeter algorithm to compute the optimum relocating sinks keeping in mind the transmission energy of the nodes. The future work relates to establishing trust among the neighbors using DES algorithm or in a simpler way deploying a trust matrix to rate the surrounding motes inorder to avoid intrusion and hackers.

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