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A SURVEY OF THE EFFECT OF NETWORK PARAMETERS ON COMMUNICATION LINKS IN WIRELESS SENSOR NETWORKS

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Abstract - In the wireless sensor networks, the communication links between sensor nodes is important. This paper presents the analysis on the effect of parameters of network size, number of nodes and communication ranges on the number of communication links in the sensor network systems. The MATLAB tool is used for deployment of sensor nodes in various area fields.

Keywords - *Communication Range,, Wireless Sensor networks, Network Parameters, Area.*

I. INTRODUCTION

Sensor networks are a collection of large number of low-cost, low-power, multifunctional, and small sensors. a transceiver and a power source [1].Wireless sensor networks hold the promise of many new applications in the area of monitoring and control. Examples include target tracking, intrusion detection, wildlife habitat monitoring, climate control and disaster management [2].Wireless sensor networks (WSNs) have gained world wide attention in recent years, particularly with the proliferation in Micro-Electro-Mechanical Systems (MEMS) technology which has facilitated the development of smart sensors [3].Distributed systems with hundreds and even thousands of very small, battery-power and, wirelessly connected sensor and actuator nodes are becoming a reality [4].Emerging applications for wireless sensor networks will depend on automatic and accurate location of thousands of sensors [5].Recent advances in wireless communications and microelectro-mechanical systems have motivated the development of extremely small, low-cost sensors that possess sensing, signal processing and wireless communication capabilities [6].Position and orientation information of individual nodes in ad hoc networks is useful for both service and application implementation. Services that can be enabled by availability of position include routing and querying [7].Network sensors-those that coordinate amongst themselves to achieve a larger sensing task-will revolutionize information gathering and processing both in urban environments and in inhospitable terrain [8].

II. SYSTEM MODEL

1) Communication Range:

Within which range a number of sensors can communicate with each other is the communication range.

2) Area:

It is an area of field in which the sensors are deployed randomly or with known locations.

3) Number of nodes:

It is the number of nodes deployed in a particular area field.

4) Number of communication links:

It is the number of communication links which can be established among sensor nodes if they are in communication range.

5) Distance between nodes:

It is the mathematical distance between the randomly deployed nodes in a sensor field. It is basically the distance between two nodes.

III. SIMULATION & EVALUATION

The simulation is done in MATLAB environment. It requires MATLAB version 7.x and greater. It is used for creating the network. After creating network range of communication is put for sensors to establish communication links.

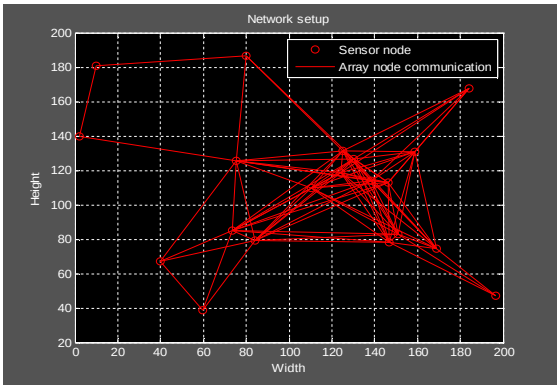

Fig.1 Sensor network communication links deployed randomly within the area of 200m x200m.

The simulations are done on each network parameters. The output of each simulation is stored into a MATLAB .m file. The distance between nodes is calculated by the mathematical equation:

d = sqrt ((xi-xj) ^2+ (yi-yj) ^2)

It gives the distance between two nodes i and j. The distance between the nodes should be within communication range to establish communication among various sensors.

IV. RESULTS & ANALYSIS

Several network parameters affect the number of communication links. Studying the effects of those parameters of network size, number of nodes and communication ranges on number of communication link can give us variation in the number of links.

A. Network Size

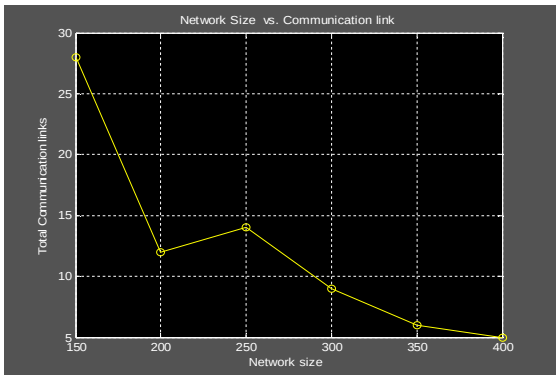

Fig.2 Effect of network size on the number of communication links

We have investigated how the communication links changes as network scales in overall size. The network size is increased from 150m x150m to 400m x400 m in area. The numbers of nodes and communication range are kept constant. If we compare from the graph the communication links are maximum when area is least. It then decreases and increases and then finally decreases for maximum network size.

B. Number of Nodes

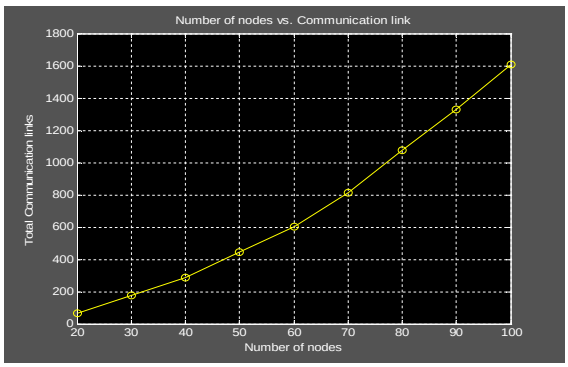

Fig.3 Effect of number of nodes on the number of communication links

As the number of sensor nodes increases total number of communication links also increases. It is maximum for 100 nodes if numbers of nodes are increased from 20 to 100. The network size and communication range are kept constant.

C. Range of Communication

The range of communication is the range in which communication establishment takes place. The distance between nodes is within range for a possible communication.

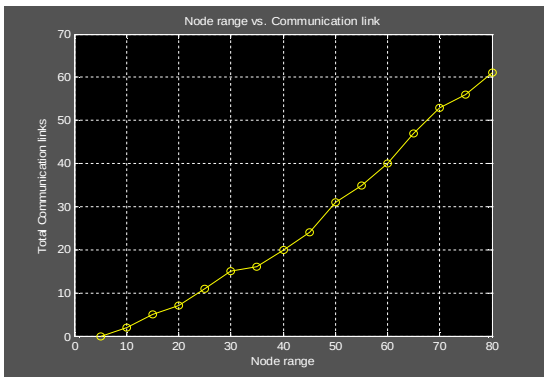

Fig.4 Effect of ranges on the number of communication links

The communication range is increased from 5m to 80m and so the total number of links increases. The network size and number of nodes is kept constant. For communication range of 80m total number of communication is a maximum of 60.

V. CONCLUSION

Wireless sensor networks have shown a remarkable growth with the advancements in the Micro-Electro-Mechanical systems (MEMS) technology. The deployment of small, inexpensive, low-power, distributed sensor nodes which are capable of local processing and wireless communication has found many applications in the field of military, agriculture, disaster management etc.

In this paper, we have analyzed variation of one network parameter on the total number of communication links keeping the other parameters constant, which provide us insights on how to set the controllable parameters of a sensor network for the best possible communication.

Simulations and experiments show the relationship between number of communication links and network parameters of a network. For a small network size good communication is possible as the total number of communication links are maximum. On the contrary, with the increase in the number of nodes and communication ranges more number of communication links are possible.

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