Designing A Strategy For Wireless Sensor Networks' Optimum Routing

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Abstract- *A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. To overcome the problems of WSN, we will design an Energy efficient algorithm for Wireless Sensor Networks using layered chain approach and Wireless Sensor Network should is not mobile and heterogeneous.*

I. INTRODUCTION

A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound ,pressure, etc. and to cooperatively pass their data through the network to a main location [1]. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. The wireless sensor network is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Previously, sensor networks consisted of small number of sensor nodes that were wired to a central processing station. However, nowadays, the focus is more on wireless, distributed, sensing nodes. But, why distributed, wireless sensing? When the exact location of a particular phenomenon is unknown, distributed sensing allows for closer placement to the phenomenon than a single sensor would permit [2]. Also, in many cases, multiple sensor nodes are required to overcome environmental obstacles like obstructions, line of sight constraints etc. In most cases, the environment to be monitored does not have an existing infrastructure for either energy or communication. It becomes imperative for sensor nodes to survive on small, finite sources of energy and communicate through a wireless communication channel. Another requirement for sensor networks would be distributed processing capability. This is necessary since communication is a major consumer of energy. A centralized system would mean that some of the sensors would need to communicate over long distances that leads to even more energy depletion. Hence, it would be a good idea to process locally as much information as possible in order to minimize the total number of bits transmitted [3]. The Diagrammatic representation of WSN is shown in fig. 1.

Diagrammatic representation of the Wireless Sensor Networks

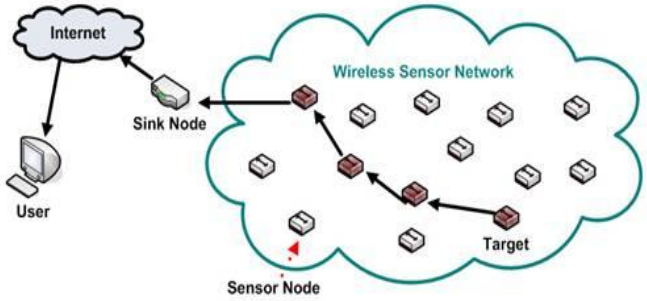

Fig. 1 (Wireless Sensor Network)

- The wireless sensor network has randomly deployed sensors.
- Data is transmitted from target node to the base station via best possible route
- Sink node collects all the information and send that to the other end via internet

II. RESEARCH PROBLEM

Technology has improved and advanced exponentially and wireless networks has play a very vital role in this improvement. In wireless sensor networks sensors play

a vital role to gather the information from its surroundings, therefore it is very important that there should be efficient routing between the sensors within a network so that the information should reach to the main base station on time without any delay [4].

The importance of routing is due to the fact that efficient routing leads to the fast communication of information. Routing is a way to get one packet from one destination to the next. Routers or software in a computer determines the next network point to which a packet should be forwarded toward its final destination . Routing involves two basic activities: determining the optimal routing paths for destination networks and transporting information groups, also known as packets, through an internetwork [5]. Research problem can be divided into two simple parts:

1.) Design an efficient algorithm for routing based on the distance metric.
2.) Algorithm should be efficient in terms of energy consumption of the nodes.

III. DESIGN DESCRIPTION

We have used the Euclidean distance metric to calculate the distance of the individual nodes from the base station.

1.) Euclidean Algorithm:In mathematics, the Euclidean distance or Euclidean metric is the "ordinary" distance between two points that one would measure with a ruler, and is given by the Pythagorean formula. By using this formula as distance, Euclidean space (or even any inner product space) becomes a metric space. The associated norm is called the Euclidean norm.
1.) Two dimensions:

In the Euclidean plane, if $\mathbf{p} = (p_1, p_2)$ and $\mathbf{q} = (q_1, q_2)$ then the distance is given by

$$\mathrm{d}(\mathbf{p}, \mathbf{q}) = \sqrt{(p_1 - q_1)^2 + (p_2 - q_2)^2}.$$

This is equivalent to the Pythagoras Theorem [6]

2.) We have defined a routing table that will be maintained by the source node, the routing table contains the following information:

Source node_id	**Distance**	**Neighbouring Node**

Routing Table

Source node_id refers to the node that generates a request, distance field gives the distance of the neighbouring node and neighbouring node gives the name of the neighbouring node [7].

3.) We have used java to implement our routing algorithm.

Algorithm Designing

SPRBD works in three phases (1) Network Construction phase (2) Chain Formation Phase (3) Data Transmission Phase

(1) Network Construction Phase

1.1 A source node S broadcast a route request message. For neighbors n1,n2,n3….Compare dist (n1),dist(n2),dist(n3)…. from a source node , Active Reply is generated containing route length [8].
1.2 Where, dist(n), distance of a neighbor n from the source,
1.3 At the source node S
All received REPLY messages are scanned. The neighbor with shortest active route is selected for forwarding the data [9].
1.4 Selected Node with shortest distance will be saved in Routing table.
1.5 The selected neighbor will act source for other nodes
1.6 Continue until all nodes have been traversed

(2) Chain Formation Phase

2.1 After Network Construction Phase , Chain formation Phase starts form the Base Station .
2.2 Base station will check its routing table and find out the node with shortest distance [10].
2.3 A line joining from the BS to the neighbouring node will show its connection.
2.4 Now , this neighbouring node will become the source node and whole process will be repeatedly.
2.5 Repeat the process for the remaining nodes that have not been added previously in the network [11].

(3) Data Transmission Phase

3.1 In this phase, Data will be transmitted from the farthest node (from the BS) to the base station Aggregating data at each node position to remove redundancy.

3.2 At the base station, Aggregated data will be collected and processed.

3.3 Additionally, if we want to add a neighbour of node which is not its closest neighbour, we can do so by adding that neighbour in the chain property of the node. But we can not add a node to be neighbour of its own. If we try to do so an error will be displayed [12].

IV. CONCLUSION

In our propsed design for the algorithm of WSN, it has given the best results. In our implementation, we have included the Euclidean distance metric and the AODV routing protocol for the routing purpose. We have consider a wireless sensor network with fixed number of sensor nodes and all the nodes are assumed to be homogeneous so there will not be any problem regarding the energy consumption of the nodes or the node failure in the system. Level assignment is done on the basis of the calculated diagonal length of the wireless sensor network then the nodes are assigned based on their position in the network. Euclidean distance metric is used for calculating distance of each node in the all the three levels. Finally the AODV routing protocol is used for the routing of nodes in the wireless sensor network

Sensor Networks hold a lot of promise in applications where gathering sensing information in remote locations is required. It is an evolving field, which offers scope for a lot of research. Their energy-constrained nature necessitates us to look at more energy efficient design and operation.

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