www.ijecs.in
International Journal Of Engineering And Computer Science ISSN:2319-7242
Volume 2 Issue 6 June, 2013 Page No. 1998-2001

Improving The Performance of Grid Network using Energy Optimal Routing with Square Matrix in WSN

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Abstract— ***Wireless sensor networks is collection of small nodes with computation, sensing, and wireless communications capabilities. The modern networks are bi-directional, also enabling control of sensor activity. Energy awareness is an essential design issue in WSN. Routing protocols in WSNs might differ depending on the application and network architecture. In Grid network, each node is connected with neighboring nodes along one or more dimensions. Grid network, known as a toroidal network when an n-dimensional grid network is connected circularly in more than one dimension. In Proposed system , we are improving the performance of grid network using energy optimal routing with square matrix in WSN. In our work, we will use vertical and horizontal approach. In this approach ,first move one step horizontally and the one step vertically.***

Keywords: wireless sensor network, grid network, energy optimal routing, sensors.

I. INTRODUCTION

A wireless sensor network (**WSN**) in its simplest form can be defined as a network of (possibly low-size and low-complex) devices denoted as nodes that can sense the environment and communicate the information gathered from the monitored field through wireless links; the data is forwarded, possibly via multiple hops relaying, to a sink that can use it locally, or is connected to other networks (e.g., the Internet) through a gateway.

Sensor networks represent a significant improvement over traditional sensors, which are deployed in the following two ways:[1]

- Sensors can be positioned far from the actual phenomenon, i.e., something known by sense perception. In this approach, large sensors that use some complex techniques to distinguish the targets from environmental noise are required.
- Several sensors that perform only sensing can be deployed. The positions of the sensors and communications topology are carefully engineered. They transmit time series of the sensed phenomenon to the central nodes where computations are performed and data are fused.

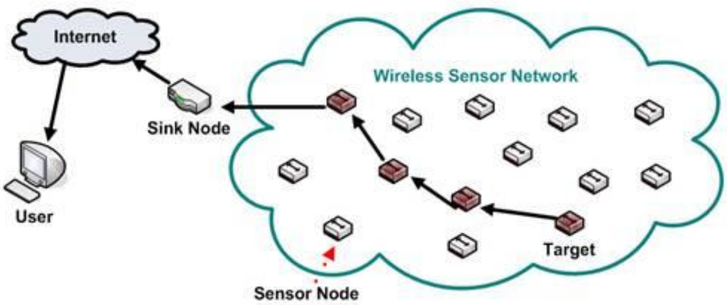

Figure1: Wireless sensor network

II. APPLICATIONS

[1]Several applications have been benefited from the advances in wireless sensor networks. These include Agriculture, Health Care, Defense, Wild Life Habitat monitoring, Under Water monitoring, Disaster Management (Safety) and Industrial (monitoring, control, factory automation) applications.

1. MILITARY APPLICATIONS:

In the battlefield context, rapid deployment, self-organization, fault tolerance security of the network should be required. The sensor devices or nodes should provide following services: [1]

- Monitoring friendly forces, equipment and ammunition
- Battlefield surveillance

- Reconnaissance of opposing forces
- Targeting
- Battle damage assessment
- Nuclear, biological and chemical attack detection reconnaissance.

2. AREA MONITORING APPLICATIONS:

Area monitoring is a common application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. A military example is the use of sensors to detect enemy intrusion; a civilian example is the geo-fencing of gas or oil pipelines.

- Environment monitoring
- Forest fire detection
- Air pollution monitoring
- Landslide detection

3. INDUSTRIAL MONITORING APPLICATIONS

- Machine health monitoring
- Data Logging
- Industrial sense and control applications

4. WATER/WASTEWATER MONITORING

- Agriculture
- Greenhouse monitoring

5. STRUCTURAL MONITORING

Wireless sensors can be used to monitor the movement within buildings and infrastructure such as bridges, flyovers, embankments, tunnels etc... enabling Engineering practices to monitor assets remotely without the need for costly site visits, as well as having the advantage of daily data, whereas traditionally this data was collected weekly or monthly, using physical site visits, involving either road or rail closure in some cases. It is also far more accurate than any visual inspection that would be carried out.[1]

III. EXITING WORK

The key challenge in sensor networks is to maximize the lifetime of sensor nodes due to the fact that it is not feasible to replace the batteries of thousands of sensor nodes. that's why, computational operations of nodes and communication protocols must be made as energy efficient as possible. Among these protocols data transmission protocols have much more importance in terms of energy, Since the energy required for data transmission takes 70 % of the total energy consumption of a wireless sensor network[2]. Area coverage and data aggregation [5] techniques can greatly help conserve the scarce energy resources by eliminating data redundancy and minimizing the number of data transmissions. Therefore, data aggregation methods in sensor networks are extensively investigated in the literature [5], [6], [7] and [8]. In this paper, we are going to discuss a network having nodes connected using grid topology. In grid topology, each node in the network is connected with two neighbors along one or more dimensions. this kind of network is called grid network.

Reactive protocols such as AODV [7] and DSR [8] solve some of these problems but for large networks, they depend on flooding for route discovery. Furthermore, DSR requires the management of large route caches and large packet headers to store the path.[4]
Routing protocols for WSNs should be lightweight in both processing power and memory and should require minimal message overhead. They should be able to route packets based on information exchanged with its neighborhood and should be resilient to node failures and frequent topology changes. For these reasons, routing in sensor networks has focused on tree-based or geography-based protocols .[3]

(A)ROUTING TREE**:**

After gathering data by sensors which sent to the sink, with some aggregation along the path. As the query propagates through network, each node remembers its parent and forward messages/originates. Directed Diffusion is a variant that routes packets along the edges of a DAG rooted at the sink and allows for multipath data delivery. Routing trees are very easy to construct and maintain but this approach is not suitable for more complex applications which require end-to-end communication.
Especially, broadcast-based routing schemes such as AODV, DSR and directed diffusion have a weakness of highly power assumption due to massive broadcast message which cause to deliver duplicated messages. These duplicated messages reduce bandwidth over network which increases the collisions of messages. As a consequence, a series of these events reduce the network lifetime overall. Taking above problems, our aim is find a proper routing method which maintains efficient bandwidth.
We defined characteristics, problems and consumption energy for transceiver in large scale wireless sensor networks . Especially, we know that the broadcasting storm is a severe problem for network's lifetime.
At that time, the amount of consumption energy to broadcast is about:

$$E_{total} = (E_{rx} * \text{the average number of neighbors} + E_{tx}) * N(1) \quad (1)$$

As equation (1) means, the total energy directly depends on the number of all nodes(*N*) and *the average number of neighbors*. So, the total energy consumed for one broadcast is big so that it can rapidly reduce network's lifetime.

```
if (M is delivered in unicast mode)
if (N is in the target area)
Broadcast M with 2 neighbor nodes
else
Deliver M to next node
end if
else (M is delivered in Broadcast mode)
if (N is in the target area && N is in M's payload)
```

Figure2: Flooding Algorithm

IV. PROPOSED WORK

The proposed algorithm we will use for energy optimal routing in wireless sensor network using grid network. In this algorithm we follow the following step:-

/* Network define a Grid Network of N*N Grids from Source to Destination*/

- c(0) to c(N) :- refers to the compromising nodes i.e. neighbor nodes
  For node(i)=source to destination
  If node(i)=center node
  Then identify the load on center node.
  Find list of neighbours node from c(0) to c(N).
  If load(center node)<c(i)
  Then load(center node)++;
  else
  load(c(i))++;
  Exit.

Figure3: Proposed Algorithm

IV. SIMULATION OF EXISTING AND PROPOSED WORK

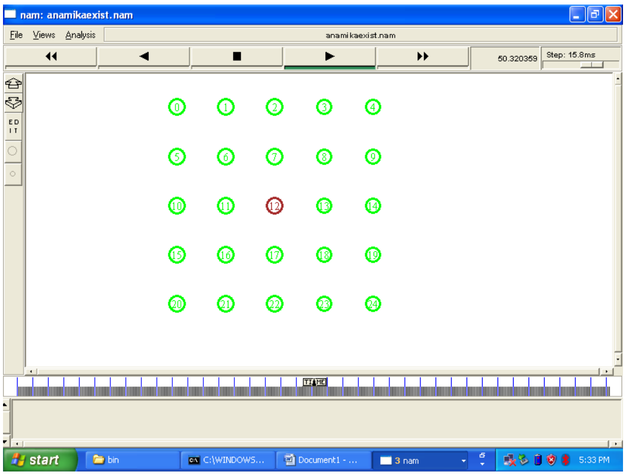

Figure4:Flooding of data (Existing work)

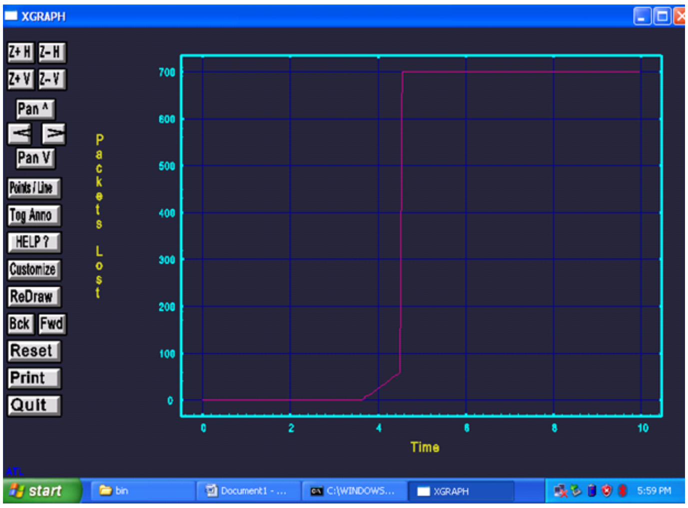

Figure 5: packets lost(Exsitng)

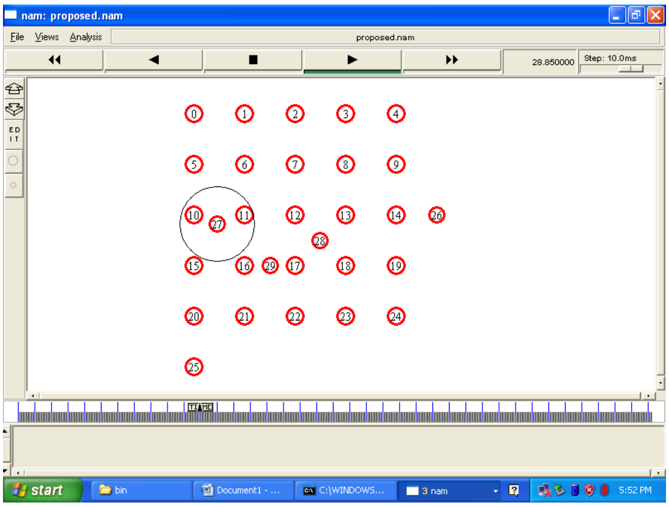

Figure 6: load distributed (proposed work)

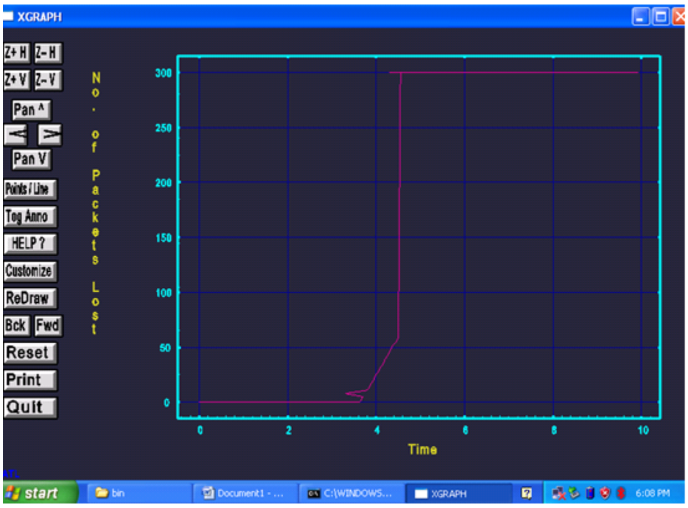

Figure 7: packets lost(proposed work)

V. CONCLUSIONS

We analyzed Horizontal–Vertical method that performs better load balancing of the grid network, all communication mode in a grid network. We will firstidentify the center node for the exceeding load limit and then release this node from the communication path. Now its load gets distributed on the surrounding other nodes. This distribution will be taken on basis of average distance from the center. After this central node is now not overloaded. Holes would also minimize in this approach. Energy consumption on central node will be minimum so that the network can be used more efficiently. For security if any node is overloaded then its packets will distributed on neighboring nodes for avoiding packet loss by overloaded node.

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