Literature Review on Different Routing Methodologies in Wireless Sensor Networks

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Abstract- A wireless sensor node is inherent limited energy resource. Besides maximizing the lifetime of the sensor node, it is preferable to distribute the energy dissipated throughout the wireless sensor network in order to minimize maintenance and maximize overall system performance. Any communication protocol that involves synchronization of peer nodes incurs some overhead for setting up the communication. We study various energy-efficient routing algorithms and compare among them. We take into account the setup costs and analyze the energy-efficiency and the useful lifetime of the system. In order to better understand the characteristics of each algorithm and how well really performed, we also analysis with an optimum clustering algorithm. The benefit of these algorithms is to show the upper bound on performance at the cost of an astronomical prohibitive synchronization costs. In this review paper we have studied the algorithms in terms of system lifetime, power dissipation distribution, cost of synchronization, and simplicity of the algorithm.

Keywords: Energy Conservation; Routing Protocols, Cluster Based Routing wireless sensor networks; WSN.

I. INTRODUCTION

These rapid advancements led to a very fast market in which computers would participate in more and more of our society's daily behaviors. In such years, one of the revolution has been taking leave, someplace computers are becoming so small and so cheap, that single purpose computers with embedded sensors are almost practical from both economical and theoretical points of view. Wireless sensor nodes are beginning to become a reality, and therefore some of the long overlooked limitations have become an important area of research. The usual topology of wireless sensor nodes involves having many node nodes dispersed throughout a specific physical locale. Present is typically no specific architecture or hierarchy in place and consequently, the wireless sensor nodes are measured to be ad hoc nodes.

An ad hoc wireless sensor node may operate in a standalone method; otherwise it could be connected to other nodes, such as the larger Internet through a base position. Base positions are usually more complex than mere node nodes and usually have an unlimited power supply.

Routing Protocols:

In the next few sub-sections, those resolve discuss the protocols tested in aspect. Temporarily, the protocols are:

1. Direct communication, in which each node communicates directly with the base position.

2. Diffusion-based algorithm utilizing only location data.

3. Diffusion based algorithm utilizing location, power levels, and node load.

4. Random clustering, similar to LEACH, in whose erratically chosen group heads receive messages from all their members and forward them to the base position.

5. An optimum clustering algorithm, in which clustering mechanisms are applied after some iterations in order to obtain optimum cluster formation based on physical location and power levels.

Direct Communication:

Each node is assumed to be within communication range of the base position and that they are all aware who the base situation is. In the incident that the nodes do not know who the base position is, the base position could broadcast a message announcing itself as the base situation, later than which all nodes in range will send to the specified base position.

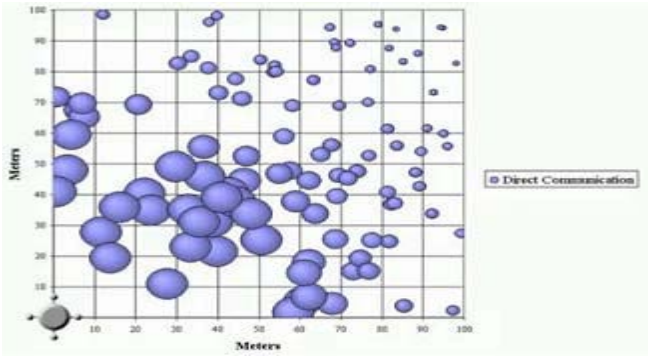

Fig. 1: Direct Communication node Lifetime

Diffusion based algorithm using location information

Each node is assumed to be within communication range of the base position and that they are all aware who the base location is. just the once the base position identity is

well-known, the subsequent sequence of messages could be between each node and several of their closest neighbors. both node is to construct a local table of signal strengths recorded from each of their neighbors, which ought to be a direct correlation to the distance those nodes are from each other.

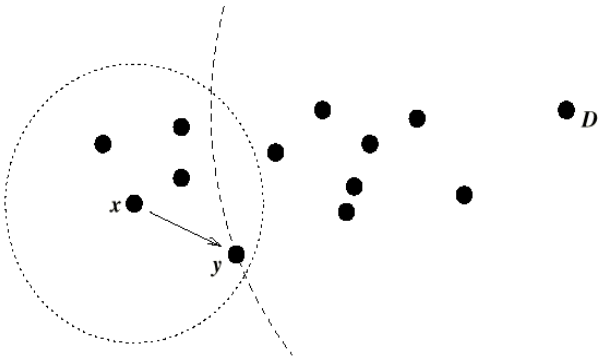

Fig.2: Diffusion based algorithm

The drawback of this organization is that it still does not completely evenly distribute the energy dissipated since nodes close to the base position will die far sooner before nodes far away from the base location. Observe these are phenomenon is inversely proportional to the direct communication algorithm. It be supposed to be clear that this happens because the nodes close to the base position end up routing many messages per iteration for the nodes farther away.

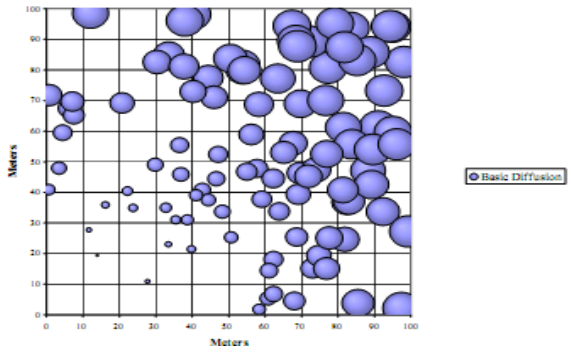

Fig.3: Basic Diffusion Node Lifetime

Energy-Efficient Distributed

In addition to everything that the basic diffusion algorithm execute, apiece node makes a list of suitable neighbors and ranks them in order of partiality, comparable to the previous approach. all instance that a node changes neighbors, the sender will require an acknowledgement for its first message which will ensure that the receiving node is still breathing. condition a instance out take place, the distribution node will choose another neighbor to transmit to and the whole process repeats. Once communication is initiated, there will be no more acknowledgements for any communication. moreover data communication, with are above all used to tell the sending node to stop sending and let the sender choose a different national. An immunity communication is generated in only three instances: the getting node's queue is too huge, the receiver's control is less than the sender's control, and the receiver has passed a certain threshold which means that it has very little control left.

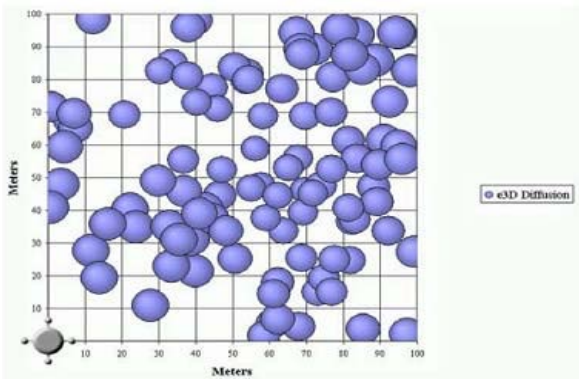

Fig.4: Energy-Efficient Distributed

II. SYSTEM MODULE

Random Clustering Based Algorithm

This algorithm is similar to LEACH, but for here is no data aggregation at the cluster starts. casual cluster start are chosen and clusters of nodes are established whose will communicate with the cluster starts.

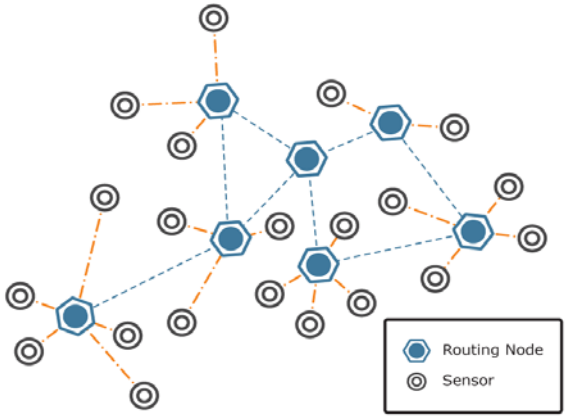

Fig. 5: Random Clustering

The main advantage of this algorithm is the distribution of power dissipation achieved by randomly choosing the group starts. A random distribution of node loss that nuisance of this algorithm is its relatively high intricacy, those want many synchronization messages compared at regular intervals throughout the lifetime of the organization. These cluster starts should not be chosen at every iteration since the cost of synchronization would be very large in comparison to the number of messages that would be actually conveyed. In the reproduction, that used rounds of 20 iterations between choosing new cluster starts. The tall cost of this schema is not justifiable for the

performance gains over much simpler schemes such as direct communiqué. as one, the scheme does not live very long and has similar characteristics to direct communiqué. see that the only difference in its perceived performance from direct communication is that it randomly kills nodes throughout the network rather than having all the nodes die on one severe of the node.

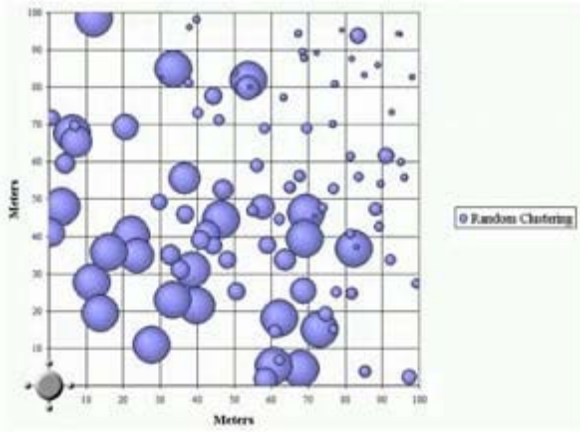

Fig 6: Clustering Node Lifetime

Ideal Clustering Based Algorithm

They implemented this algorithm for comparison purposes to better evaluate the diffusion approach, especially that the random clustering algorithm had a wide range of performance study since everything depended on the random cluster vote. The charge of implementing this classical clustering algorithm in a real world distributed system such as wireless sensor networks is energy prohibitively elevated; though, it does offer us insight into the upper bounds on the performance of clustering based algorithms.

Sensor Network Simulator:

So for testing these various routing protocols, they designed a Sensor Network Simulator.

Communication model:

In our experiment they consider applications where they cannot know the location of the target in advance (e.g. monitoring a vehicle in a forest). A target is generated in region A.

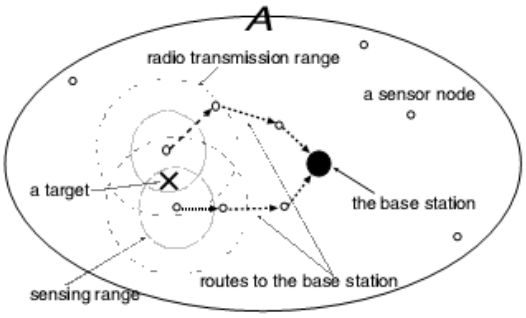

Fig. 7: Communication model

A sensor node can explore a target only if it is in sensing range of the node. A sensor node can convey data to or receive data from other sensor nodes within the radio show range. Normally, the sensing range is much smaller than the radio transmission range. When a target is generated, all the sensor nodes those have it within their sensing D. A sensor node consumes its battery energy to convey and to receive bits when a sensor node exhausts its battery, all the functions of the sensor node stop.

Parameters:

In this simulator, those preserve regulate certain parameters. The parameters are the following:

*Buffer Limits***:** It is a realistic idea to set an upper limit to the number of packets each sensor can receive and convey in part instance. In that experiments they have regulated the maximum number of packets conveyted and received per simulation part point, as 200 and 400 respectively.

Max transfer sim cycle = 200

Max received per sim cycle = 200

*Activity Radius***:** The sensors are able to sense a target within a given range of reserve. also, pro convey a given packet converter range can be varied but energy consumed in it is directly proportional to the square of distance convey. They have regulated the sensing radius as:

Sense Radius = 60 units

Energy Consumption Rates: Energy is spent in sensing and broadcasting (they have assumed that the information regarding the packets are broadcasted within the transradius) the box. They have assumed the following:

Sense Consumption = 1.9 μJ

Energy spent in transmission depends upon the signal conveyed distance.

Energy consumption = K d2

Where K = constant,

D = distance conveyed.

Placement & Localization of sensor nodes:

at this time, permit us original converse some placements and localization techniques measured in our testing:

Constant placement:

In this placement, sensor nodes are placed so that their compactness is invariable. They call this constant placement.

$$F(X) = \frac{1}{|A|}$$

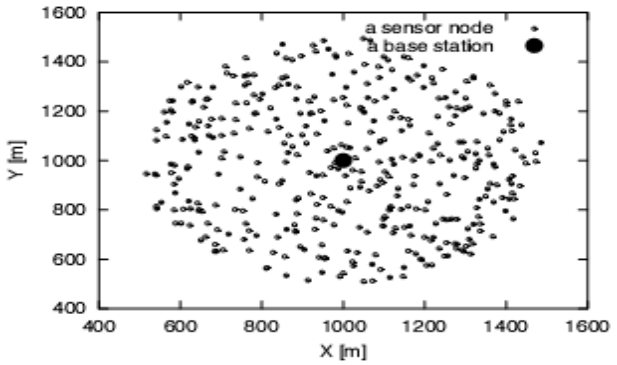

Fig. 7: Constant placement

R-random placement:

In this method called the R-random residency, antenna nodes are uniformly scattered in terms of the radius and angular direction from the hub, whose coincides with the base station.

$$F(r,\theta) = \frac{1}{2\pi R},$$

$$0 \le r \le R, 0 \le \theta \le 2\pi$$

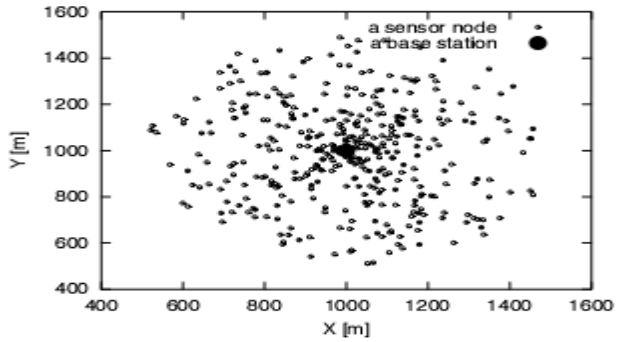

Fig. 7: R-random placement

Alfa Placement Algorithm:

Sensor nodes are uniformly scattered in terms of the radius and angular direction from the core, whose coincides with the base station. Density function of the sensor is given by

$$\rho(r,\alpha) = \frac{K^*(2-\alpha)^*(r^{-\alpha})}{2\pi R^{2-\alpha}},$$

$$0 \le r \le R, 0 \le \alpha \le 2$$

III. LITERATURE REVIEW

In the year of 2014 Behzad, M.; Javaid, N.; Sana, A.; Khan, M.A.; Saeed, N.; Khan, Z.A.; Qasim, U.,[1] Investigated on In Wireless Sensor Networks, efficient energy management is of great importance. In this research, they propose a novel routing protocol, Threshold Sensitive Density Controlled Divide and Rule (TSDDR) to prolong network lifetime and stability period. To achieve these targets, they utilize static clustering with threshold aware transmissions. Simulations are done in MATLAB and the studies show that our protocol has 60% longer stability period than LEACH [1] and 36% longer stability period than DDR [2]. They also implemented the Uniform Random Model (URM) to find Packet Drop to make our scheme more practical.

In the year of 2013 Ahmad, A.; Latif, K.; Javaid, N.; Khan, A.; Qasim, U.,[2] The study of Cluster based routing technique is most popular routing technique in Wireless Sensor Networks (WSNs). Due to varying need of WSN applications efficient energy utilization in routing protocols is still a potential area of research. In this research work they introduced a new energy efficient cluster based routing technique. In this technique they tried to overcome the problem of coverage hole and energy hole. In our technique they controlled these problems by introducing density controlled uniform distribution of nodes and fixing optimum number of Cluster Heads (CHs) in each round. Finally they verified our technique by experimental studies of MATLAB simulations.

In the year of 2013 Chanak, P.; Samanta, T.; Banerjee, I.,[3] Investigated on an optimal load distribution scheme in cluster head and cluster members nodes for wireless sensor networks (WSN). Proposed load distribution model is based on associative clustering model, guided by residual energy and load of the sensor nodes in a cluster. Energy hole can be avoided in this scheme by uniform load distribution in the clusters. An efficient data routing is also performed through the clusters to the base station using multi-hop technique. Simulation studies show that our proposed scheme outperforms the existing algorithms in terms of the network lifespan, and optimal load distribution. Time efficient routing is also established within a cluster.

In the year of 2013 Vey, Q.; Berthou, P.; Gayraud, T.,[4] The study of Energy consumption is a critical point for sensor networks, which are located in remote places without access to the power grid and must harvest their own energy. The same networks may also have to use Delay Tolerant Networking technologies if they can't have a permanent connectivity. The PEAR routing algorithm was proposed to address the latter problem. In this research, they propose an optimization of the signaling information diffusion for this particular algorithm, in order to reduce its energy consumption. This new algorithm matches some specific characteristics that can be found in agricultural monitoring networks. Its performances have been simulated, and it multiplies network's packet efficiency by 2.77 while maintaining the same successful transmission rate as the original PEAR algorithm or Epidemic algorithm. It increases the usefulness of this algorithm in low power networks and low loaded networks.

In the year of 2011 SungHwi Kim; Seungmin Oh; Hosung Park; Jeongcheol Lee; SangHa Kim,[5]: Investigated on Wireless sensor networks consist of a large number of sensor nodes, recharging them is often infeasible. The failure of sensor nodes caused by energy exhaustion or physical destruction may lead to the reduction of sensor areas. In wireless sensor networks, holes can be formed due to void areas in sensor nodes deployment, destruction of sensor nodes, or uneven energy consumption. In such a network, geographic routing is very strong energy-efficient routing scheme without consideration of global network topology. But the whole problem becomes another difficult issue faced by geographic routing. Moreover, the holes make more serious obstacles in multipath routing, that is, multiple paths are eager to bypass the holes simultaneously. Simulation studies present our protocol is superior to the previous works in terms of energy consumption, average delivery delay and show reliable disjoint multipath construction under the hole flexibly.

IV. PROBLEM DESCRIPTION

The first challenge concerns Wireless sensor networks have their own unique characteristics which create new challenges for the design of routing protocols for these networks. Sensors are very limited in transmission power, computational capacities, storage capacity and most of all, in energy. Thus, the operating and networking protocol must be kept much simpler as compared to other ad hoc networks. due to the large number of application scenarios for WSN, it is unlikely that there will be a one-thing-fits-all solution for these potentially very different possibilities. The design of a sensor network routing protocol changes with application requirements. For example, the challenging problem of low-latency precision tactical surveillance is different from that required for a periodic weather-monitoring task. Data traffic in WSN has significant redundancy since data is probably collected by many sensors based on a common phenomenon.

V. CONCLUSIONS & FUTURE SCOPE

We have analyzed that Diffusion Based Algorithm (Cluster Routing) and DDR routing are energy efficient algorithm which works fine for any placement strategies. DDR routing is a little advancement of routing in order to resolve maintenance problem for the network. But advantage gain by DDR in maintenance end up with wasting lots of energy in synchronizing the network which is redundant in remote area where energy constraint is the biggest problem. So we can deal with network life with its maintenance depending upon the situations we have or the network we desire. Sometimes it is not possible to achieve everything; we have to lose some in order to gain some. To conclude the following are some suggestions for the future work which can be done. In this, bio-inspired clustering algorithm Bacteria Foraging has been used. Other bio-inspired algorithms like Ant colony optimization, artificial Immune system, Genetic algorithm

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