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Analysis and Design of EAMMH Protocol in WSN

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Abstract— Environmental and bioprocess monitoring are some of the areas where the development of sensors has benefited most, particularly biosensors and networks of sensors. The replacement of sensor nodes with very fewer power sources is difficult and sensor life depends on the electricity supply. The energy-efficient routing protocol is important to reduce energy consumption. Therefore, it is essential to design the energy-efficient routing protocol. For WSNs a lot of routing protocol is planned. WSN routing is a very challenging job because of the inherent characteristics of the WSNs. Some common problems occurred are Coverage which indicates how well a sensor in a wireless network is monitored or tracked. Location evaluation problem is the main challenge is assessing the actual wireless network node position. Energy consumption addresses the problem that the energy consumed in the WSN is used to transmit and receive data compared with data collection and treatment. The project aims at implementing and understanding energy-efficient network algorithms for node grouping by wireless sensors. One of the major design problems for a sensor network is energy conservation in each sensor node. Wireless sensor networks are essential for increasing network life. In this respect, numerous routing algorithms were developed. Of such classification algorithms, the efficiency of the nodes thereof has become important when it comes to the network life. Clustering is an efficient way to extend the existence of a network of wireless sensors. In this paper, she contrasts two popular routing protocols, namely LEACH and EAMMH, for several general scenarios and a brief study of the effects of simulation against known energy and net life metrics. This paper presents the conclusions and findings from the outcomes of analyses of these protocols. Clustering-based routing protocol is a well-known way to increase life in WSN. In order to decrease the amount of data transmission, the clustering concept of a routing is based on the information aggregation mechanism to minimize the power dissipation of communication and in effect to achieve energy savings for sensor nodes.

Index term: Wireless Sensor Network, LEACH, Energy, Clusters, Routing Protocols, Sensor Nodes, EAMMH

I. INTRODUCTION

One of the best innovations in WSNs is routing. In comparison, routing in WSNs is more exciting because of their inherent features in standard ad hoc networks. First of all, the availability, processing capacity and bandwidth of transmission resources are very small. Second, a global approach to Internet Protocol (IP) is difficult to design. In addition, IP can not be extended to WSNs, as the updating of addresses can lead to heavy overhead in wide or complex WSNs. Thirdly, it is difficult to manage evolving and frequent change in topology, especially in a mobile environment, due to the inadequacy

of resources. Fourthly, the processing of data by several sensor nodes produces a high likelihood of data consistency calculated by the protocols for the routing. Most applications of WSNs do not allow a single multi-source communication device to be multi-cast or pair-to-peer applications. Lastly , data transfers should be carried out within a certain period of time for applications of WSNs with time constraints. Therefore, in these types of applications, minimal latency for data transfers should be considered. In many applications, however, energy security is more critical than service quality (QoS) since energy, which is directly linked to the network life, is limited by all sensor nodes.[11][13][14]

Routing protocols on WSNs may be split in two groups depending on the network structure: flat routing and hierarchical routing. Each node performs the same tasks and functionalities in the network in a flat topology. Data is typically transmitted hop by hop using the flood method. In small scale networks, flat routing protocols are fairly efficacious and are typical of a WSN's flat routing mechanism including flow and bogusing, sensor protocols for negotiation information (SPIN), direct diffusion (DD), greedy perimeter stateless routing (GPSR), trajectory-based forwarding (TBF), energy-aware routing (EAR), gradient-based routing (GBR), sequential assignment routing (SAR), etc. However, in large-scale networks it is relatively unnecessary since resources are limited, but all sensor nodes provide more data processing and bandwidth. On the other hand nodes perform various tasks in WSNs, in a hierarchical topology, and are usually clustered according to different requirements or measurements into numerous clusters. In general, each cluster includes the cluster head (CH) and other nodes (MN) or ordinary nodes (ONs) and CH may be arranged to form additional levels of hierarchy. In general , high energy nodes function as CHs and perform the task of processing and transmission of data, while low-energy nodes act as MNs and perform the task of sensing information. In WSN, traditional clustering protocols include Low Energetic Adaptive Clustering (LEACH), Hybrid Energy Efficiency Distributed (HEED), Weight-Based Distributed Energy Efficient hierarchy (DWEHC), Position-Based Aggregator Node Election (PANEL) Protocol, LEACH (TL-LEACH) two-level hierarchy, Unven Clustering size (UCS), Energy Efficiency (EEE) Model. .[21][13][18]

Energy Efficient Network Sensor (TEEN) protocol, Adaptive Threshold Sensor Sense Efficient Energy Sensor Network (APTEEN), two stage data distribution (TTDD), Focus Clustering Scheme (CCS), HGMR, etc. Due to many advantages, including greater scalability, data aggregation / fusion, less load, less energy consumption, more robustness, etc. Clustering routing is becoming an important field for routing technology in WSNs

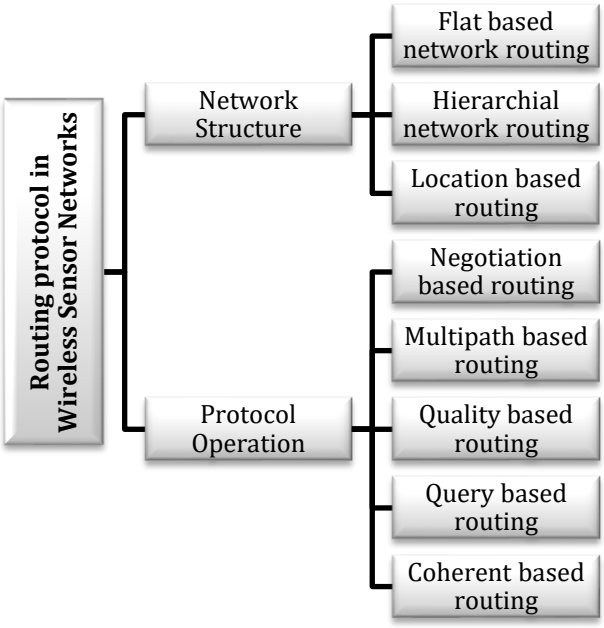

Figure 1.1 Routing protocols in in Wireless Sensor Networks

WSN routing protocols may differ depending on the application and design of the network. Routing in WSNs can in general be divided into flat, hierarchical, and location-based routing, depending on the layout of the network. All nodes usually have equivalent roles or features allocated for flat-based routing. However, nodes play specific roles in the network in hierarchical-based routing. The position of sensor nodes in location-based routing is utilized for network routing data. If such device parameters can be managed to adjust to current network conditions and energy levels, a routing protocol is called adaptive. In addition, these protocols can be categorized according to the operation of a protocol into multi-way, query-based, negotiated, QoS-based or coherent routing techniques. Furthermore, it is possible to categorize the routing protocols into three categories: proactive, reactive and hybrid according to what the path to the destination is contained in the original source. All routes are calculated in proactive protocols before they are actually required, while the routes are calculated on demand in reactive protocols. A mixture of these two concepts is used for hybrid protocols. If sensor nodes are static, routing protocols powered by a table would be preferred instead of using reactive protocols.

II. ENERGY AWARE MULTI-HOP MULTI-PATH HIERARCHICAL (EAMMH)

EAMMH is an intra-cluster network multihop protocol which arranged the sensor nodes into clusters. It establishes multiple tracks to the cluster head from every sensor node and offers an energy conscious heuristic feature to select the best path. EAMMH is a Hierarchical Routing Protocol to route wireless sensor networks energy efficiently. Energy-conscious routing protocols are mostly heuristic protocols which rely mainly on the energy of the next hop. Since sensor nodes have very little resources, and energy-conscious strategies avoid selecting sensors with very low energy in data transmission in order to extend network life. Thus, in balanced and effective routing protocols it is a good heuristic. In addition , the purpose of these protocols is to balance the communication load using the rest of the sensor nodes to balance energy consumption and to provide data reliability over multiple pathways. In this group, the protocols create routes by messages that are transmitted to the entire network. The main

goal of message broadcasting is to collect and create the neighbouring table. Each node contains an adjoining table that stores important information about the adjacent nodes such as residual energy, hop distance and signal power.By using all the attributes that are in the list, the next table allows the node to determine on the next move. This scheme leads to a multiple road network built from the nodes to meet the requirements. Energy-sensitive protocols use reactive routing, which means that the route is only defined when necessary. This eliminates a great deal of overhead contact. Below are Energy Conscious Multihop Hierarchical Multi-Path (EAMMH) Routing Protocols. The EAMMH protocol for routing has been extended by inducing energy conscious routing faces and intra-cluster multi-hop routs..

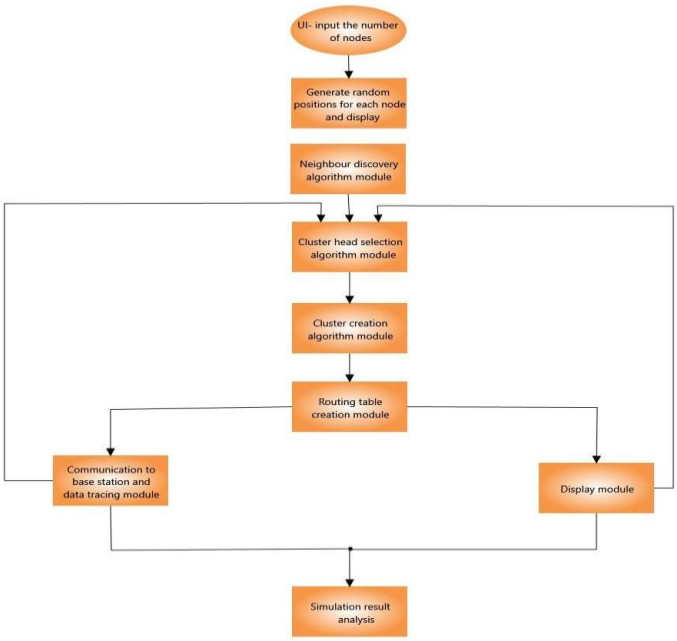

Figure 1.2: Flow Chart of EAMMH

For wireless sensor networks, we use the first order radio model shown in Figure 1.3. Any of these networks can be found here. When communicating with each other or with the BS, all sensors are within the radio contact range. Sensors will have the same sensing and processing capabilities as well as communication. In the heart of the sensor networks, BS is located and has an infinite supply of energy. Sensing data was ignored for the energy dissipation and for the energy dissipation for the clusters. In addition, we presume that all algorithms run on the BS cluster. The dissipation of energy from one bit data is a constant value. And the radio uses a k-bit message to relay a distance d: .[19][12]

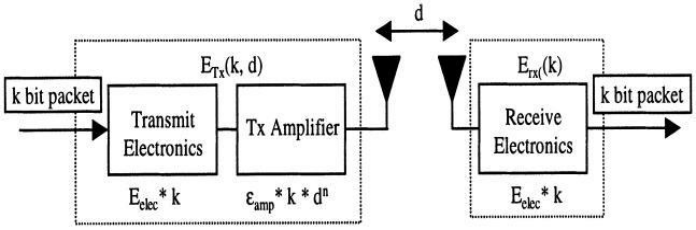

Figure 1.3 First Order Radio Model for Wireless Sensor Networks

$E_{Tx}(k,d) = k*E_{elec}+k*E_{fs}*d^2 < 0$
(1.1)

$k*E_{elec}+k*E_{amp}*d^4 \geq 0$
(1.2)

The first term reflects radio dissipation's energy consumption and the second term describes an enhancement radio energy usage. Depending on the transfer size, the use of free space Efs and the multi-way Emp canal models fading. The radio expends when it receives this data:

$E_{Rx} (k) = k*Eelec.$ (1.3)

Additionally, data aggregation operation will consume the energy E_{DA}. In this way the protocol has been simulated using MATLAB.

III. IMPLEMENTATION

The discovery occurs in the configuration phase after the node deployment. This can be achieved by many methods such as k-of-n, ping, beacon messaging. After the next discovery, every node decides whether or not to be a cluster head for the current cycle when the cluster is formed. This is analogous to the LEACH form of judgement. The two key tasks operate in the setup process, cluster creation and selection (CH cluster head).

Data Transmission Phase -The sensor nodes are allocated timeslots for data transmission during the data transmission process. If nodes still send data, they send it at their specified time interval. If a node receives data from a neighbour, it applies its own data. When the aggregated data is forwarded, they must choose an appropriate route from their routing table entries. This decision is based on a heuristic function and heuristic function,

$h= K (Eavg / hmin * t)$
(1.4)

Where K is a constant, Eavg is average current path energy, hmin is a minimum current path hop number, t = current path traffic. The highest heuristic value route is picked. If the Emin > threshold is this direction, it will be picked. Otherwise, you select the route with the highest heuristic value

Emin = Eavg /const (1.5)

The constant may have an integer value such as 10 if const is constant. If Emin has no node above threshold energy in the routing table, it selects the node with the highest minimum energy. The last procedure in the EAMMH Protocol is a periodic update, which after a short time will stop providing information on pathways and routing table entries for each node. Based on the incorrect details, heuristic values frequently lead to wrong decisions. Therefore, fresh information should be regularly given for the nodes. This will make the heuristic method more reliable and timely. The required information is shared at regular intervals during the process of each round. The interval of daily updates is wisely chosen so that the node does not base its decisions on the inaccuracy of information but does also not overwhelm the network activity in the periodic updating. .[21][23][11]

IV. SIMULATION & RESULTS

MATLAB simulates both LEACH and EAMMH. In determining EAMMH and LEACH, the parameters considered are as follows:

• Round number v / s Dead Nodes number (with probability variations)

• Average Node Energy v / s round number (with probability variations)

• Round number v / s Dead Nodes number (with node number variations)

• Round number v / s Average Node Energy (with node number variation). The results below display the simulation of both the LEACH and the EAMMH protocols at 0,01 chance, which is 1 % of the total nodes that can be cluster led.

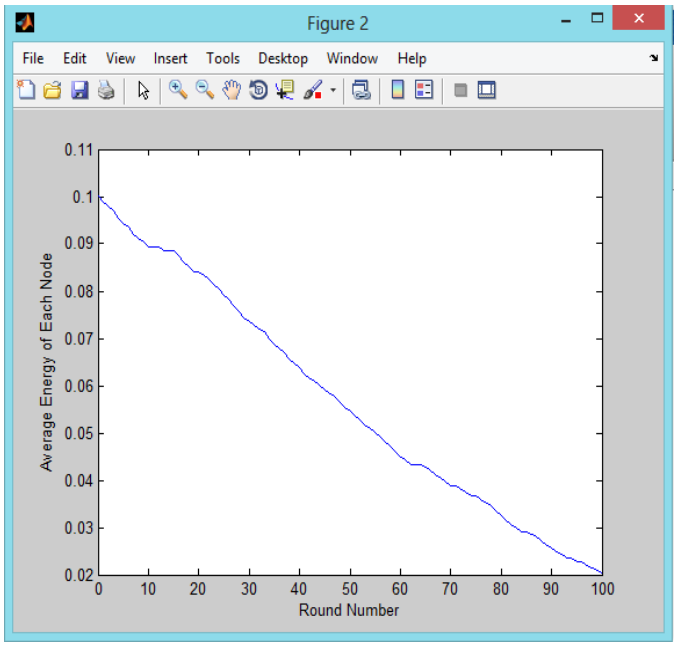

Figure 1.4 Average Energy v/s Round No. (EAMMH)

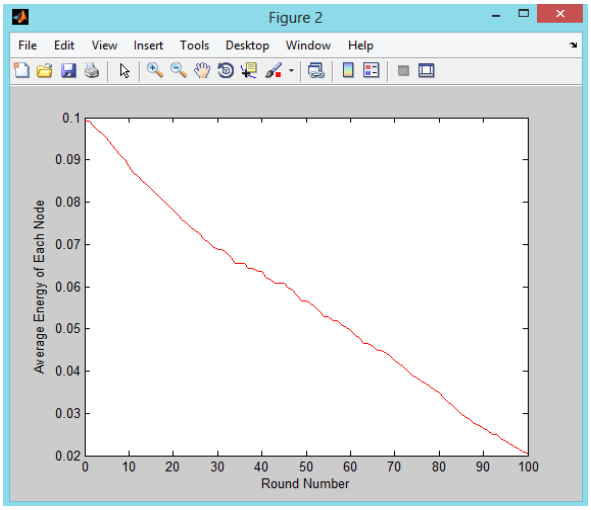

Figure 1.5 Average Energy v/s Round No. (LEACH)

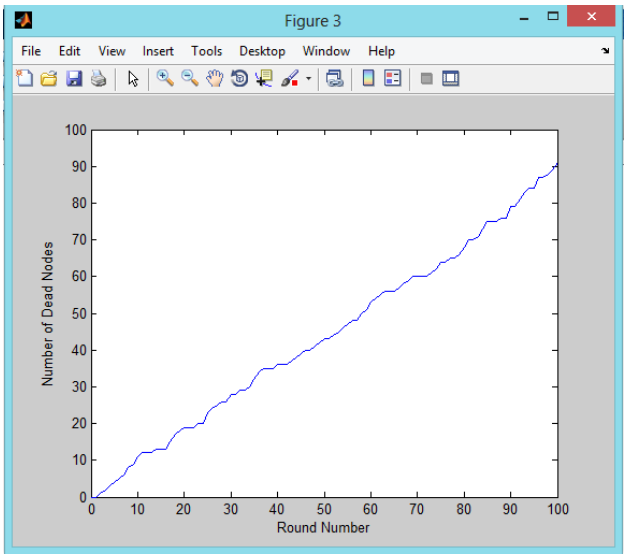

Figure 1.6 No. of Dead Nodes v/s Round No. (EAMMH)

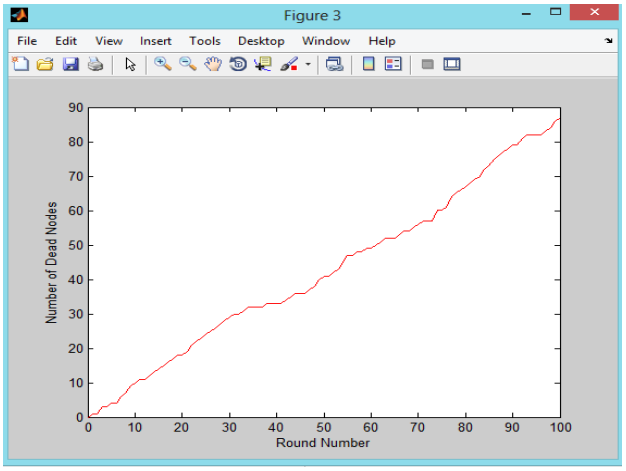

Figure 1.7 No. of Dead Nodes v/s Round No. (LEACH)

Figures show that with the time LEACH and EAMMH improvement both lose energy as the round increase. Often, when a node reaches the zero value, it is not available anymore and is called a dead node. Figures show that with the increasing number of nodes, the EAMMH curve is slightly better for each node's average power. The number of dead nodes is also lower when compared to LEACH, the total number of nodes increases. Therefore EAMMH is better when compared to LEACH for a likelihood of 0.01 as the number of nodes increases. It is evident that the number of EAMMH nodes increase with respect to the average energy of each node and the total number of dead nodes at each probability level. However, LEACH has improved its performance for a lower number of total nodes. Figures show that although EAMMH is stronger, most of the operations have the first dead node by EAMMH. LEACH has a delayed period to get the first dead node, however, a larger number of knots will be helpless in a short time. In the Statistics, it may be found that for a fixed number of nodes the average energy of each node distance between the curves decreases if the likelihood of selecting the Cluster head is increased. We note that LEACH is better than EAMMH at 0.01 probability, while at 0.5 probability EAMMH beats LEACh by a factor of 25% and 0.2 by a factor of around 45%. This is because the nodes or clusters that are more far from the base station are forced to dissipate large

amounts of energy to send data, because they must move longer distances from those that are nearer. This is because Eammh is an intercluster routing device, which makes the network survive longer, than LEACH in most cases. Eammh is the only thing it does. LEACH, however, communicates directly with the cluster head and then with the base station. While the company uses multi-hop systems, EAMMH can achieve much better energy efficiency than LEACH with the use of multi-way and hierarchical routing parameters and techniques with the use of a multi-hop system.network.

V. CONCLUSION

In many cases, wireless sensor networks are usually dispersed across broad areas. There is a requirement in this respect for methods that can better manage the WSN. The limited battery capacity is used for wireless sensor networks. The key challenge in designing Wireless Sensor Network protocols is energy efficiency as the sensor nodes are restricted in capacity. The last motivation behind every routing protocol is to make the network work for a longer period of time as energy-efficient as possible. In this research, we introduced clustering as a means of overcoming this energy efficiency problem. Detailed description on the process of LEACH and EAMMH two protocols is available. The information on the simulation and the findings have also been discussed. From the short analysis of the simulation, we concluded that LEACH can be used in smaller grids with less than 50 nodes in total, when it is somewhat better than EAMMH and EAMMH, in larger grids and when the heuristic probability of selecting Cluster Head is higher.

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