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WIRELESS SENSOR NETWORK PROVIDE A NODE LIFE TIME IN SELECTION OF CLUSTER HEAD

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***Abstract* - Network lifetime, WSNs energy consumption is one of the big issues which need to be consumed by sensors node. Node is an especially making good use of time tool used for sensing and collecting data using large number of wireless sensor network, among various platforms. Routing is the process of choosing the best paths in a network. Earlier, the term routing was used for forwarding the network can better described as a simple forwarding. Routing is the process of selecting best paths in a network. A wireless sensor network can be used to gathering data in various situations, with a large number of sensor nodes. One of the major issues in WSN (Wireless Sensor Network) is to develop an energy efficient routing protocol which has significant impact on the overall lifetime of the sensor network. This work focuses on reducing the power consumption of wireless sensor networks. Thus routing helps to obtain the best path in a network to send the traffic on that path.**

Keywords—Wireless Sensor Network; routing; network life time,)

I. INTRODUCTION

Wireless communication technology is trending nowadays, due to which several mobile applications have been used. Mobile networks are used because of their flexibility in nature and cost. In comparison with wired network, mobile networks have unique characteristics as node can move freely anywhere that cause frequently changes in the topology of the network. Wired networks bounds; whereas wireless link capacity varies through the impact of noise, fading and interference. On the other hand, wireless mobile networks also have some demerits like high error rate, power restrictions as well as bandwidth limitations. Uses of WSN are increasing day by day without any kind of limitations. Different type of applications have different type of network bearing constraints and features but still most of the issues are common or same which makes them comparable

Routing is basically used to forward the traffic among networks to attain less traffic on the network as the speed and performance of the network will be increased. Thus routing helps to obtain the best path in a network to send the traffic on helps to obtain the best path in a network to send the traffic on path. Routing is performed on telephone network, electronic data networks and transportation networks.

Routing has become the foremost form of addressing on Internet. Bridging is widely used inside localized environments. Selection of path involves smearing a routing metric to the multiple routes, in order to find and select the best route.

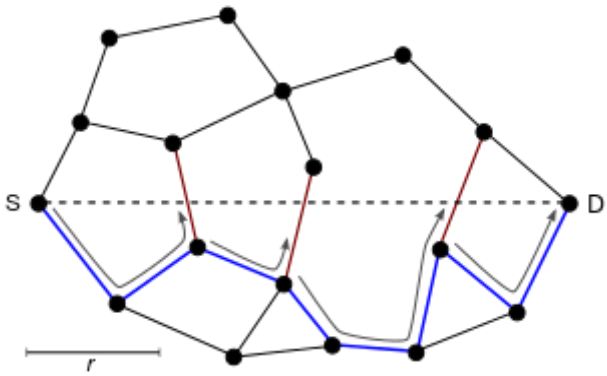

Fig 1. Routing in Wireless Sensor Network

To find the path from source to destination and to attain the best path in between them, there are several algorithms have been proposed. In this we are using distance vector algorithms that use bellman-ford algorithm. In this algorithm cost number is assigned to each of the links between each node in the network. Each nodes will be calculated when node sends packet from source to destination through the path. This distance will be calculated and node having lowest total cost selected as a path for the packet.

The above explanation can be done through the algorithm. Initially, a node does not know about the other nodes

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information, it knows only about the intermediate neighbor or node and direct cost involved in reaching them. In the routing table or distance table of each node it contains information about the list of destinations, total cost to each, and address of next hop to get there. At the time of communication, each node sends its own information with the total cost to get to all the destinations it knows of. When other nodes receive this information, it will compare the received information with their own information i.e. stored in their routing table. With this comparison it will replace the relevant information with their stored information for the improvement purpose.

This process will lead each node with the best next hop with its best total cost for all destinations. The basic advantage behind using this algorithm is that in case of damage of any node, other nodes who having damaged node as their next hop will discard its entry from its routing table and will also create new routing table information. Also it will inform other nodes about updated routing information to all adjacent nodes. The whole process will go like same until or unless all the nodes in a network receive updates and able to discover new paths that are still reachable.

II. NEED OF ROUTING PROTOCOLS

As we know that wireless sensor network consist of various components. The nodes that are present in the network are used for sensing the data and then will send that data to the base station. While sending the data to the base station some amount of power is required. So the energy conservation plays an important parameter that is taken in consideration when the data is send to the base station. For this purpose various protocols are designed so the at the network became energy efficient. The network is efficient when it consume less amount of energy for sending the data. The protocols are designed for both homogeneous and heterogeneous networks. By proposing these protocols the network stability is increased and in addition to this the network life time is also increased

III. STRUCTURING AND DELEGATING THE ROUTING TASK

Some of the classifications are based on the routing scheme of the network. Thus, structure and delegating of nodes are different in different techniques mentioned as:

- Uniform Routing protocol
- Non-uniform routing protocol
- Zone based routing protocol
- Cluster based routing protocol

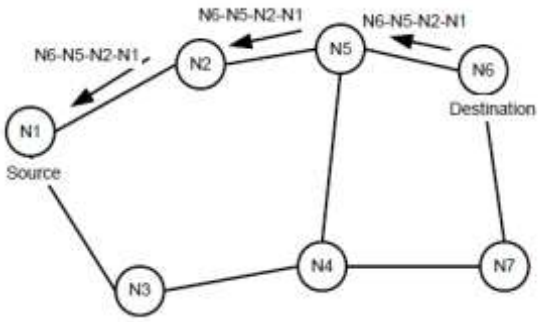

Fig. 1.1.Route Reply with Route Record in DS

In a uniform routing protocol, uniform means same thus all mobile nodes in a network performs same role, has the same importance and functionality. Some of the examples of uniform routing protocols are wireless Routing protocol, dynamic source routing, AODV abbreviated as Ad hoc On-demand Distance vector routing and DSDV named as Destination Sequence Distance Vector routing protocol. In a uniform network there is not any type of variations thus it normally assume as a flat network structure.

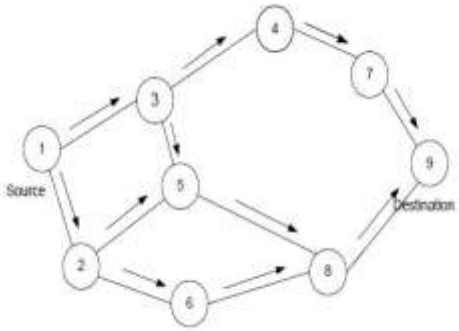

Fig. 1.2.The Route Request Packets Flooding in ADOV

Second routing protocol is non-uniform routing protocol; it defines the network non-uniformly which means that management of the network is distinct i.e. different from one another. Thus to manage and organize the structure of nodes, hierarchical structure have defined. Non-uniform routing protocols are further divided into different categories depends upon the organization of mobile nodes. These protocols can be defined according to the performance of the routing functions or how they will perform. Some of the examples of routing protocols division are:

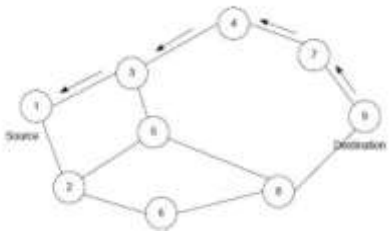

Fig. 1.3.The forwarding of Route Reply packet in AODV

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1. Zone based routing protocol
2. Cluster based hierarchical routing protocol
3. Core node based routing protocol

Zone based routing protocol use geographical information to construct the zone based algorithms. These types of algorithms do not use node organization thus it does not rely on constructing method. As a result this protocol may overlap constructing method. Therefore, there is no need for maintaining the routing information that will reduce the maintenance cost. As in the zone constructing method, mobile nodes know how to reach each other in a same zone with smaller cost rather than maintaining routing information about each node in the whole network.

Different protocols that are based on the zone based routing protocols named as Zone Routing Protocol i.e. ZRP and Zone Based Hierarchical link state routing (ZHLS) used for mobile ad hoc networks.

In Cluster based Hierarchical routing protocol clustering algorithm is used to select the cluster head from the set of clusters or mobile nodes. In routing protocol, clusters are the mobile nodes from which a cluster head is chosen for the management and for routing functions as well. Some of the cluster based mobile ad hoc network routing protocols use multi level structure such as HSR referred as Hierarchical State Routing.

IV. PROPOSED WORK

The protocols that enhance the working of a network and that are designed to improve the performance of a system are called energy efficient protocols. The drawbacks of the conventionally used protocols were the random selection of the cluster head and no use of optimization technique to improve the lifetime and throughput of the system. In the proposed technique, certain criterion is fixed for the selection of the cluster head, the selection is not random and the parameters are considered which selects cluster head among nodes. Those parameters on which the selection of CH is to be done are

- Energy of node
- Distance among nodes
- Distance among node and sink

Also the sectioning of the network will be done to maintain the uniformity of cluster formation

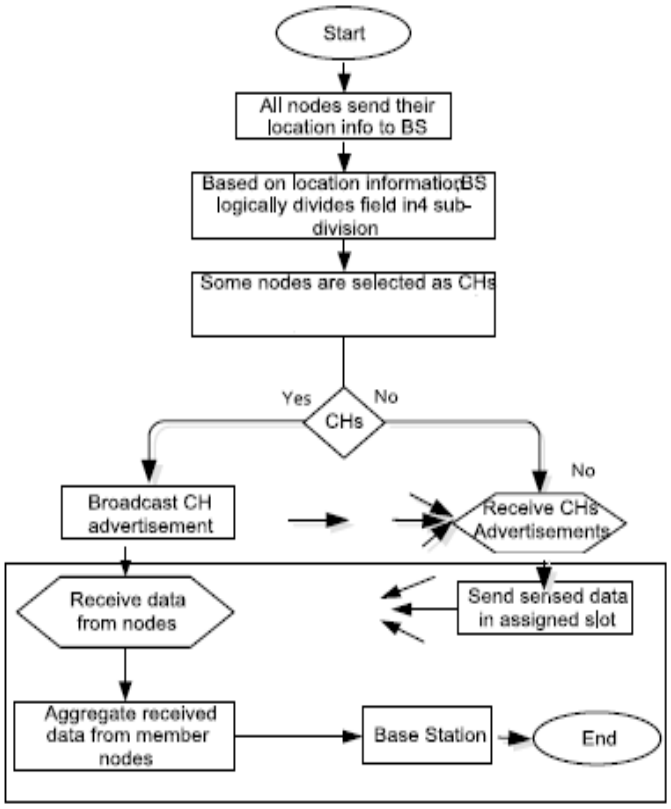

Fig 4.1 Proposed Working

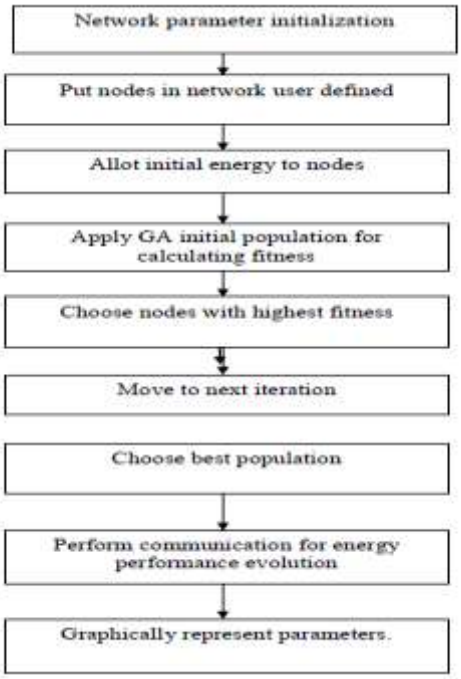

Figure 4.2 Proposed block diagram

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V. RELATED WORK

In this comprehensive survey of literature the work of the other researches has been highlighted. Researchers have been involved in the research related to Wireless sensor network since several years. Here the study work carried in this field of wireless sensor network and related algorithms have been highlighted**:**

K.Ramesh (4 November 2011) "A COMPARATIVE STUDY OF CLUSTERHEAD SELECTION ALGORITHMS IN WIRELESS SENSOR NETWORKS"- Sensor nodes life time is the most critical parameter in Wireless Sensor Network. Many researches on these lifetime extension are motivated by the LEACH scheme, allowing rotation of cluster head role among the sensor nodes tries to distribute the energy consumption over all the nodes in the network. Selection of cluster-head greatly affects the energy efficiency of the network for such rotation. Different communication protocols and algorithms are investigated in order to find ways to reduce power consumption. Paper proposed a brief survey taken from many proposals, which suggests different cluster-head selection strategies and a global view is presented for this. Comparison of their costs of cluster-head selection in different rounds , transmission method and other effects like cluster formation, distribution of cluster-heads and creation of clusters shows a need of a combined strategy for better results.

Jong-Shin Chen (8 August2010) "Efficient Cluster Head Selection Methods for Wireless Sensor Networks"- In many field like disaster management, border protection and security surveillance Wireless Sensor Network (WSN) have been used for last few years. In these, applications are likely to be remotely deployed andin unattended environments operate autonomously by sensors. Since a WSN is composed of nodes with non-replenish able energy resource, the main concern is elongating the network lifetime. Nodes are often grouped into disjoint clusters to support scalability. Each cluster would have a leader, often referred as cluster head (CH). The power-consumption of a CH is higher than the general (non-CH) node. Therefore, the lifetime of WSN will affect the CH selection. In this work, we proposed to classify the lifetime into different types and give it the corresponding Cluster head selection method to achieve the life-time extension objective. Simulation results shows that our study can enlarge the life-time for different requests of the sensor networks.

M. J. Handy (September 2002) "Low Energy Adaptive Clustering Hierarchy with Deterministic Cluster-Head Selection"- This paper focused on reducing the power consumption of the wireless micro-sensor networks. In that context, a communication protocol named LEACH (Low-Energy Adaptive Clustering Hierarchy) is modified. In this work, we extend LEACH's stochastic cluster-head selection algorithm by the deterministic component. Depending on the network configuration, network lifetime can increased by about 30 %. Furthermore, a new approach is proposed to define the lifetime of micro-sensor networks using three new metrics i.e. First Node Dies (FND), Half of the Nodes Alive (HNA), and Last Node Dies (LND).

Thein (29 January 2010) "An Energy Efficient Cluster-Head Selection for Wireless Sensor Networks"-Recent development in wireless sensor networks have led to many new protocols specifically designed for sensor networks where energy awareness was an essential consideration. Clustering is the key routing technique that is used to reduce the energy consumption. Clustering sensors are into the groups, so that sensors communicate the information only to the cluster-heads and then the cluster-heads communicate to the aggregated information to the base station, results into saving the energy and thus prolonging network lifetime. In this paper, for adapting clusters and rotating cluster head positions to evenly distribute the energy load among all the nodes we propose an energy efficient cluster-head selection algorithm. By modifying the probability of each node, the proposed model is extended to the LEACH's stochastic cluster-head selection algorithm to become cluster-head based on remaining energy level of sensor nodes. Simulation results show that our proposed model could better implement the load balance and also prolong the lifetime of the network.

Ying Liang (8 December 2005) "Energy Adaptive Cluster-Head Selection for Wireless Sensor Networks"- A wireless network can be an effective tool for gathering data in a variety of environments that consist a large number of small sensors with limited battery power. Clustering sensors are into the groups, so that sensors lead thedata or the information only to cluster-heads and then the cluster-heads communicate the aggregated information to the base station, results into saving the energy and thus prolonging network lifetime. In this work, an optimal energyadaptive clustering algorithm which is motivated from the LEACH protocol is proposed. To ensure the balanced energy depletion over the whole network, we optimize LEACH's random cluster-head selection algorithm resulting in prolonging the network lifetime. Simulation results reveals that our algorithm outperforms LEACH by about 20% to 35% when 1%, 50%, 100% of nodes die for different network sizes and topologies.

Puneet Azad (2013) "Cluster Head Selection in Wireless Sensor Networks under Fuzzy Environment"-For prolonging the network lifetime in wireless sensor networks (WSNs), clustering is one of the important methods. It involves grouping of sensor nodes into clusters and electing CHs (cluster heads) for all the clusters. CHs collect the data from respective cluster's nodes and forward that aggregated data to base station. Select appropriate cluster heads is a major challenge in WSNs. In this work, a fuzzy decision-making approach for the selection of cluster heads is proposed. To select CHs, Fuzzy multiple attribute decision-making (MADM) approach is used based on three criteria that includes the residual energy, number of neighbors, and the distance from the base station of the nodes. The results show that this approach is more effective for prolonging the network lifetime than the other approaches like distributed hierarchical

agglomerative clustering (DHAC) protocol in homogeneous environments.

Shilpa Mahajan (November 2014) "An energy balanced QoS based cluster head selection strategy for WSN"- Sensors energy conservation becomes a prime paradigm for prolonging lifetime of the network. A cluster head weight selection method has been discussed named as the Cluster Chain Weight Metrics approach (CCWM) that takes service parameters for enhancing performance of the overall network. In the clustering based approach one of the main concerns is the formation of balanced clusters and the selection of appropriate cluster heads in the network. The cluster formation takes place after the Cluster heads are selected in a network based on weight metric. This approach not only aims to conserve energy of sensors but also balances load. In order to reduce the communication cost and the computation, a local clustering mechanism is adopted within the cluster. A new technique for data transmission is also explored. The results of the proposed approach are compared through simulation with LEACH, WCA and IWCA. The results shows an improvement on an average over rounds by 51 percent over LEACH, 27 percent from WCA and 18.8 percent from IWCA in terms of lifetime and energy consumption.

S. Taruna (4 august 2012) "DISTANCE BASED ENERGY EFFICIENT SELECTION OF NODES TO CLUSTER HEAD IN HOMOGENEOUS WIRELESS SENSOR NETWORKS"- Wireless sensor networks (WSN) provide the availability of small and low-cost sensor nodes along with the capability of detecting, observing and monitoring the environment, along with data communication and data processing. These sensor nodes possess the limited transmission range, processing and storage capabilities as well as their limited energy resources. For wireless sensor networks routing protocols are responsible for maintaining the energy efficient paths in the network and ensures the extended network lifetime. In this work, a new approach is proposed and analyzed of cluster head selection by a homogeneous sensor node having same initial energy in wireless sensor network, that involves the choosing the cluster head which lies closest to the midpoint of the base station and the sensor node. The proposed routing algorithm is related with the energy factor and the distance factors of each nodes. This scheme is then compared with the traditional LEACH protocol that involves selection of the cluster head which is nearest to the particular node. Results conclude that the proposed protocol effectively extends the network lifetime with less consumption of energy in the network.

VI. CONCLUSION AND FUTURE SCOPE

The process of routing is done to select the best path for transmission of data from source to destination. The technique used for selecting best path or routing is employed for this work only i.e. for selecting the best path from the available paths. In this the detailed study of the routing in the wireless sensor network is presented.

In future the researchers are still working to obtain more efficient protocol for routing. Improvements in the area are carried out every day. The protocols can be improved by increasing the number of parameters that are to be considered while selecting the best path or optimization algorithms can be employed for finding out the optimized path for routing.

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