A Review on different heirarical routing protocols for WSN using Moving Base Station.

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Abstract: WSN is the wireless sensor network have various network related issues used as wireless network for small difficult terrain. Each node in the sensor network is battery operated. The life time of the node is directly is dependent on the direct battery usage. While transmission of the sensed data and while receiving the data large amount of energy will be required. Various protocols based on different type of working techniques are being researched to minimizes the energy usage. Less energy means more life time of the node. The hierarchical based routing protocols are most suitable type for energy saving. Because it sub divide the total network into smaller clusters. Each cluster will be having randomly distributed nodes. Based on residual energy a cluster head will be selected. Each sensor node has to sends the data to the cluster head. From cluster head to second level cluster head then to the base station. The chain or hierarchy of the network depends upon the size of the network area. There are various research papers which has mentioned the network with moving base station. Base station is energy harvested. It can move on fixed type of path. While moving on the path it collects the data from the cluster head. This will in result in less wastage of the energy.

Keywords: WSN, UAV, Cluster Head, Sensor node.

I . INTRODUCTION

A Wireless Sensor Network (WSN) is a distributed network and it comprises a large number of distributed, self-directed, and tiny, low powered devices called sensor nodes alias motes. WSN naturally encompasses a large number of spatially dispersed, petite, battery-operated, embedded devices that are networked to supportively collect, process, and convey data to the users, and it has restricted computing and processing capabilities. Motes are the small computers, which work collectively to form the networks. Motes are energy efficient, multi-functional wireless device. The necessities for motes in industrial applications are widespread. A group of motes collects the information from the environment to accomplish particular application objectives. They make links with each other in different configurations to get the maximum performance. Motes communicate with each other using transceivers. In WSN the number of sensor nodes can be in the order of hundreds or even thousands.

Now a day's wireless network is the most popular services utilized in industrial and commercial applications, because of its technical advancement in processor, communication, and usage of low power embedded computing devices. Sensor nodes are used to monitor environmental conditions like temperature, pressure, humidity, sound, vibration, position etc. In many real time applications the sensor nodes are performing different tasks like neighbor node discovery, smart sensing, data storage and processing, 2 data aggregation, target tracking, control and monitoring, node localization, synchronization and efficient routing between nodes and base station.

Wireless sensor nodes are equipped with sensing unit, a processing unit, communication unit and power unit. Each and every node is capable to perform data gathering, sensing, processing and communicating with other nodes. The sensing unit senses the environment, the processing unit computes the confined permutations of the sensed data, and the communication unit performs exchange of processed information among 3 neighboring sensor nodes.

1.1 Routing Protocols in WSN

CATEGORY	REPRESENTATIVE PROTOCOLS
Location-based Protocols	MECN, SMECN, GAF, GEAR, Span, TBF, BVGF, GeRaF
Data-centric Protocols	SPIN, Directed Diffusion, Rumor Routing, COUGAR, ACQUIRE, EAD, Information-Directed Routing, Gradient-

	Based Routing, Energy-aware Routing, Information-Directed Routing, Quorum-Based Information Dissemination, Home Agent Based Information Dissemination
Hierarchical Protocols	LEACH, PEGASIS, HEED, TEEN, APTEEN
Mobility-based Protocols	SEAD, TTDD, Joint Mobility and Routing, Data MULES, Dynamic Proxy Tree-Base Data Dissemination
Multipath-based Protocols	Sensor-Disjoint Multipath, Braided Multipath, N-to-1 Multipath Discovery
Heterogeneity-based Protocols	IDSQ, CADR, CHR
QoS-based protocols	SAR, SPEED, Energy-aware routing

1.2 Hierarchical Protocols

Many research projects in the last few years have explored hierarchical clustering in WSN from
different perspectives [1]. Clustering is an energy-efficient communication protocol that can be used by the sensors to report their sensed data to the sink. In this section, we describe a sample of layered protocols in which a network is composed of several clumps (or clusters) of sensors. Each clump is managed by a special node, called cluster head, which is responsible for coordinating the data transmission activities of all sensors in its clump.

1.2.1 Low-energy adaptive clustering hierarchy (LEACH): LEACH [3,4] is the first and most popular energy-efficient hierarchical clustering algorithm for WSNs that was proposed for reducing power consumption. In LEACH, the clustering task is rotated among the nodes, based on duration. Direct communication is used by each cluster head (CH) to forward the data to the base station (BS). It uses clusters to prolong the life of the wireless sensor network. LEACH is based on an aggregation (or fusion) technique that combines or aggregates the original data into a smaller size of data that carry only meaningful information to all individual sensors. LEACH divides the a network into several cluster of sensors, which are constructed by using localized coordination and control not only to reduce the amount of data that are transmitted to the sink, but also to make routing and data dissemination more scalable and robust.

1.2.2 Power-Efficient Gathering in Sensor Information Systems (PEGASIS): PEGASIS [5] is an extension of the LEACH protocol, which forms chains from sensor nodes so that each node transmits and receives from a neighbor and only one node is selected from that chain to transmit to the base station (sink). The data is gathered and moves from node to node, aggregated and eventually sent to the base station. The chain construction is performed in a greedy way. Unlike LEACH, PEGASIS avoids cluster formation and uses only one node in a chain to transmit to the BS (sink) instead of using multiple nodes.

1.2.3 Hybrid, Energy-Efficient Distributed Clustering (HEED): HEED [6,7] extends the basic scheme of LEACH by using residual energy and node degree or density as a metric for cluster selection to achieve power balancing. It operates in multi-hop networks, using an adaptive transmission power in the inter-clustering communication. HEED was proposed with four primary goals namely (i) prolonging network lifetime by distributing energy consumption, (ii) terminating the clustering process within a constant number of iterations, (iii) minimizing control overhead, and (iv) producing well-distributed CHs and compact clusters. In HEED, the proposed algorithm periodically selects CHs according to a combination of two clustering parameters. The primary parameter is their residual energy of each sensor node (used in calculating probability of becoming a CH) and the secondary parameter is the intra-cluster communication cost as a function of cluster density or node degree (i.e. number of neighbors).

1.2.3 Threshold Sensitive Energy Efficient Sensor Network Protocol (TEEN): TEEN [8,9] is a hierarchical clustering protocol, which groups sensors into clusters with each led by a CH. The sensors within a cluster report their sensed data to their CH. The CH sends aggregated data to higher level CH until the data reaches the sink. Thus, the sensor network architecture in TEEN is based on a hierarchical grouping where closer nodes form clusters and this process goes on the second level until the BS (sink) is reached.

1.2.4 Adaptive Periodic Threshold Sensitive Energy Efficient Sensor Network Protocol (APTEEN): APTEEN [10] is an improvement to TEEN to overcome its shortcomings and aims at both capturing periodic data collections (LEACH) and reacting to time-critical events (TEEN). Thus, APTEEN is a hybrid clustering-based routing protocol that allows the sensor to send their sensed data periodically and react to any sudden change in the value of the sensed attribute by reporting the corresponding values to their CHs. The architecture of APTEEN is same as in TEEN, which uses the concept hierarchical clustering for energy efficient communication between source sensors and the sink. APTEEN supports three different query types namely (i) historical query, to analyze past data values, (ii) one-time query, to take a snapshot view of the network; and (iii) persistent queries, to monitor an event for a period of time. APTEEN guarantees lower energy dissipation and a larger number of sensors alive [10].

Energy Efficient Homogenous Clustering Algorithm for Wireless Sensor Networks: Singh et al. [2] proposed homogeneous clustering algorithm for wireless sensor network that saves power and prolongs network life. The life span of the network is increased by ensuring a homogeneous distribution of nodes in the clusters. A new cluster head is selected on the basis of the residual energy of existing cluster heads, holdback value, and nearest hop distance of the node. The homogeneous algorithm makes sure that every node is either a cluster head or a member of one of the clusters in the wireless sensor network. In the proposed clustering algorithm the cluster members are uniformly distributed, and thus, the life of the network is more extended. Further, in the proposed protocol, only cluster heads broadcast cluster formation message and not the every node. Hence, it prolongs the life of the sensor networks. The emphasis of this approach is to increase the life span of the network by ensuring a homogeneous distribution of nodes in the clusters so that there is not too much receiving and transmitting overhead on a Cluster Head.

II. COMPARATIVE ANALYSIS

AUTHOR,YEAR	ADVANTAGES	DISADVANTAGES
LEACH,2010	It is cluster based routing protocol. Total network will be sub divided into small clusters. Each cluster will be having randomly distributed nodes	each node transmit continuously to the cluster head and then to the base station
PEGASIS,2010	it is the improvement of the LEACH. It builds the chain of the nodes. Starts from the one sensor node and connects the other node in the neighbor list.	It does not has no data aggregation ability. Immediately sensor node receives the data, it will transmit that data to the base station or the cluster head.
HEED,2000	it is similar to the LEACH. But the cluster head will be selected based on density of the node, residual energy and node degree for balancing of the energy	It again does not checks the criticality of the information. Rather duplicated data will be transmitted from the sensor node to the base station.
TEEN,2002	It is based on hard threshold of the time. For fixed time period the sensor node keep on collecting the data. After the elapse of the time data collectively be sent to cluster head.	it may be possible that the critical data does not arises in fixed time period. That means duplicated data keeps on sending.
APTEEN,2004	It is based on soft threshold. Only when the critical reading is occurred at the sensor node then only transmission of the data will be taken place. Till then it keep on checking the data	it is better routing protocol for transmission of the data. But it also loose the energy in checking the critical information or reading from the physical environement.

III. CONCLUSION

From the study of various research papers specifically based on heirarical routing protocols it is clear that the sub dividing the network into smaller segments is more efficient. Large number of nodes are distributed into each cluster. Based on max. residual energy cluster head will be selected. These cluster heads are lying in different hierarchy. The length of chin of these cluster heads will depends upon the network size. Each sensor node has to sends the sensed data to the nearby cluster head. Various researches are also in the line of moving base station. This moving base station can be a UAV node. Its purpose is to move along the path after the elapse of time. In that time interval cluster heads transfers the aggregated data to the moving base station. It will save energy. In result increase the life time of the sensor nodes.

IV. FUTURE WORK

Energy efficiency is the primary issue as far as WSN protocol selection is concerned. Various hierarchical based routing techniques are being followed for making more energy saving. Moving UAV on random path and collecting the aggregated data from the cluster heads. In future this efficiency can be increased by keeping moving base station on circular path in the center of the cluster.

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