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A Review on Various Approaches and Routing Protocols in WSN

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Abstract-

WSN is the field of networking that utilized for sensing information from non approachable are by ysung sensors. Sensors sense information and transmit this information via wireless channel. Various issues have been emerged in WSN in recent years, These issues are similar to power supply, memory and processing time in these frameworks. In WSN various routing protocols have been utilized for transmission information to base station. In this paper various approaches have been reviewed on the basis of different issues in WSN. Various Channing, clustering and data transmission approaches have been discussed in this paper to extract best approach for WSN.

Keywords: Wireless; clusters; LEACH; PEGASIS.

1. INTRODUCTION

1.1 Wireless Sensor Network: WSN accumulation 1.1 of hundred or thousand of hubs. A greater amount of sensor systems are associated with these that are utilized to sense the data from the area where system is sent every hub contain various parts a radio trans-collector with an inner reception apparatus or association with an outside receiving wire. A microcontroller, an electric circuit to interface with the sensors has been utilized for detecting and a vitality source is utilized. When we give vitality to WSN hubs greatest a battery of cells is utilized. By the measure of the sensor hub is ascertained and area it can be of grain dust size to the span of shoe box. The expense of sensor hubs changes as indicated by the attributes, vitality, correspondence extent and data transfer capacity utilized for correspondence [1]. The innovation which utilized WSN exchange from star topology to multi bounces remote lattice topology. Portable WSN is a sort of system in which the sensor hubs which are utilized for detecting are versatile. The portable implies that the hubs can move all through the system. These hubs sense data when they move in a specific range and these hubs are not static. We settled on choice in light of that data and these hubs gather the data after that pass the data to that base station and gather the relative data and pass this data to the base station to settle on choice relying on the data. Portable remote sensor system is more adaptable as contrast with the static remote sensor system. This system can be conveyed in any zone and collaborate with any quick topology changes made in the system. The WSN have so much comparable like this system like this system use trans-collector and a microcontroller fueled by a battery. Sensors utilized for this are additionally same as utilized as a part of straightforward WSN. The fundamental case of MWSN is automaton [2].

1.2 Parts of WSN:

1.2.1 Sensor Node: This is a core component of WSN. This node plays a multiple roles in WSN, such as simple sensing; data storage; routing; and data processing.

1.2.2 Clusters: Clusters are the organizational unit for WSNs. The dense nature of these networks requires the need for them to be broken down into clusters to simplify tasks such a communication.

1.2.3 Cluster heads: Cluster heads are the managing the cluster head. They often are needed to managing task in the cluster. These tasks include but are not limited to data-aggregation and organizing the communication schedule of a cluster.

1.2.4 Base Station: The base station is at the upper level of the hierarchical WSN. It provides the communication link between the sensor network and the end-user [3].

1.2.5 End User: The data in a sensor network can be used for a wide-range of applications. Therefore, a particular application may make use of the network data over the internet, using a PDA, or even a desktop computer.

1.3 Major differences between WSN with other networks:

a) Number of nodes can be orders of magnitude higher.
b) Sensor nodes are densely deployed.
c) Sensor nodes are prone to failure.
d) Frequent topology changes.
e) Broadcast communication paradigm.
f) Limited power, processing and power capabilities.

g) Possible absence of unique global identification per node [4].

1.4 Energy Dissipation Model in WSN

1) Data Acquisition and No Processing (DANP) approach

2) Data Acquisition and Transform Coding (DATC) approach

3) Data Acquisition and Compressive Sensing (DACS) approach

1.4.1 Compressive Sensing

Wireless Sensor Networks (WSNs) are comprised of spatially distributed sensor nodes, where each node contains units for sensing, processing, and communicating data. In general, sensor nodes are assumed to have limited processing power and highly constrained energy resources. A typical WSN topology includes a base station - a powerful entity more capable than the ordinary sensor nodes with a significantly higher energy budget. Ordinary sensor nodes transfer processed or raw sensed data to the base station, which performs the final information aggregation and extraction tasks [5].

1.4.2 Mixed Integrated Programming

Mixed Integer Programming (MIP) based analysis of communication networks is extremely useful for uncovering the fundamental performance limits. Choosing an MIP based analysis method has a number of advantages. One of them is the abstraction from a specific protocol which enables us to investigate energy cost in ideal conditions with optimal routing decisions. Secondly, due to global knowledge in the optimization problem solver, the results can be obtained in an efficient and consistent manner.

1.4.3 PEGASIS protocol

PEGASIS (Power-Efficient Gathering in Sensor Information Systems), which is near optimal for this data gathering application in sensor networks. The key idea in PEGASIS is to form a chain among the sensor nodes so that each node will receive from and transmit to a close neighbor. Gathered data moves from node to node, get fused, and eventually a designated node transmits to the BS. Nodes take turns transmitting to the BS so that the average energy spent by each node per round is reduced. Building a chain to minimize the total length is similar to the traveling salesman problem, which is known to be intractable. However, with the radio communication energy parameters, a simple chain built with a greedy approach performs quite well. The PEGASIS protocol achieves between 100 to 300% improvement when 1%, 20%, 50% and 100% of nodes node die compared to the LEACH protocol. Our scheme can be modified appropriately if some of the stated assumptions about sensor nodes are not valid. If nodes are not within transmission range of each other, then alternative, possibly multi-hop transmission paths will have to be used. In fact, our chain based schemes will not be affected that much as each node communicates only with a local neighbor and we can use a multi-hop path to transmit to the BS. We need to make some adjustments in the chain construction procedure to ensure that no node is left out. The s LEACH protocol relies on direct reachability to function correctly[6].

Low Energy Adaptive Clustering Hierarchy ("LEACH") is a TDMA-based MAC protocol which is integrated with clustering and a simple routing protocol in wireless sensor networks (WSNs). The goal of LEACH is to lower the energy consumption required to create and maintain clusters in order to improve the life time of a wireless sensor network. LEACH is a hierarchical protocol in which most nodes transmit to cluster heads, and the cluster heads aggregate and compress the data and forward it to the base station (sink). Each node uses a stochastic algorithm at each round to determine whether it will become a cluster head in this round. LEACH assumes that each node has a radio powerful enough to directly reach the base station or the nearest cluster head, but that using this radio at full power all the time would waste energy. Nodes that have been cluster heads cannot become cluster heads again for P rounds, where P is the desired percentage of cluster heads [7]. Thereafter, each node has a 1/P probability of becoming a cluster head in each round. At the end of each round, each node that is not a cluster head selects the closest cluster head and joins that cluster. The cluster head then creates a schedule for each node in its cluster to transmit its data. All nodes that are not cluster heads only communicate with the cluster head in a TDMA fashion, according to the schedule created by the cluster head. They do so using the minimum energy needed to reach the cluster head, and only need to keep their radios on during their time slot. LEACH also uses CDMA so that each cluster uses a different set of CDMA codes, to minimize interference between clusters. LEACH is based on a hierarchical clustering structure model and energy efficient cluster-based routing protocols for sensor networks. In this routing protocol, nodes self-organize themselves into several local clusters, each of which has one node serving as the cluster-head. In order to prolong the overall lifetime of the sensor networks, LEACH changes cluster heads periodically [8]. LEACH has two main steps: the set-up phase and the steady-state phase. In the set-up phase, there are two parts, the cluster-head electing part and the cluster constructing part. After the cluster-heads have been decided on, sensor nodes (which are chosen as cluster-heads) broadcast an advertisement message that includes their node ID as the cluster-head ID to inform non-cluster sensor nodes that the chosen sensor nodes are new cluster-heads in the sensor networks. They use the carrier-sense multiple access (CSMA) medium access control (MAC) protocol to transmit this information. The non-cluster sensor nodes that receive it choose the most suitable cluster-head according to the signal strength of the advertisement message, and send a join request message to register on the chosen cluster-head. After receiving the join message, the cluster-heads make a time division multiple-access (TDMA) schedule for data exchange

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with non-cluster sensor nodes. Then, the cluster head informs the sensor nodes of its own cluster and the sensor nodes then start sending their data to the base station via their cluster-head during the steady-state phase. However, the balance of energy consumption between all nodes in this manner does not ensure that the sensing coverage is preserved sufficiently. Nodes are deployed randomly over an entire desired area; therefore, the sensing areas of different nodes may partially overlap. When a local area has a much higher than average node density, a target location may be covered by multiple nodes [9]. On the other hand, if the node density of a local area is much lower than the average, a target location is generally covered by only one node.

To improve the network sensing coverage in LEACH, each sensor node uses the value of probability in order to decide whether to be a cluster-head or not. Nodes with large values of probability can reduce the energy consumption due to being a cluster-head, while the burden of being a cluster-head will mainly be carried by nodes with small values of probability. By applying the CPCHSA algorithm, the nodes that die off first are those with a smaller normalized effective sensing area. As a result, the impact on the network sensing coverage from the dying off of these nodes is minimized. It is worth noting that the network topology is changed whenever at least one of the nodes has died off, and therefore the normalized effective sensing area is changed accordingly for some nodes. This implies that updating the estimated normalized effective sensing area may help the correctness of cluster-head selection, thereby improving the network sensing coverage. This updating process will consume some energy for all of the nodes but it is negligible. The updating procedure includes the detection of the node death and the re-calculation of the effective sensing coverage. For a specific node, if there is no neighbouring node died in current round, the re-calculation of the effective sensing coverage is not required. Frequent updates can capture timely network topology information and achieve a better sensing coverage. The most frequent update possible is performing the updating in each round. On the other hand, the LEACH-Coverage protocol corresponds to the most infrequent update [10].

2. REVIEW OF LITERATURE

Wassim Znaidi et al [1] “Hierarchical Node Replication Attacks Detection in Wireless Sensor Networks”, In this work author has introduced a new hierarchical distributed algorithm for finding node replication attacks by the use of Bloom filter mechanism and a cluster head selection. Author also presents theoretical discussion on the bounds of our algorithm. Author also performs extensive simulations of his algorithm for random topologies, and he also compares those results with other proposals of the literature. Finally, author show the effectiveness of his algorithm and its energy efficiency.

Jaydeep Barad et al [2] “improvement of deterministic key management scheme for securing cluster-based sensor networks” In this context, from all the diverse key management schemes in WSNs, deterministic key management schemes with LEACH, called DKS-LEACH is the plan which is utilized to secure wireless sensor network in proficient way and gives confirmation, secrecy and integrity of detected information. Still energy utilization and strength against node catch is an issue with DKS-LEACH. So author proposed the plan RINGLEACH to enhance the current plan to make it stronger utilizing separation based key administration plan. Indeed, even to make it energy productive, one can adjust the current strategy to quit sending fake messages to BS. In this way proposed approach manages inside and additionally outside malevolent nodes. The outcome plainly demonstrates that author plan doesn't builds vitality utilization yet at a same time gives player security against the malevolent node.

Nayyer Panahi et al [3] “Adaptation of LEACH Routing Protocol to Cognitive Radio Sensor Networks” One of the downsides of LEACH protocol is the uncontrolled choice of group heads which, in a few rounds, prompts the centralization of them in a constrained zone because of the haphazardness of the choice strategy. LEACH C is a variation of LEACH that uses a brought together clustering algorithm and structures great groups through sink control. In such engineering, clusters heads have a legitimate spatial appropriation and are ideally found everywhere throughout the system. In this paper, utilizing the physical layer data and saving the element of irregular group head choice in LEACH, it has been attempted to both move the position of clusters heads to suitable areas and make their amount ideal.

Mr. suyog pawar et al [4] “design and evaluation of en-leach routing protocol for wireless sensor network” A wireless network comprising of countless sensors with low-control handsets can be a successful device for social occasion information in an assortment of situations like common and military applications. The information gathered by every sensor is conveyed through the system to a solitary handling focus called base station that uses all reported information to decide qualities of nature or recognize an occasion. Clustering sensors into gatherings, with the goal that sensors impart data just to neighborhood CLUSTER heads and afterward the cluster heads convey the amassed data to the processing center, might spare a great deal of energy.

Shin-nosuke Toyoda et al [5] “Dynamic Change Method of Cluster Size in WSN” One of the real issues in wireless sensor network is adding to a energy-efficient routing protocol. LEACH is exceptionally energy-efficient routing protocol in light of the clustering of the sensor nodes. In any case, energy consumption of nodes has a tendency to end up uneven in LEACH. Notice enhances the LEACH using so as to clustering algorithm data of remaining electric force of nodes. In spite of the fact that HEED gives preferred execution over LEACH, it doesn't consider the quantity of nearby hubs. Along these lines, the cluster head does not proficiently cover the nodes in HEED. HIT depends on the little transmission range and multi-hop correspondence.

Muhammad haneef et al [6] "comparative analysis of classical routing protocol leach and its updated variants that improved network life time by addressing shortcomings in wireless sensor network", LEACH (Low energy adaptive clustering Hierarchy) is thought to be a first dynamic routing protocol utilized as a part of Wireless Sensor Networks. It adequately expands the system life time and outperform the immediate communication protocol, minimum-transmission-energy protocol and static clustering protocol. As of late, number of variations has been proposed. This paper depends on the relative investigation of various redesigned variations subsequent to characterizing the deficiencies connected with LEACH.

Prasath, K.A et al [7] "RMCHS: Ridge method based cluster head selection for energy efficient clustering hierarchy protocol in WSN" In wireless sensor network (WSN), energy efficiency is a one of the vital outcome in shrewd space and amazing situations and it has a limitless assortment of uses. The cluster head based communication protocols assume an essential part for vitality sparing in hierarchical WSN. In the majority of the clustering algorithms, a cluster head (CH) will transmit information to the sink node. This sort of system has turned into a customary approach to improve energy in WSN. This paper proposes another Synchronous travel algorithm named Ridge Method Cluster head Selection (RMCHS), which chooses productive cluster heads (CHs) to the sensor network. To consider consistency of CHs to adjust clusters, RMCHS utilizes another Synchronous travel calculation. Correlations with surely understand LEACH protocol, it show's undeniable better execution of RMCHS in term of remaining energy, throughput, alive nodes and dead nodes.

Roslin, S.E et al [8] "Genetic algorithm based cluster head optimization using topology control for hazardous environment using WSN" Wireless Sensor Network (WSN) is generally utilized as a part of late years for the applications where human mediation is unthinkable. In the event of atomic force plant if any little defer happens for information sending because of any hub disappointment might brings about extreme calamity. Consequently viable Topology Control is required to acquire a vitality productive sensor organize regardless of the possibility that any hub falls flat. A productive topology control utilizing hereditary algorithm based group head choice is introduced in this paper. In this work, three level sensor system engineering is created and is contained Super Head nodes, Cluster Head nodes and Cluster Slave nodes. The outcomes acquired for the created three level designs is contrasted and two level and one level models. Remaining Energy, Bandwidth and Memory Capacity are utilized as determination criteria. Quantitative investigation is likewise done to concentrate on the effect of N-levels on the execution of the proposed algorithms. From the quantitative examination of the proposed techniques on the N-level engineering with different node densities, it has been demonstrated that the two level designs gives lessened energy utilization compared with others.

3. APPROACHES USED

3.1 Max-Min D-Cluster Algorithms:

With Max-Min D cluster, the authors[11] propose a new distributed cluster-head election procedure, where no node is more than d (d is a value selected for the heuristic) hops away from the cluster-head. This algorithm provides load balancing among cluster heads. The cluster-head selection criteria are developed by having each node initiate 2d rounds of flooding, from which the results are logged. Then each node follows a simple set of rules to determine their respective cluster-head. The 1st d rounds are called flood-max, used to propagate the largest node ids. After this is complete, the 2nd d rounds of flooding occur. This round is called flood-min, used to allow the smaller node id to reclaim some of their territory.

3.2 Weighted Clustering Algorithm (WCA) [6]:

The algorithm explained in this section is a non periodic procedure to the cluster-head election, invoked on demand every time a reconfiguration of the networks topology is unavoidable. [6].This clustering algorithm tries to find a long-lasting architecture during the first cluster-head election. When a sensor loses the connection with any cluster-head, the election procedure is invoked to find a new clustering topology. This is an important feature in power saving, as the reelection procedure, which consumes energy, occurs less frequently. This algorithm is based on a combination of metrics that takes into account several system parameters such as: the ideal node degree; transmission power; mobility; and the remaining energy of the nodes. Depending on the specific application, any or all of these parameters can be used as a metric to elect cluster-heads. Another important aspect of the algorithm is that it is fully distributed; meaning that all the nodes in the mobile network shares the same responsibility acting as cluster-heads.

3.3 LEACH

Low-Energy Adaptive Clustering Hierarchy (or LEACH) was one of the first major improvements on conventional clustering approaches in wireless sensor networks. Conventional approaches algorithms such as MTE (Minimum-Transmission-Energy) or direct transmission do not lead to even energy dissipation throughout a network. LEACH provides a balancing of energy usage by random rotation of cluster heads. The algorithm is also organized in such a manner that data fusion can be used to reduce the amount of data transmission. The decision of whether a node elevates to cluster head is made dynamically at each interval. The elevation decision is made solely by each node independent of other nodes to minimize overhead in cluster head establishment. This decision is a function of the percentage of optimal cluster heads in a network (determined a priori on application); in combination with how often and the last time a given node has been a cluster head in the past. The threshold function is defined as: T (n) = {P/1−P(r mod 1/P), if n € G Otherwise 0 where n is the given node, P is the a priori probability of a node being elected as a cluster-head, r is the current round number and G is the set of nodes that have not been elected as cluster-heads in the last 1/P rounds. Each node during cluster-head selection will generate a random number between 0 and 1. If the number is less than the threshold (T (n)), the node will become a cluster-head. Following elevation to cluster head, the new cluster-head will broadcast its status to neighboring nodes. These nodes will then determine the optimal cluster-head (in terms of minimum energy required for transmission) and relay their desire to be in that particular cluster. The broadcast messages as well as cluster establishment messages are transmitted using CSMA (Carrier Sense Multiple Access) to minimize collisions. Following cluster establishment, cluster-heads will create a transmission schedule and broadcast the schedule to all nodes in their respective cluster. The schedule consists of TDMA slots for each neighboring node. This scheduling scheme allows for energy minimization as nodes can turn off their radio during all but their scheduled time-slot.

3.4 HEED: Hybrid Energy-Efficient Distributed Clustering (or HEED) is a multi-hop clustering algorithm for wireless sensor networks, with a focus on efficient clustering by proper selection of cluster-heads based on the physical distance between nodes. The main objectives of HEED are to:

- Distribute energy consumption to prolong network lifetime;
- Minimize energy during the cluster-head selection phase;
- Minimize the control overhead of the network.

Clusterheads are determined based on two important parameters:

1.The residual energy of each node is used to probabilistically choose the initial set of clusterheads. This parameter is commonly used in many other clustering schemes.

2. Intra-Cluster Communication Cost is used by nodes to determine the cluster to join

4. CONCLUSION

In the remote sensor organizes the system hubs are utilized for the sensing the data from the different sorts of non-reachable territories. Because of augmentation in different application of the WSN system the different sorts of requests has been expanded. The expanding requests make different sorts of issues in these situations. These issues are similar to power supply, memory and processing time in these frameworks. As the interest of the WSN builds substantial measure of stream has been happened between the hubs. In these hubs if blockage happens then it influences the execution of the framework. The parcel misfortune, data transmission lessening and vitality utilizations are the principle issues happen because of blockage. Because of bundle misfortune the framework does not give great throughput and framework does not grantee the parcel conveyance. Blockage happens in the framework because of the vicinity of substantial load on a solitary hub. At the point when blockage happens the specific hub begins drop the parcels because of the overwhelming burden which causes data misfortune. Past examination has been carried out to evade clogging in which need is relegate to hubs to dodge blockage however there are still some provisos in that exploration as they didn't say any criteria on the bases of which need was allocate.

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