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Review of Clustering Approach for 5G-IOT Wireless Sensor Networks

[1]Amardeep Singh Rajawat, [2]Dr. Soheb Munir
M.Tech Scholar, Associate Professor
Department of Electronics and Communication Engineering,
Lakshmi Narain College of Technology Excellence, Bhopal, India

Abstract : The Internet of Things (IoT) is one of the major technological revolutions that happened in the 21st century and Wireless Sensor Networks (WSN) is one of the technologies used in IoT. WSN is used for specific applications in smart agriculture, process automation, advanced healthcare, disaster management, intelligent transportation, etc. It has revolutionized the globe than any other technological development. There are efficient clustering techniques which optimize the routing of nodes communication under WSN. This paper presents the review of clustering approach for 5G-IOT wireless sensor networks.

IndexTerms **- IOT-WSN, 5G, Cluster, Sensor.**

I. INTRODUCTION

Wireless sensor networks (WSNs) refer to networks of spatially dispersed and dedicated sensors that monitor and record the physical conditions of the environment and forward the collected data to a central location. WSNs can measure environmental conditions such as temperature, sound, pollution levels, humidity and wind.[1]

These are similar to wireless ad hoc networks in the sense that they rely on wireless connectivity and spontaneous formation of networks so that sensor data can be transported wirelessly. WSNs monitor physical or environmental conditions, such as temperature, sound, and pressure. Modern networks are bi-directional, both collecting data[2] and enabling control of sensor activity.[3] The development of these networks was motivated by military applications such as battlefield surveillance.[4] Such networks are used in industrial and consumer applications, such as industrial process monitoring and control and machine health monitoring.

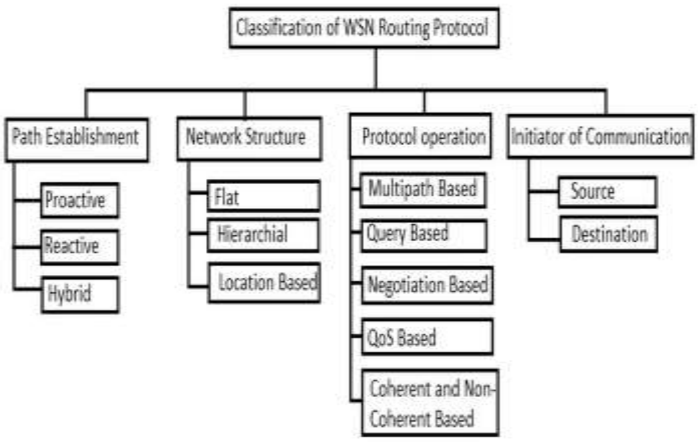

Figure 1: Classification of WSN Routing Protocols

Routing calculations decide the particular decision of course. Every switch has earlier information just of systems connected to it straightforwardly. A routing protocol shares this data first among quick neighbors, and afterward all through the system. Thusly, switches gain information on the geography of the system. The capacity of routing protocols to powerfully conform to changing conditions, for example, debilitated information lines and PCs and course information around hindrances is the thing that gives the Web its adaptation to non-critical failure and high accessibility.

A routing protocol indicates how switches speak with one another to disperse data that empowers them to choose courses between any two hubs on a PC arrange. Switches play out the "traffic coordinating" capacities on the Web; information parcels are sent through the systems of the web from switch to switch until they arrive at their objective PC.

The particular attributes of routing protocols remember the way for which they abstain from routing circles, the way wherein they select favored courses, utilizing data about bounce costs, the time they require to reach routing intermingling, their adaptability, and different factors, for example, transfer multiplexing and cloud access system boundaries. Certain extra attributes, for example, multilayer interfacing may likewise be utilized as a methods for disseminating positive systems administration doors to approved ports.[1] This has the additional advantage of forestalling issues with routing protocol circles.

II. BACKGROUND

A. Lipare et al.,[1] presents, the clusters are generated using the famous Fuzzy C-means (FCM) algorithm and the Cluster Head (CH) from each cluster is selected using the Sugeno fuzzy system. FCM generates load-balanced clusters and the proposed approach named SF-MPSO selects the suitable CH from each cluster. The local information of the sensor node such as residual energy, its distance from cluster centroid and the distance from the BS is provided to SF-MPSO. In the existing algorithms, the fuzzy rules are manually designed, whereas, in this article, the modified Particle Swarm Optimization (PSO) algorithm is applied to generate optimum Sugeno fuzzy rules.

Z. A. Dagdeviren et al.,[2] propose an actor controlled framework for localization and clustering in sensor networks. To the best of our knowledge, our framework is the first which offers both localization and clustering within constant message complexity per node. In this structure, a mobile actor device traverses the sensor network to localize and cluster the sensor nodes. Total energy consumption of the sensor nodes using this method are reduced compared to the distributed approaches. Moreover, cluster quality of our algorithms is better than their counterparts. We show that our framework provides a suitable infrastructure for cluster-based applications in an energy efficient manner.

S. Verma et al.,[3] propose an Intelligent Clustering approach for ITS (ICITS) which selects CHs based on a hybrid optimization method called GABAT that integrates the strengths of Genetic Algorithm (GA) and BAT Algorithm (BA). The proposed framework (ICITS) is targeted primarily to road transport in military areas due to their stringent requirements in terms of security and reliability while collecting the data from the deployed sensor nodes. The simulation results obtained with ICITS demonstrate that it performs well for various performance metrics that include stability period, network survival period and `number of packets sent', which are improved by 54.7%, 19.6%, and 40.5%, respectively as compared to recently proposed Cluster-based Intelligent Routing Protocol (CIRP).

K. Tripathi et al.,[4] Wireless sensor networks (WSN) has been used in many areas like healthcare, defense, disaster, agriculture, etc. in the various application based on WSN have one BS and many numbers of the sensor device to monitor pressure-temperature in various environment condition. wsn consist of small tiny devices called sensor nodes (SNs) having few limitations in stipulations of sensing range and battery. There are numerous parameter plays an important role for designing an effective protocol of WSN to improve the lifespan of WSN. To minimize the energy dissipation of the SN and enhance the lifespan of the wireless sensor networks is a big issue.

A. F. Raslan et al.,[5] propose a novel algorithm to select the best CHs in the IoT-WSN. The novel algorithm is called an Improved Sunflower Optimization Algorithm (ISFO). In the ISFO, we combine the Sunflower Optimization Algorithm (SFO) with the lèvy flight operator. Such invoking can balance the diversification and intensification processes of the proposed algorithm and avoid trapping in local minima. We compare the ISFO algorithm with six SI algorithms. The results of the proposed algorithm show that it can consume less energy than the other algorithms; also the number of nodes still alive for it is larger than alive nodes for the other algorithms. Hence, the ISFO algorithm proved its superiority in reducing the consumed energy and increasing the lifetime of the network.

Y. Han et al.,[6] The optimization is offline and will be executed only once before the network is working. We make a detailed comparison of CPMA with classical clustering protocols. The results show that CPMA can better prolong the network lifetime and improve network throughput under almost all the network conditions. Furthermore, our simulation also exhibits that CPMA has good adaptability and performs well under different network lifetime definitions. All the results prove that CPMA has the advantages of being suitable and efficient for a wide number of WSN applications.

S. Umbreen et al.,[7] introduced an energy-efficient mobility based cluster head selection mechanism to overcome these limitations. CH selection is based on dedicated parameters that have a huge impact on the sensor energy consumption. The weightage of each node is calculated on the base of the node's mobility level, residual energy, distance to sink, and density of neighbors. Inter-cluster communication uses single-hop/multi-hop. MATLAB is used to perform simulations. Results show that the proposed approach EEMCS performs better as compared to the existing algorithms CRPD, LEACH, and MODLEACH in terms of load balancing, network stability, energy depletion, and throughput. Energy utilization in the case of EEMCS is much less and the network lifetime is greater than other existing protocols.

Y. Tao et al.,[8] proposes an unequal clustering algorithm based on interval type-2 TSK fuzzy logic theory (UCT2TSK). The relative distance to the BS (RDB), residual energy (RE), and node density (ND) are considered as the inputs of an interval type-2 fuzzy logic system (FLS). Through fuzzy reasoning, outputs are acquired that can be used to optimize the CHs and determine the cluster sizes. Simulation results verify that UCT2TSK can effectively balance energy consumption and enhance energy efficiency because it has better performance in network lifetime and network throughput than other classical and recent clustering algorithms.

J. Wang et al.,[9] Optimal number of clusters and identity of cluster heads are automatically determined by combining the excellent characteristics of IMO algorithm and the rich resource, comprehensive information at the sink together. Thanks to its centralized structure, IMOCRP proposed in this work avoids excessive overhead in cluster head selection and cluster formation, which in turn helps conserve energy. Available channel list at each living node is taken into consideration to perform reasonable channel allocation for clusters, and the probability of collisions with primary users can be reduced, which promotes more successful information delivery. Simulation results have shown that IMOCRP can balance network lifetime and effective information collection capability, and it is superior to other competing protocols.

A. Mohamed et al.,[10] proposes a new clustering scheme for heterogeneous WSN using Coyote Optimization based on a Fuzzy Logic (COFL) algorithm. It uses the coyote optimization algorithm (COA) in conjunction with fuzzy logic (FL) system to reinforce and balance the clustering process for increasing the wireless network lifetime and reducing energy consumption. FL based clustering is adapted to determine a tentative set of CHs. The output of the FL is added as a solution within the initial solutions of the COA. Furthermore, a new fitness function has been adapted to minimize the total intra-cluster distance between each CH node and its cluster members and minimize the inter-cluster distance between the CHs nodes and the base station. An extensive simulation with three different scenarios is performed.

M. A. Hossen et al.,[11] Clustering in CRAHN supports cooperative tasks such as spectrum sensing and channel managements and achieves network scalability and stability. In this work, we proposed a Q-learning based cluster formation approach in CRAHN, in which Q-value is used to evaluate each node's channel quality. To form a distributed cluster network, channel quality, residual energy and neighbor node/network conditions are considered. By exchanging each node's status information in terms of channels and neighbors, each node knows neighboring topology and which node is the best candidate for cluster head (CH). Distributed CH selection, the optimum common active data channel decision, and gateway node selection procedures are presented in this work.

X. He, et al.,[12] the trajectory length of the mobile sink, we design a mechanism to select potential visiting points within communication overlapping ranges of sensor nodes, rather than locations of sensor nodes. Additionally, according to trajectory characteristics of the mobile sink, we design an effective trajectory encoding method that can generate a trajectory containing an unfixed number of visiting points. The simulation results show that the proposed EETP is superior to existing WRP, CB and the MOPSO-based algorithm, in terms of delay in data delivery, network lifetime and energy consumption.

III. ROUTING PROTOCOLS AND CHALLENGES

Proactive Protocols

- The protocols keep on computing the route regularly and therefore, the routing table changes or updates frequently. These protocols use Bellman Ford Algorithm in which all the nodes keep the information related to the next node.
- The one of the advantage of the said protocol is that the route will be known whenever a packet wants to send a data. Example of this protocol includes Optimized Link State Routing (OLSR) and Destination Sequenced Distance Vector (DSDV) protocol. OLSR is basically a refined version of link state protocol.
- The working of link state protocol is such that any change in a topology will be broadcasted to all the nodes in a network which will increase the network overhead. OLSR handles with two kinds of messages like hello and a message to control the topology. Hello messages are used to find the data about the connection status. While topology control message is used to broadcast its own neighbour information with the help of multi point relay (MPR) selected list. Because of the use of MPR, the overload has reduced as it was in the case of pure link state protocol. DSDV protocol is a modification of Bellman Ford Algorithm. This algorithm resolved the problem of looping in routing by maintaining the sequence number information of each node.

Reactive Protocols

- This type of protocols does not possess the information about all the nodes. It only keeps the information of the nodes that comes in the route.
- The example of reactive protocols is an Ad-hoc On-Demand Distance Vector (AODV), Dynamic Source Control Routing (DSR) and Dynamic Manet on Demand (DYMO) protocol. AODV is the most commonly used protocol in WSN.
- It possesses the information of next hop for the destination nodes. Moreover, each routing table lasts for certain period. If there is no route demand within the specified time than route will get expired and a new route will be defined on demand. As per AODV, whenever a source node wants to send a data to the destination node, it will check the route in its routing table.

Hybrid Protocols

- Hybrid is a composite of proactive and reactive routing protocols which reduced the overhead and delays occurrence due to the periodic sharing of topology information. The hybrid approach, the efficiency and scalability feature of network has improved. On the other hand, the drawback of hybrid approach is high latency for navigating new routes. The common protocol based on hybrid approach is Zone Routing Protocol (ZRP).

The major challenges that a routing protocol designed for ad hoc wireless networks faces are mobility of nodes, resource constraints, error-prone channel state, and hidden and exposed terminal problems.

IV. CONCLUSION

This paper reviewed many studies related to routing protocols. As per the research completed, AODV proved to be the best routing protocol in WSN environment. In the scenario, routing protocols in WSN are in charge of forwarding the information generated by the node to monitoring centres through multi-hop communications. The 5G-IOT constraint based wireless sensor network implementation and perform the node communications.

REFERENCES

1. A. Lipare, D. R. Edla and R. Dharavath, "Fuzzy Rule Generation Using Modified PSO for Clustering in Wireless Sensor Networks," in IEEE Transactions on Green Communications and Networking, vol. 5, no. 2, pp. 846-857, June 2021, doi: 10.1109/TGCN.2021.3060324.
2. Z. A. Dagdeviren, "A Framework for Localization and Clustering in IoT Enabled Wireless Sensor and Actor Networks," 2021 5th International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT), 2021, pp. 732-737, doi: 10.1109/ISMSIT52890.2021.9604598.
3. S. Verma, S. Zeadally, S. Kaur and A. K. Sharma, "Intelligent and Secure Clustering in Wireless Sensor Network (WSN)-Based Intelligent Transportation Systems," in IEEE Transactions on Intelligent Transportation Systems, doi: 10.1109/TITS.2021.3124730.
4. K. Tripathi and S. Agarwal, "Energy Efficient Clustering Scheme to Improve the Lifespan of WSN," 2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), 2021, pp. 1-5, doi: 10.1109/ICRITO51393.2021.9596195.
5. A. F. Raslan, A. F. Ali, A. Darwish and H. M. El-Sherbiny, "An Improved Sunflower Optimization Algorithm for Cluster Head Selection in the Internet of Things," in IEEE Access, doi: 10.1109/ACCESS.2021.3126537.
6. Y. Han, G. Li, R. Xu, J. Su, J. Li and G. Wen, "Clustering the Wireless Sensor Networks: A Meta-Heuristic Approach," in IEEE Access, vol. 8, pp. 214551-214564, 2020, doi: 10.1109/ACCESS.2020.3041118.
7. S. Umbreen, D. Shehzad, N. Shafi, B. Khan and U. Habib, "An Energy-Efficient Mobility-Based Cluster Head Selection for Lifetime Enhancement of Wireless Sensor Networks," in IEEE Access, vol. 8, pp. 207779-207793, 2020, doi: 10.1109/ACCESS.2020.3038031.
8. Y. Tao, J. Zhang and L. Yang, "An Unequal Clustering Algorithm for Wireless Sensor Networks Based on Interval Type-2 TSK Fuzzy Logic Theory," in IEEE Access, vol. 8, pp. 197173-197183, 2020, doi: 10.1109/ACCESS.2020.3034607.
9. J. Wang, S. Li and Y. Ge, "Ions Motion Optimization-Based Clustering Routing Protocol for Cognitive Radio Sensor Network," in IEEE Access, vol. 8, pp. 187766-187782, 2020, doi: 10.1109/ACCESS.2020.3030808.
10. A. Mohamed, W. Saber, I. Elnahry and A. E. Hassanien, "Coyote Optimization Based on a Fuzzy Logic Algorithm for Energy-Efficiency in Wireless Sensor Networks," in IEEE Access, vol. 8, pp. 185816-185829, 2020, doi: 10.1109/ACCESS.2020.3029683.
11. M. A. Hossen and S. Yoo, "Q-Learning Based Multi-Objective Clustering Algorithm for Cognitive Radio Ad Hoc Networks," in IEEE Access, vol. 7, pp. 181959-181971, 2019, doi: 10.1109/ACCESS.2019.2959313.
12. X. He, X. Fu and Y. Yang, "Energy-Efficient Trajectory Planning Algorithm Based on Multi-Objective PSO for the Mobile Sink in Wireless Sensor Networks," in IEEE Access, vol. 7, pp. 176204-176217, 2019, doi: 10.1109/ACCESS.2019.2957834.