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CLUSTER BASED K-MEDOIDS APPROACH FOR IMPROVEMENT OF NETWORK LIFE TIME IN WSN

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Abstract: *Due to shortage of power source, energy is the significant concern part in Wireless Sensor Systems. Wireless Sensor Networks(WSNs) are currently used in numerous kinds of WSN simulators have been established to visually illustrate the coverage, energy consumption status and expected lifetime of WSN sensors. Most of the Researchers have proposed and develop routing algorithm to increase the network lifetime. As cluster heads chosen by nodes, gathers the data from their individual groups and exchanges the collected data to the mobile sink as proposed in the heuristic tour planning technique. In this research, the mobile sink starts the collection of data irregularly from the initial site, which is stored in cluster heads in an individual hop extend and at last returns to the initial site. In existing approaches, scheduling time for data delivery is less. The proposed system helps in mitigation of travelling time when compared to existing approaches. To find the effectiveness of proposed algorithm, NS2 (Network simulator-2) software is used for simulation verification.*

Keywords: Wireless Sensor Networks, Cluster, Mobile sink.

1. INTRODUCTION

Wireless Sensor Networks have been introduced in many domains including health care systems, natural conditions monitoring, military applications, and others as Internet of Things [1-3, 4]. The most key issue for wireless sensor networks is energy efficiency. However, the supply of power is limited and hard to replace for sensor nodes. And also, nodes close to the base station expend more energy in contrasted and different nodes since the nodes transfer the information received by sensor nodes stay away from the sink. Henceforth, the information received by different sensors can't be exchanged to the sink once these sensors close to the sink fail. The complete setup ends up early at that particular point, even though a large part of the nodes can even now have an expected measure of energy. WSNs equipped with a group of various sensor nodes with limited sensing, computing and communication abilities. These sensors nodes are set up over a big areawith one or more than one Base Station [5]. Each node contains a detecting part, a processing part, a transmission part, a battery, and a power harvester. WSN has extensive application possibilities, which includes environmental monitoring, health monitoring, terrestrial and underwater habitat monitoring, disaster management, military surveillance, forest fire-tracking, security surveillance, etc. Rapid developments in wireless communications system, low-power electronics, battery technology, and power harvesting abilities have facilitated the improvement of low-cost WSNs [6]. The routing methods selection is a vital problem for the effective delivery of the packets to their target point. Furthermore, in such networks, the applied routing scheme should confirm the lowest of the energy consumption and hence extension of the lifetime of the network [7]. From few years, researchers have demonstrated that the clustering is an effective approach in expanding lifetime and reduces energy consumption of Wireless Sensor Networks. In each cluster, there are several nodes, among them one will be act as a cluster head (CH) and others will be numerous cluster members. Cluster members sense and collects the information from surrounding environment and forward the information to cluster head (CH). Among them clustering is the best technique and it is well known for accomplishing energy effectiveness in WSNsMoreover, CHs function as fusion point for data aggregation, so that the actual data transferred to the BS is abridged [8]. An existing and frequently used algorithm is K-means algorithm in WSN. The main limitation of this K-means algorithm is random initial centroid selection. To improve K-means algorithm, a Midpoint method in initial centroid selection is used Clustered WSNs also utilizes single-hop technique and multi-hop technique for communication between the nodes. Therefore clustering and multi-hop communication are the effective tools to make network more energy efficient. By using cluster algorithm and centralized midpoint method, k-means algorithm is enhanced and cluster head selection is also improved.

2. RELATED WORKS

Many researchers have proposed various methods to improve energy efficiency of routing protocols in MANET. Some of these are mentioned here. In [9] author modifies DSR algorithm to improve network lifetime. In this the author proposed an efficient DSR (EDSR) which minimizes energy consumption per packet, maximizes network lifetime and minimize maximum node cost. This is done by selecting energy

efficient paths. In DSR some relay nodes may act selfish and drop packets for other nodes so that their energy consumption is reduced. The EDSR finds such selfish nodes and deals with them. The drawback of EDSR is to find such selfish node extra overload generated which causes energy consumption. In [10] authors designed an on-demand Power and Mobility Aware Routing (PMAR) protocol. The main objective of PMAR is to select a route that improves the minimum battery power of the node which maximizes network lifetime and reduces total transmission power required to reach destination so that overall energy resources in the network can be utilized efficiently. PMAR also consider mobility of the nodes due to which frequent link breakages occurs in network which affects ongoing data transmission and end-to-end delay performance of the MANET. To optimize this problem PMAR adds route lifetime as constraint in the protocol. But all these problems cannot be solved online for large networks hence some heuristic algorithms are designed to solve all these issues in PMAR. In [11] authors proposed a novel energy consumption model using Residual Energy based Mobile Agent selection scheme (REMA). In this by sharing topology information among the nodes, mobile agent dynamically select appropriate upper layer agents for reliable data transmission. REMA uses multimode Gateway selection process to analyze mobility weightage within the zone group and across different zone groups also congestion free traffic is monitored. REMA retains energy of the node for maximum time to increase battery life and the gateway is selected based on maximum weight which utilizes various rout path data transfer mechanisms. In [12] authors implement two algorithms -power and delay aware multipath routing protocol (PDMRP) and slow start exponential and liner algorithm (STELA) using cross layer design. STELA adjust sleeping window when there is no activity in the network and thus improves energy efficiency of the network. While PDMRP selects shortest and energy efficient path when there is any network activity. Using these two algorithms, author designed an energy efficient multipath routing protocol using adjustable sleeping window (EMRAS) which reduced overall energy consumption without degrading QoS of service. The limitation of this method is to adjust sleeping window of node. [13], drawbacks are clustering head transmission time is more and mobile user takes more time to collect the data from cluster head.In physical conditions, the detecting field may contain obstacles with various shapes and sizes. Due to the irregular shape of obstacles, it can't directly construct the deterrent spreading over diagram for the mobile sink scheduling on the basis of the spanning graph algorithm above. In this manner, an exploration challenge is how to utilize the spanning graph algorithm to discover an obstacle-avoiding shortest route for the mobile sink. The papers [14-16, 18] utilize network based systems to examine and tackle issues in WSNs. Here, by also utilizing grid based strategies to take care of the planning problem of the mobile sink. The detecting region is isolated into a similar size grid cells by using the grid-based techniques. Obviously, edges of obstructions meet grid cells and obstacles may have some part of grid cells. When obstacles involve some part of one grid cell, it is expected that the grid cell is viewed as obstacles. The authors present a VGDRA (virtual grid- based dynamic routes adjustment scheme) scheme to minimize the communication cost for the mobile sink in [19]. The cell-header nodes are chosen by the nodes near the center and the sensor field is isolated into a virtual grid containing the same size cells. And also, the construction of a virtual backbone structure is done which consists of the cell header nodes. By communicating with the border cell header nodes, the mobile sink collects the detecting information and moves across the sensor field. The routes remaking process incorporates just a subset of cell-header nodes to decrease the general correspondence cost. In [19], the drawbacks are same size of cells used for grid and it doesn't verify background process in network.

3. PROPOSED METHODOLOGY

In the proposed method, the data transmission is performed using Cluster Based K-Medoids algorithm. This proposed EEMRCP enhances K-means algorithm by using midpoint method for initial centroid selection. There are two main considerations for cluster head selection in proposed work, one is it's residual energy, and another one is Euclidean distance used in Cluster Based K-Medoids .

Objective of proposed approach

- To design an Efficient Energy Clustering protocol using Fuzzy K-means and centralized midpoint algorithm.
- Evaluate the performance of proposed protocol.
- Compare the results of proposed protocol with existing methods.
- Increases the lifetime of the networks with low energy consumption.

Network model

In proposed methodology, the sensor network model is built upon it with the following properties. The following assumption of the network model is given below:

(a)The Base station is highly energized and it is placed far away from the sensor network area.
(b)Every sensor nodes are equally spread inside a square field with a uniform initial residual energy.

The sensor node continuously sense from the environment and forward sensed data to the BS at required regular time intervals.

(d)The sensor nodes should perform computational functions and collects data from environment individually.

(e)The Base station and sensor node are left unattended after deployment.

(f)Each and every node should have to communicate with CH and transmit data to the CH by using either single Hop or Multi Hop communication, which depends on the threshold distance value.

(g)Instead of transmitting individual data to the BS, the CH should aggregate the data collected from allneighbour nodes and then forward aggregated data to BS.

(h)By using Data compression techniques the CH transmits compressed data to the BS at high data rates have been achieved.

(i)The BS specifies every node to reinitiate clustering when all the CH nodes in the network have inadequate energy.

In this segment, described proposed system CBKM, Collection Oriented Distributed Scheme for WSN with Distance, Energy, Link quality, Bandwidth, and Delay. Paper introduced clustering mechanism in previous work so paper should follow k-medoids algorithm for clustering and cluster head selection that works with CBKM. Here all the communications are directed through cluster head (CH) to RP (rendezvous point) called as collection point (CP) then directly goes to sink (receiving node). Here sink will act as Mobile sink to collect the information from collection points within short period. The proposed system presents, mitigation of travelling time during transmission and finally to collect all the information from collection points and continues up to end of simulation process. During the clustering process, the nodes will compare their information with each other and designate the cluster heads. Once the cluster head is selected, then the cluster head node intimates it selection to all the other nodes and remaining nodes join as member. The difference between clustering algorithms are distance and energy. The k-medoids calculates distance between the sensor node and sink node and selects cluster heads.To address the described issue, proposed approach works by partitioning the System, in each segment and mobile element is assigned. This apportioning contemplates the conveyance of the nodes, to maintain a strategic distance from long separation. Proposed approach begins; by distinguishing the arrangement of nodes, they are used to build mobile elements visits. To acquire these sets, utilization of the collection point based algorithm is proposed. Once the nodes of the visits are recognized, the proposed approach begins by apportioning the system into two segments.

Table1. System parameters

PARAMETER	VALUE
Application Traffic	CBR
Transmission rate	15 packets/sec
Radio range	250m
Packet size	512 bytes
Maximum speed	30m/s
Simulation time	8000ms
Number of nodes	25
Area	1000x500
Grid size	10m

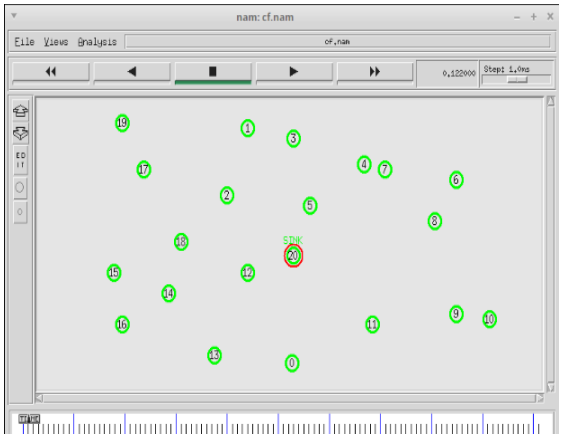

Figure. 1 Network Life Time

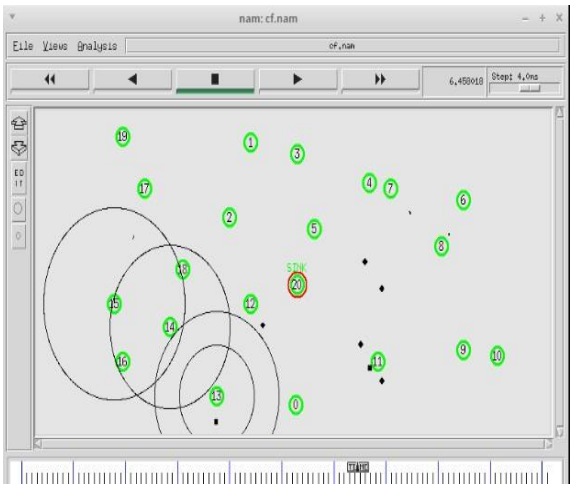

Figure. 2 Broadcasting in network

In this area, used heuristic obstacle avoidance based algorithm to lead various analyses in detecting field with obstacles. As indicated by the system lifetime and the development way of mobile sink, exploratory outputs of the calculation which are presented below.

5. CONCLUSION

Collection oriented distributed scheme with k- medoids clustering approach and considered parameters like Distance, Energy, Link quality and Delay. In CODS-KM, routing decisions are based on Collection point methodology which incorporates Remaining Energy, Distance, and Link quality, which attributes to choose the best next hop for the routing operation, thus allowing for better load balancing and network lifetime extension. Here K- Medoids function is useful for selection of cluster-head. In this paper, mobile sink is used to extend the lifetime of a network. Based on the cluster-based method, used the heuristic obstacle-avoiding calculation based algorithm to release the mobile sink. The paper proposes a collection oriented distributed scheme to limit the quantity of got visits. For simulation verification, NS2 software is used and exploratory outcomes demonstrate that our cluster-based approach is practical for sending mobile sink. The future extent of this paper is bunch heads whatever.

REFERENCE

1) J. C. Cuevas-Martinez, J. Canada-Bago, J. A. Fernandez-Prieto, and M. A. Gadeo-Martos, "Knowledge-based duty cycle estimation in wireless sensor networks: Application for sound pressure monitoring", Applied Soft Computing, Vol. 13, No. 2, pp. 967-980, 2013.

2) H.-L. Fu, H.-C. Chen, and P. Lin, "Aps: Distributed air pollution sensing system on wireless sensor and robot networks", Computing Communications., Vol. 35, No. 9, pp. 1141-1150, 2012.

3) Z. Shen, X. Pan, C. Huang, J. Feng, Y. Zhao, M. Gao, and L. M. Ni, "Energy consumption monitoring for sensor nodes in SNAP", International Journal of Sensor Networks, Vol. 13, No. 2, pp. 112-120, 2013.

4) M. Dong, X. Liu, Z. Qian, A. Liu, and T. Wang, "QoE-ensured price competition model for emerging mobile networks", IEEE Wireless Communications, Vol. 22, No. 4, pp. 50-57, 2015.

5) S.K.Singh andJ.P.Singh, "A Survey on Successors of LEACH Protocol", IEEE Access Journal, Vol.5, pp .4298-4328, 2017.

6) N.Pantazis, A.Nikolidakis, and S. Vergados, "Energy-Efficient Routing Protocolsin Wireless Sensor Networks:A Survey",Communications Surveys& Tutorials, IEEE, Vol. 15, No. 2, pp. 551 –591, 2013.

7) Dileep Kumar,"Performance analysisof energy efficient clustering protocolsfor maximising lifetimeof wireless sensor networks", IET Wireless Sensor Systems,Vol.4, No.1, pp. 9 –16, 2014.

8) A.Pandey,N. Muchhal, and M. A.Mishra, "Heterogeneity Aware Clustered WSN using Multi-hop Communication",InternationalJournal of Computer Applications,Vol.101,No.2, pp. 41-45, 2014

9) S.Shivashankar, G. Varaprasad, and S. Narayanagowda, "Implementing a new power aware routing algorithm based on existing dynamic source routing protocol for mobile ad hoc networks", IET Network., Vol. 3, No. 2, pp. 137–142, 2014.

10) W. Tan, S. Bose, and T.-H. Cheng, "Power and mobility aware routing in wireless ad hoc Networks", IET Communication., Vol. 6, No.11, pp. 1425–1437, 2012.

11) R. Valikannu, A. George, and S. Srivatsa, "A Novel Energy Consumption Model using Residual Energy Based Mobile Agent Selection Scheme (REMA) in MANETs",In: Proc. of the 2nd International Conference on Signal Processing and Integrated Networks, pp. 334-339, 2015.

12) K. Remya, C. Sangeetha, and C. Suriyakala, "Cross layer Design of energy efficient protocol using adjustable sleeping windows in MANETS",In: Proc. of Global Conference on Communication Technologies, pp. 520–524, 2015.

13) G. Xie and F. Pan, "Cluster-Based Routing for the Mobile Sink in Wireless Sensor Networks With Obstacles", IEEE Access, Vol. 4, pp. 2019-2028, 2016.

14) C. Ai, L. Guo, Z. Cai, and Y. Li, "Processing Area Queries in Wireless Sensor Networks", In: Proc. of the Fifth International Conference on Mobile Ad-hoc and Sensor Networks, pp. 1-8, 2009.

15) I.-H. Peng and Y.-W. Chen, "Energy consumption bounds analysis and its applications for grid based wireless sensor networks", Journal of Network and Computer Applications, Vol. 36, No. 1, pp. 444-451, 2013.

16) K. Xu, G. Takahara, and H. Hassanein, "On the robustness of grid-based deployment in wireless sensor networks", In: Proc. of the Int. Conference

Wireless Communications and Mobile Computing, pp. 1183-1188, 2006.

17) Z. Zhou, J. Tang, L.-J. Zhang, K. Ning, and Q. Wang, "EGF-tree: An energy-efficient index tree for facilitating multi-region query aggregation in the Internet of Things", Personal and Ubiquitous Computing, Vol. 18, No. 4, pp. 951-966, 2014.

18) G. Han, A. Qian, J. Jiang, N. Sun, and L. Liu, "A grid-based joint routing and charging algorithm for industrial wireless rechargeable sensor networks", Computer Networks, Vol. 101, pp. 19-28, 2016.

19) A. W. Khan, A. H. Abdullah, M. A. Razzaque, and J.I.Bangash, "VGDRA: A virtual grid-based dynamic routes adjustment scheme for mobile sink-based wireless sensor networks", IEEE Sensors Journal, Vol. 15, No. 1, pp. 526-534, 2015.

20) G.Jagatheeshkumar and Dr.S.Selva Brunda, "TextClusteringAlgorithmUsingFuzzyWhaleOpti mizationAlgorithm" vol 12, issue:2, pp:278-286, April -2019.