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Completely Dynamic WSN Clustering Using Linear Routing and Single Node Clustering

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Abstract— Remote Sensor Networks are utilized in variety of region since they can be appropriate for different situations. It can work autonomously in the state of hazard places where a human's nebulous vision is spirit or hard. Hence this work focus on arranging this WSN network into clusters by using GSCLR (Graph Spanning Cluster and Linear Routing). Use of graph based clustering by minimum spanning tree algorithm reduce execution time. Here after clustering routing of the sensor nodes were transferred by establishing logical path from different cluster center nodes to base station. Clustering algorithm was so designed that energy loss of the sensor nodes while transferring data was minimum. Here proposed GSCLR method was compared with existing MSGR method.

Keywords- Energy Efficient Routing, Dynamic Routing, Node Clustering, Wireless Sensor Network.

I. INTRODUCTION

Information handling encourages us to automate number of functions and add more knowledge to our framework. The principle reason for Internet of Things is to improve the standard of individuals' day to day life [1]. A portion of the WSN gadgets have compelled capacities and restricted access to control. As a piece of a home automation framework, there are a considerable measure of basic battery fueled sensors and actuators like temperature, stickiness sensors, light sensors, movement locators, fire cautions, and so forth. They are a vital module of the home automation framework and should function to the extent that this would be possible without the need of changing the battery. It very well may be extremely irritating for the end client and even hard to have a physical access as well as occasionally change batteries. Limitations of the gadgets influence the qualities of the working for improper communication. Battery limit additionally confines the execution of the remote communication channel and lifetime of the gadget. In spite of the fact that the utilizations of WSN are to a great degree plentiful and appealing, the WSN won't be received in the greater part of these applications if batteries are to be changed always. In this way, when the sensor node is outlined, control utilization must be limited. There are various methodologies that can be utilized to lessen the normal supply current of the radio, and consequently the power utilization.

The issue identified with the energy utilization is attempt by numerous strategies like, giving an enhanced bunching calculation, routing calculation, information accumulation, streamlining the transmitter and beneficiary power, decreasing information measure, nearby information preparing, and so on. Among these, a significant number of the issues could be tackled by picking a energy proficient clustering calculation. Remote sensor arrange is a power expending framework, since nodes perform with confined power a battery which diminishes its lifetime. Once conveyed, the little sensor nodes are generally out of reach to the client, and therefore substitution of the energy source isn't attainable. Consequently, a standout amongst the most imperative issues

that should be upgraded keeping in mind the end goal to enhance the life expectancy of the system is energy effective.

In order to make perfect communication between the base station and nodes clustering approach is utilized as it provide energy efficiency on single or multiple hop routing. In clustering, a sensor node in a bunch is chosen which act as Cluster Head (CH) and transfers information from a sensor to a remote recipient [3]. Barely any center nodes are intensely stacked, in clustering when energy exhaustion occurs. Main role of this center node is to collect data from its cluster element node and transfer this to the base station. LEACH is a well known routing convention algorithm which direct packets movement to lessen energy utilization [1]. LEACH partitions communication into rounds with a round including a set-up stage and an stable state [4].

The rest of this paper will be: Section 2 discusses various approaches applied by different authors in WSN node clustering for improving energy efficiency of the network. While third section discuss proposed SNCLR technique. In Section 4 the Clustering Parameters are explained and comparison of results was done with existing methodology [1]. Finally the conclusion and future work was detailed in Section 6.

II. RELATED WORK

Bouachir Ons (2016) et. al [13] exhibit that an ORP and information spread convention for energy collecting WSN (EH-WSN) rely upon cross-layer develops that permit over the layers synchronization and coordination among the routing convention and the application layer benefit. The OMNET++ based broad reproduction of this convention indicated promising outcomes as far as meeting application necessities of taking care of dire activity and postpone tolerant movement flawlessly and guaranteeing energy use effectiveness.

In Chun-Wei Tsai, Zhen-A Liy , 2017 [14] this paper, an elite metaheuristic calculation, called seek financial matters based clustering calculation (SECA), is introduced. One of the fundamental thoughts of SE-based calculations [7] is to portray the arrangement space to "abstain from looking through similar districts too often" and to "look through the potential locales that have not been sought as regularly as would be prudent." The SECA is proposed for decreasing the energy utilization of an WSN to draw out its lifetime.

Ahmad, A., Latif, K. Javaid N. Khan et. al. (2013) [15] examined on clustering technique which is most very much perceived coordinating methodology in WSNs. In view of varying need of WSN application beneficial imperativeness use in coordinating traditions is as yet a potential field of research. Creators displayed new energy effective coordinating method in this exploration. This technique is used to crush the essential inconvenience of energy opening and scope gap. In their procedure, they have controlled these issues by displaying thickness controlled uniform dissemination of centers and settled a perfect number of Cluster Heads in each round.

Lohan, P. what's more, Chauhan, R. et. al.(2012) [16] displayed the GeographyInformed Sleep Scheduling and Chaining Based Routing (GSSC) calculation in remote sensor arrange. As finder nodes are control restriction, the framework lifetime enhanced by using the energy of nodes capably. GSSC preserves control by finding alike nodes from routing viewpoint by utilizing their land data, it faculties almost comparative data and afterward killing unnecessary nodes to dispose of information excess. This fastening based routing can reduce energy going through of information exchanging with the assistance of multi-hop routing method. Their recreation result (utilizing MATLAB) exhibit that GSSC accomplished extensive addition in organize life expectancy than LEACH and PEGASIS.

CHs. Gherbi Chirihane and Aliouat Zibouda et al. (2015) [17] proposed a dispersed energy proficient versatile clustering convention with Data Gathering for WSN decreases the energy utilization and system lifetime is expanded. The bunching methods are utilized productively with appropriated group heads. The node's proportion is killed for settled era and rest control laws are intended to diminish the cost work. The situation shows arbitrary arrangement of nodes and the aggregate reproduction time is disintegrated utilizing asset

reservation. The strategy conveyed energy proficient versatile clustering convention with Data Gathering (DEACP) decreased the general system energy utilization, adjust the energy utilization among the sensors and expand the lifetime of the system by making the bunching effective in multifaceted nature of message and time, welldistributing the group heads over the system, the heap adjusting done well and therefore transmission intensity of the node is lessen which along these lines diminishes the energy utilization .

Drain is a notable bunching based convention [12]. In LEACH sensor nodes are sorted out into the bunch. Each group has bunch head and part nodes. Group heads in each bunch are chosen haphazardly. The principle detriment of LEACH is that if a sensor node with less remaining energy is chosen as bunch head would bite the dust rapidly; at last the entire group would progress toward becoming non-practical. Drain performs nearby handling to lessen the measure of information being transmitted to the BS, subsequently diminishing energy utilization and enhancing system lifetime.

III. PROPOSED METHODOLOGY

Here explanation of proposed work is done by two module first was clustering of node while in second explanation of routing of nodes packet was done. So reading this part make clear understanding of whole work in detail. In this work a approach is adopt for finding the best set of cluster center by using SECM (Single Element Cluster Merging). Here whole work is depend on the random condition of the available energy present in different nodes. In this work energy obtained from the nodes act as important feature for the cluster center selection. Routing was done by developing line route to the base station so chance of packet collision get reduced.

Develop Region and Assign Node position

Develop an MxM region place N number of nodes present in the region. Relegate their starting energy level before transmitting and getting any bundles. Here energy utilization per unit hub is required to be evaluate. The transmission energy (E_{Tx}) and accepting energy (E_{Rx}) can be processed as pursues:

$$E_{Tx}(L,d) = E_{elec} \text{ x } L + a \text{ x } L \text{x } d^b$$

$$E_{Rx}(L,d) = E_{elec} \text{ x } L$$

where L is the information bit length, d the space among source and goal node, E_{elec} the energy utilization per bit. The estimations of a and b rely upon the estimation of d. On the off chance that d <= d0, a and b will be a_{fs} and 2, Else, they will be a_{amp} and 4. Note that a_{fs} and A_{amp} are the amplifier energy cost. For a target that is situated at a longer distance than d_0, the amplifier should expend considerably more energy to achieve it. In outline, the objective of the grouping issue of a WSN is to amplify "the alive sensors" and "the rest of the energies" of the considerable number of sensors.

Estimate K Cluster

So as to ascertain the k number of cluster value that limits the aggregate energy utilization, this work compute the subsidiary of E_{total} with k and set the subordinate as zero so as to prompt the ideal number of bunches k_{opt} to limit the absolute energy utilization of the system.

$$K_{opt} = \sqrt{\frac{N \times \varepsilon_{fs} \times M^2}{2\pi(2E_{elec} + E_A)}}$$

Where ε_{fs} is amplifier power consumption of the free-space, E_A is energy consumption required for nodes to fuse *k*-length data.

Single Node Clustering

During this algorithmic program projected work has following steps.

i. Initial generate matrix have same dimension as of input node positions then mix this matrix within the image. Here this facilitate in generating the contour within the WSN region.
ii. Currently notice contour position within the WSN region and generate contours that facilitate to find clusters of the area. This produce initial segmentation for the region.
iii. Once these contour were found within the region next is to update the various phase by finding the close to by distance from the phase region. Here if distance is small

then price of the constituent or position of that constituent is contemplate as a part of the phase. Here if distance is positive then price of the constituent or position of that constituent is contemplate as outside of the phase.

iv. Currently next step is to update the divided space by analyzing the early contour values of the phase. Here perform is thus taken that modification within the region is well acceptable for any new dynamic situation of node position.

v. Go to step (c).

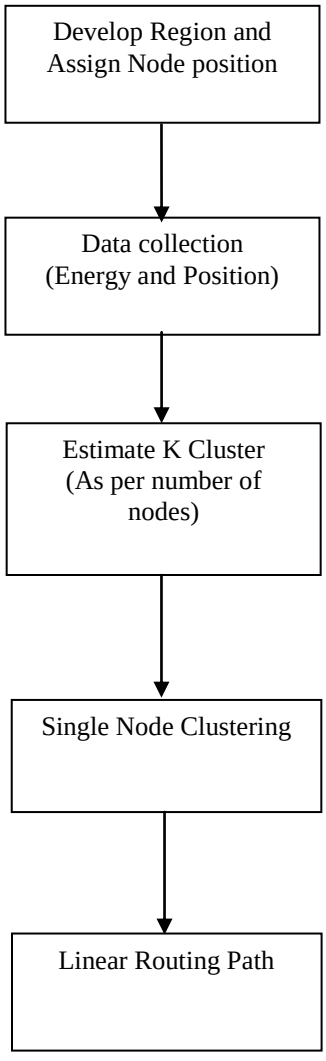

Fig. 1 Basic block diagram of proposed model.

Initial Cluster Center

In this step all nodes are consider as the cluster and each node act as cluster center of that cluster. So initially N clusters are consider in the work. After this merge nearby cluster as per cluster center energy and distance from the base station was done.

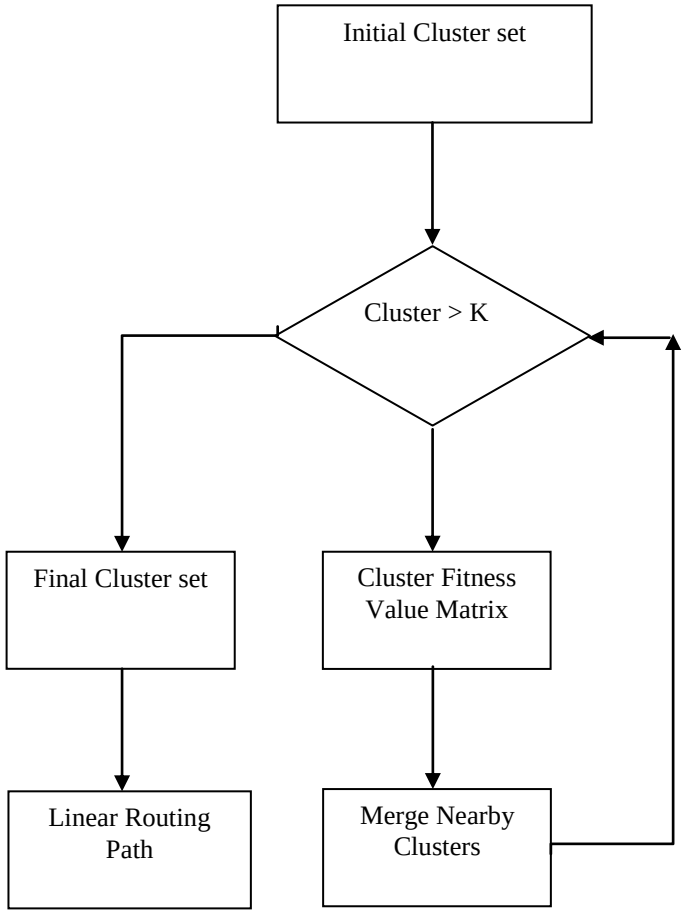

Fig. 2 Clustering and Routing steps of working.

Merge Nearby cluster

In this step different cluster present in the region are merge as per distance between cluster centers from each other. Here distance matrix was maintained were explanation of this was doen single node clustering heading poit number iii. This can be understand let Cc is number of cluster center in i^{th} iteration than distance matrix D shown in table 1 have dimensions Cc X Cc. Based on the D cluster center merging would be done.

Table 1 Represent Distance matrix D.

	C1	C2	C3	C4	C5	C6
C1	0	0.3	0.8	0.6	0.6	0.4

C2	0.3	0	0.2	0.6	0.8	0.1
C3	0.8	0.2	0	0.3	0.4	05
C4	0.6	0.6	0.3	0	0.4	0.6
C5	0.6	0.8	0.4	0.4	0	02
C6	0.4	0.1	0.5	0.6	0.2	0

Now C1 matrix was merge with C2 as distance between C1 and C2 is minimum as compared to distance from C1 to other. Now after merging single cluster left so node which have good fitness value is consider as final cluster center of this merge cluster.

Fitness Value calculation

$$FV_{ch} = \alpha E_{ch} + \beta d_{(ch,BS)}$$

Where α and β are acting as weight of the energy as well as distance feature value of cluster center. After each merging step it is essential to check that either K number of clusters left in the region or not.

Final Cluster Set

In this work after sufficient number of iteration best possible cluster centers are obtained and assign nodes to those clusters. Here each cluster is represent by its cluster center. Once K number of cluster left after continuous merging in each iteration work will obtain final cluster set.

Linear Routing Path

Here single path was logically generated from one node to base station. Here node which have highest distance from base station is considered as one end of the path. Now check nearby cluster center from the selected cluster. It is necessary to check that distance of next node should be less as compared to base station distance. This can be understand as by fig. 5.

At _rst, all of CHs are independent and do not make any connections with other nodes, so they are all active nodes and have a mode of 0. All CHs in the network broadcast their connection requests within their transmission radius. After receiving a connection request, each node can estimate the distance to each adjacent node according to the signal strength. When a node selects a neighbor node for connection, if the neighbor node has already connected or have mode 1 to other nodes, the node will select the neighbor node second nearest to it for connection. If there is still no connection with other nodes within the node coverage, it will be directly connected with the BS.

If the connection between two nodes in the network that are the closest to each other, the two nodes that are far away from each other need to be connected _nally, it will increase energy consumption. To avoid this phenomenon, the function that is inversely proportional to the distance is used to control the order of selecting one node's adjacent nodes. In this way, the nodes farther away from the base station will select the adjacent nodes preferentially, and the remaining nodes will be concentrated near the BS. The overall length of the network structure will be shortened.

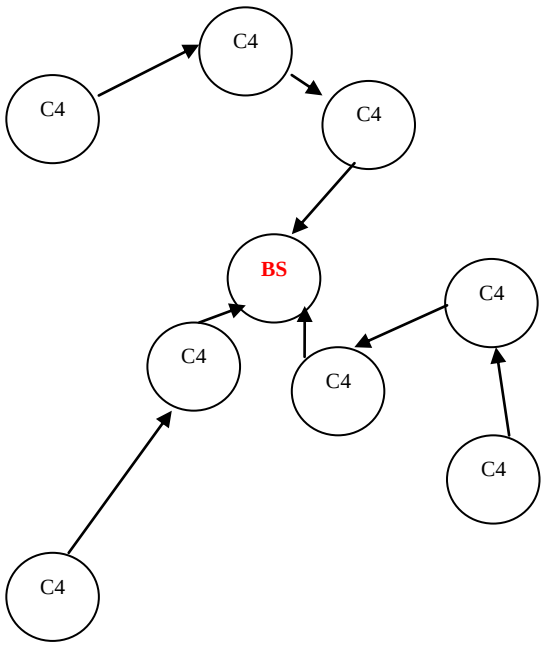

Fig. 5 Linear Routing Path for packet transfer by WSN.

IV. EXPERIMENT AND RESULT

So as to direct analysis and measure assessment results MATLAB 2012a programming tool was used. This segment of paper demonstrate test setup and results. Three set of experimental setup were utilized to assess the execution of the clustering calculation of dynamic moving sensor nodes. The main benchmark is 70 sensor nodes in a virtual space of 100m x100m locale, the second benchmark is dynamic moving 100 sensor nodes in a 100m x 100m area and third was 100 dynamic sensor node with 150m x150m area. The tests were performed on a 2.2 Giga Hertz Intel i3 processor machine, equipped with 4 Giga Byte of RAM, and running under Windows 10 operating system.

Evaluation Parameters

Number of Rounds: One cycle of sending packet from non cluster center node to Base station is considered as Round. Here numbers of round are count for each comparing methods.

Execution Time: This is the execution time of the work where cluster center were elected dynamically from available set of nodes.

Packet Transfer: This is the number of packet transfer done in the WSN while all the node get discharge, so wireless arrangement having maximum number of packet transfer is good solution.

Results

Here proposed methodology was compared with existing methods MSGR in [1]. Results of the proposed work GSCLR Algorithm Based Cluster Head Selection and routing was compared with the existing method in [1].

Table 3 Comparison of round number for First Node loss in WSN.

Region size	Nodes	MSGR	GSCLR	SNCLR
100	**70**	21846	26387	27590
100	**100**	14529	26061	26184
150	**100**	3596	26939	27034

Table 3 shows that SNCLR has improved the number of packets indifferent region and number of nodes. Here it was obtained that proposed work high packet delivery in small region while number of successful packet transfer is less in large area.

Table 4 Comparison of Number of Rounds count.

Region size	Nodes	MSGR	GSCLR	SNCLR
100	**70**	21389	27918	
100	**100**	22558	27502	
150	**100**	13595	28518	

Table 4 shows that SNCLR has improved the number of rounds in different region and number of nodes. Here it was obtained that proposed work high round delivery in small region, while number of rounds are less in large area. Here large region increase distance between nodes which increases energy requirement for transferring same packet.

Table 5 Comparison of Cluster Head Selection Execution Time in Seconds.

Region size	Nodes	MSGR	GSCLR	SNCLR
100	**70**	99.1724	78.7972	67.5443
100	**100**	108.9533	99.7856	91.3143
150	**100**	165.1919	132.568	125.7744

Table 5 shows that SNCLR has reduced the execution time for finding the cluster center. As single element mergingmethod increases the clustering approach accuracy in less time. Here it

was also obtained that MSGR algorithm was less was effective due to even odd clustering of nodes.

Table 6 Comparison of total packet trnsfer.

Region size	Nodes	MSGR	GSCLR	SNCLR
100	**70**	1115267	1834173	1075728
100	**100**	1614627	2586599	1718170
150	**100**	533961	2634932	477003

Table 3 shows that SNCLR has improved the number of packets indifferent region and number of nodes. Here it was obtained that proposed work high packet delivery in small region while number of successful packet transfer is less in large area.

Fig.6 Comparison of Node loss in network for 100x100 region and 70 nodes.

Fig. 7 Comparison of Node loss in network for 100x100 region and 100 nodes.

Fig. 8 Comparison of Node loss in network for 150x150 region and 100 nodes.

Fig. 6, 7 and 8 shows that proposed work number of rounds for SNCLR first node was always high as compared to other existing algorithm. In all set of regions it was obtained that algorithm data analysis for cluster head selection improved the work performance.

V. CONCLUSION

Wireless sensor networks are considered one of the best sources for monitoring remote fields and critical conditions which are out of range from human's perception. Here these calculation are dynamic and prepared to work continuously in unconditional circumstance without any earlier preparation. Here graph based clustering was done by using minimum spanning tree technique. While routing was done by using the single path to the base station which has also improved the proposed work SNCLR efficiently. Result shows that packet transfer rate was highly increase as compared to MSGR approach. In future a perfect algorithm is desired which can analyze data of the WSN device and increase routing in safer way against different attacks.

REFERENCES

[1]. Suraj Sharma, Deepak Puthal, Sabah Tazeen, Mukesh Prasad, And Albert Y. Zomaya. MSGR: A Mode-Switched Grid-Based Sustainable Routing Protocol for Wireless Sensor Networks.*Digital Object Identifier 10.1109/ ACCESS* October 12, 2017.

[2]. M. J. Usman, Z. Xing, H. Chiroma, A. Y. U. Gital, A. I. Abubakar, A. M. Usman and Herawan, Modified Low-Energy Adaptive Clustering Hierarchy Protocol for Efficient Energy Consumption in Wireless Sensor Networks for Healthcare Applications, International Review on Computers and Software, vol. 9, no. 11, pp. 1904-1915, 2014.

[3]. Bouachir Ons, Mnaouer Adel Ben, Touati Farid, Cresciniy Damiano, "Opportunistic Routing and Data Dissemination Protocol for Energy Harvesting Wireless Sensor Networks", 978-1-5090- 2914-3/16©2016 IEEE.

[4]. Chun-Wei Tsai, Zhen-An Liy, Ming-Chao Chiang and Chu-Sing Yang. "A novel clustering algorithm for wireless sensor network based on search economics". 2017 IEEE International Conference on Systems, Man, and Cybernetics (SMC) Banff Center, Banff, Canada, October 5-8, 2017.

[5]. M. Aslam and A. A. Ehsan Ullah Munir, Muhammad Bilal, Muhammmad Asad, 'HADCC: Hybrid Advanced Distributed and Centralized Clustering Path Planning Algorithm for WSNs', IEEE 28th International Conference on Advanced Information Networking and Applications, pp. 657–664, 2014.

[6]. I. S. Akila and R. Venkatesan, 'A Cognitive Multi-hop Clustering Approach for Wireless Sensor Networks', Wireless Personal Communications, vol. 90, no. 2, pp. 729–747, 2016.

[7]. C. P. S. S. Malarkkan, 'H-CERP: Energy Efficient Scheme for Industrial WSN Applications', Wireless Personal Communications, vol. 94, no. 4, pp. 1937– 1950, 2017.

[8]. R. Kumar and D. Kumar, 'Multi-objective fractional artificial bee colony algorithm to energy aware routing protocol in wireless sensor network', Wireless Networks, vol. 22, no. 5, pp. 1461–1474, 2016.

[9]. Ahmad A., Latif, K., Javaid, N., Khan, A. and Qasim U., "Density controlled divide-and-rule scheme for energy efficient routing in Wireless Sensor Networks," Electrical and Computer Engineering (CCECE), 2013 26th Annual IEEE Canadian Conference on, vol., no., pp.1,4, 5-8 May 2013.

[10]. Lohan P. and Chauhan R., "Geography-informed sleep scheduled and chaining based energy efficient data routing in WSN," Electrical, Electronics and Computer Science (SCEECS), 2012 IEEE Students' Conference on, vol., no., pp.1,4, 1-2 March 2012.

[11]. Gherbi Chirihane & Aliouat Zibouda, "Distributed energyefficient adaptive clustering protocol with data gathering for large-scale wireless sensor networks", Programming and Systems (ISPS), 12th International Conference, IEEE,2015.

[12]. T. Camilo, C. Carreto, J. S. Silva, F. Boavida, "An EnergyEfficient Ant-Based Routing Algorithm for Wireless Sensor Networks", 2006 Springer.

[13]. Bouachir Ons, Mnaouer Adel Ben, Touati Farid, Cresciniy Damiano, "Opportunistic Routing and Data Dissemination Protocol for Energy Harvesting Wireless Sensor Networks", 978-1-5090- 2914-3/16©2016 IEEE.

[14]. Chun-Wei Tsai, Zhen-An Liy, Ming-Chao Chiang and Chu-Sing Yang. "A novel clustering algorithm for wireless sensor network based on search economics". 2017 IEEE International Conference on Systems, Man, and Cybernetics (SMC) Banff Center, Banff, Canada, October 5-8, 2017.

[15]. Ahmad A., Latif, K., Javaid, N., Khan, A. and Qasim U., "Density controlled divide-and-rule scheme for energy efficient routing in Wireless Sensor Networks," Electrical and Computer Engineering (CCECE), 2013 26th Annual IEEE Canadian Conference on, vol., no., pp.1,4, 5-8 May 2013.

[16]. Lohan P. and Chauhan R., "Geography-informed sleep scheduled and chaining based energy efficient data routing in WSN," Electrical, Electronics and Computer Science (SCEECS), 2012 IEEE Students' Conference on, vol., no., pp.1,4, 1-2 March 2012.

[17]. Gherbi Chirihane & Aliouat Zibouda, "Distributed energyefficient adaptive clustering protocol with data gathering for large-scale wireless sensor networks", Programming and Systems (ISPS), 12th International Conference, IEEE,2015.