Novel Technique Grid Clustering by Network Analysis Optimize with Bacterial Foraging Approach

Deepak Bisht, Er. Aayushi Chadha
Universal Institute of Engg. & Tech., IKG PTU Jalandhar

Abstract - Wireless Sensor network (WSN) has added a new dimension in the field of wireless communication. In Sensor network basic challenge reduce the energy consumption of node by selecting effective nodes as cluster head. IN this paper, cluster head decision by bacterial foraging method by previous information of node in our experiment show alive node increase and cluster head more time stable in wireless network and stable network for more time compare to without optimization.

Keywords - *Wireless Sensor network, Cluster, Wireless communication, Cluster head, BFO*

I. INTRODUCTION

In look into world Wireless Sensor Network (WSN) is quickly developing and now days for inquire about researcher this is a rising zone. In ecological applications like earthquake information, animal tracking, weather information and so forth. WSNs are utilized. WSN are likewise utilized as a part of business applications, hospitality, Military applications, security, and Military application. WSN is the accumulation of minor sensor nodes outfitted with limited storage space, data gathering, integrated sensing and processing ability. Each modest hub has limited battery power which is utilized to detect the data from the sensing ranges. For the wireless sensor network the essential prerequisite is diminish the aggregate vitality utilization of the sensor nodes, while sensor nodes have limited battery power with limited lifetime, at that point at last increment the survival time of network. Amid data sensing the battery of sensor nodes can't be change in the sensor network regions [1]. In different fields from commercial and industrial to military territories WSNs are utilized. Monetarily these have capacity to convey by means of constrained memory and computing power. For calculations by energy consumption the lifetime of hub and network are specifically affected. With the hubs utilizing jump remove network including wireless communication connects the information is transmitted towards the base station, in a shaky communication medium they discuss and they frequently work unattended, where in a protected way the information should be sent. In wireless sensor networks, the pairwise key process gives the fundamental security administrations. An open key cryptography utilizes key encryption algorithm which is normally a low-power area in which cryptanalysis is utilized to extricate information for the safe transmission. Cryptographic algorithms can be named symmetric or asymmetric. For key dispersion, the hubs are deterministic in the network, and network utilizes clustering method for secure communication. The all hubs in a cluster maintain distinctive keys, however every hub utilizes same key for various communications with the base station [2]. A wireless sensor organize (WSN) has the capacity of imparting, detecting and registering and is a gathering of spatially scattered hundreds or thousands sensor nodes. In physical spaces it installed; from the earth consistently accumulate a major measure of data. From that point in numerous spaces, for example, observing, logical examinations, following and more WSN is useful innovation. With a specific topology in a zone any WSN fuse a few sinks or single, a few or single sources and numerous sensor nodes are sorted out. For example, humidity sensor, pressure sensor, sound sensor, temperature sensor, and so forth the sensor nodes can contain extraordinary. From the condition that it embedded in When this sensor nodes sense components, data by utilizing the processing units inside the sensor nodes through the simple to digital converter module the simple signal is changed over in to digital, after that for processing the data is send to the base station. To the base station Wireless sensor hub can convey specifically and furthermore it can speak with each other.

Appeared by the figure 1 the accompanying parts are contained by the sensor organize:

- Collecting Data: amid transducers that has the capacity of obtaining and detecting.
- Transport Data: amid the ad-hoc/wireless channels.
- Processing: to dissecting the data that has capacity.

In its outline WSNs confront many difficulties, where, for example, client get to and business operation it is rigid to guidelines and arrangement changes. In business necessities any progressions will be difficult to overcome by algorithms and it will require manual reconfiguration and reconstructing that is hard to oversee. From the sensor hub estimate and the sensor hub measure there is additionally many difficulties where it must be minimal to suite the reason. In restricted memory stockpiling being minimal outcomes, constrained power source and restricted calculation quality. To suit the constrained memory stockpiling in WSN the measure of information to be for all time put away into an information stockroom ought to be diminished by a specific summarization algorithm. Additionally the hub control is

imperative and on account of the little size of the nodes. By utilizing more proficient routing algorithm while it is more useful to spare the power and broaden the life time of the arrange. Arranging objects into bunches whose individuals are comparable somehow grouping is the process. In a similar group by the CH the information is gathered and amassed, and afterward to the base station it is transported. To communicate with the base station the group head is the main bunch hub that is allowed. The clog of the system and the aggregate utilized vitality will be limited by this [3]. In the life cycle of WSNs there are three stages, relocation stage, deployment stage and working stage. To start with, introductory sensor stage is sent in sensors then the opening recuperating and gap recognition is secured. This stage is otherwise called the SD (Sensor Deployment) issue. After the stage deployment, it works in the objective field sensors teams up to frame scope. Because of the vitality exhaustion or specialized issues if any sensor is down the other sensor will fill in. To stay away from scope openings the WSN will enter in the relocation stage. In the relocation phase, in look for a repetitive sensor that would takeover be able to its task any sensor needing help will send request messages (if the sensor is down, its neighboring sensors will carry out the occupation). In other words, in this stage two issues are to be tended to, a repetitive sensor is situating by one and for the excess sensor to move to the asking for put the other is arranging a way. The whole assignment is known as the SR (Sensor Relocation) issue [4].

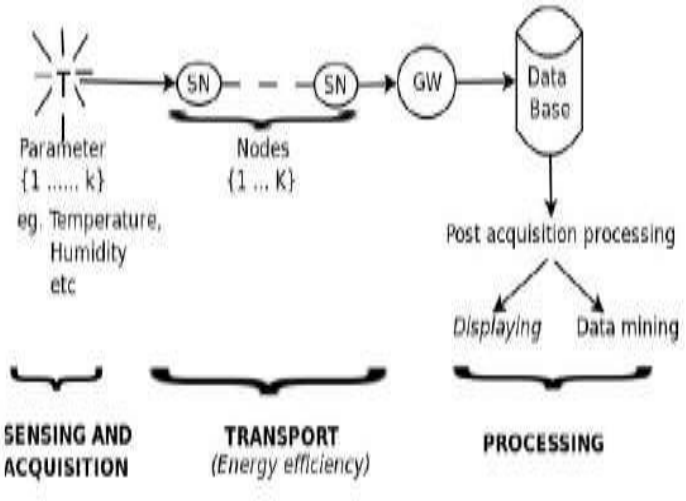


Fig.1: WSN Components [2]

II. LITERATURE REVIEW

Manoj Pant et.al.[5]based On EEBCDAa multi-hop routing protocol is proposed in this paper. As on EEBCDA it divides the sensors network into unequal grid in such way that grid that isaway from the sink hasmore number and larger size of sensor nodes.CH is performed in each grid rotation. CH collects data after the formation for next hop data transmission and to its next level neighbor grid. The amount of energy utilization is significantly reduced by this approach and hence the network lifetime is increased. The process involved for the finding of the next hop to enhance the network lifetime, in making the grid and cluster formation can be further contrive.Utpal Kumar Paul et.al. [6] with limited sources of battery powerthe sensornodes are placed at remote places and are equipped, to make the system more energy efficientproper energy efficient routingalgorithms as well as clustering protocols are highly needed. In this paper such as energy efficient clustering algorithm has been presented. Here, into small squares of cluster areas the entire are has been divided and foreach clusterin each round a separate cluster head has been assigned.I-HsuanPeng et.al. [7]in a grid based sensor networkfor information forwarding the ideal distance and bounds of energy consumptions were analyzed and derived, through exhaustive simulations the analytical results were examined. To verify with the derived upper and lower bounds the values of the maximum and the minimum energy consumption during the simulations were recorded. The validity of the proposed energy consumption bounds is verified by the results of experiments. To reduce energy consumption a multiple sources issue is investigated and a topology combination approach is proposed. With summation of the individual lower boundscompared and discussed the simulation results. Bhaskar Prince et. al [8]for larger network areaan energy efficient unevengrid clustering based routing (EEUGCR) protocol is proposed. Based on the centralized approach the protocol is proposed which uses fixed clustering. The whole network is divided by BS into fixed rectangular shaped clusters of unequal size. From the BSsize of the cluster is dependent on its distance. Due to more data handling to overcome from more energy loss at the clusters nearer to the BS, unequal size grid clustering approach is introduced by the proposed protocol. For any communication it also ensures that the transmission distance in the network is less than the threshold distance of the energy consumption model. In term of the energy consumption and data traffic it also increases load balancing.Tata JagannadhaSwamyet. al. [9]in this papertwo base station placement techniques are proposed and each one has several disadvantages and advantages. The receiving antenna should have the isotropic characteristics if Base Station is at middle of the Uniform Grid Based Sensor Filed (UGCBSF). The receiving antenna should be more directional if the Base Station antenna place at the corner of the UGBSF.. Sanu Thomaset. al. [10]for a Quadtree clustered grid based Wireless Sensor network a new way of sensor node address assignment is described. Then by one bit onlythe adjacent addresses are combined similar to as in the case of Karanaugh map simplification method. By reducing the size of the sensor address data this provide data compression as compared to the flat address system. Between every sensor

node address the Quadtree layout achieves one to one binding. Swift Singh et al. [12]In this paper, the effectiveness of these approaches has been investigated in the area of WSNs. WSN have many applications in different areas and faces many challenging issues such as optimal deployment of nodes, relay node placements, localization of nodes, coverage and connectivity, clustering, routing, data aggregation, cross-layer design, and fault tolerance. Most of these issues have been resolved by the meta-heuristic approaches with developing a new strategy. Still it is required to develop new algorithms with using the best features of meta-heuristic techniques. This work focuses on the optimal coverage-aware deployment, localization, coverage aware clustering, routing, relay node placement and cross layer design methods based on meta-heuristic algorithms. And, provide a discussion about the comparative performance evaluation of these techniques.Raghavendra V. Kulkarni et al. [13]Wireless sensor networks (WSNs) are networks of autonomous nodes used for monitoring an environment. Developers of WSNs face challenges that arise from communication link failures, memory and computational constraints, and limited energy. Many issues in WSNs are formulated as multidimensional optimization problems, and approached through bio-inspired techniques. Particle swarm optimization (PSO) is a simple, effective and computationally efficient optimization algorithm. It has been applied to address WSN issues such as optimal deployment, node localization, clustering and data-aggregation. This paper outlines issues in WSNs, introduces PSO and discusses its suitability for WSN applications. It also presents a brief survey of how PSO is tailored to address these issues.Gurjot Singh Gaba et al. [14]The prime objective behind optimized sensor deployment is to reduce sensing range of a sensor node. Proper positioning of sensor nodes leads to increased lifetime, better coverage and more connectivity among nodes. In this paper, the sensor deployment problem has been considered as a clustered approach and the solution to the optimal co-ordinates of the sensor deployment has been obtained using Bacterial Foraging Optimization.

II. METHODOLOGY

Step 1: Initialization phase:

Deploy the WSN nodes

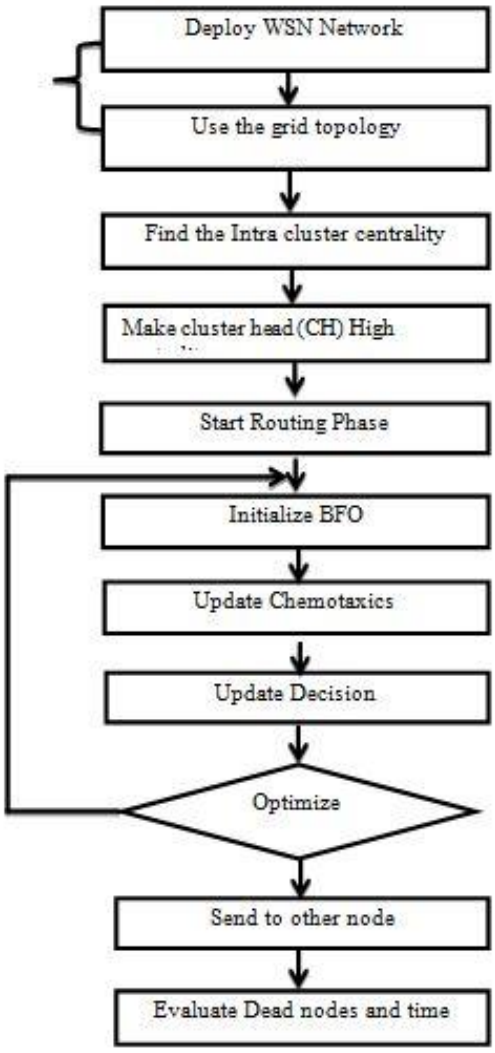
Make grid topology.

Step 2: Setup Phase:

Make cluster head with high centrality.

Step 3: Routing Phase:

Decision Routing N (I,j)



1. Initialize BFO ← Distance, Energy.
2. Start reproduction loop, change the parameters.
3. Compute the chemotaxics (Energy reduction).
4. Compute cost function
   If optimize ← yes then go to step 5 otherwise step 1.
5. Analysis Dead node and time.

Proposed Algorithm:

Proposed Algorithm

In the proposed work, Bacterial Foraging Optimization Algorithm (BFO) is used. The BFOA is stirred by the social event scrounging conduct of microscopic organisms, for example, E.coli and M.xanthus bacteria. In particular, the BFOA is energized by the chemotaxis direct of microorganisms [15] that will see substance slants in the earth, and push toward or far from particular signs. Microorganisms see the making a beeline for sustenance in context of the

slants of chemicals in their condition. So in like manner, microorganisms emanate pulling in and repulsing chemicals into nature and can see each other moderately. Utilizing speed instruments (for example, flagella), microscopic organisms can move around in their condition, every so often moving loudly (tumbling and turning), and in distinctive conditions, moving co-ordinately that might be implied as swimming. Bacterial cells are managed like administrators in an area, utilizing their perspective of sustenance and distinctive cells as motivation to move, and stochastic tumbling and swimming like improvement to re-discover. Dependent upon the cell-cell interchanges, cells may swarm a sustenance source, and also may commandingly rebuke or caress each other. The information prepares strategy of the count for engaging cells stochastically and all in all swarm toward optima. This is achieved about an array of triple processes on a state of sham cells: 1) 'Chemotaxis' – the cost of cells is lowered individually by their closeness to diverse cells and cells skate the manipulated cost face one at a time, 2) 'Reproduction' – only the pioneers in the above said cells may create the heirs, and 3) Elimination-dispersal' – loser cells are scrapped and new arbitrary samples are infused as fresh ones.

Pseudo code:

Input: $Prob_{size}$, $Cells_N$, N_i, N_r, N_{tc}, N_{cc}, st_{size}, D_{bss}, W_{ass}, H_{rep}, W_{rep}, P_{li}
Output: $cell_j$
Population←initialize population ($cells_k$, $Prob_{size}$)
For ($L=0_{to}N_i$)
For ($N=0_{to}N_r$)
For ($j=0_{to}N_{ts}$)
Chemotaxis and Swim (*population*, $prob_{size}$, $cells_n$, N_{cc}, st_{size}, D_{bss}, W_{bss}, H_{rep}, W_{rep} **)**
For *(cell∈population)*
If ($cost(cell) \leq cost(cell_m)$)
$Cell_{m \leftarrow cell}$
End
End
End
Sort by $cell_{health}$*(population)*
Select←by $cell_{health}(population, \frac{cellc_n}{2})$
population←select
population←select
End
For (*cell∈population*)
If ($random() \leq p_{di}$)
cell←create cell at *random location ()*
End
End
Return ($cell_m$)

IV. RESULTS

Figure 4.1 Grid routing simulation in MATLAB

The figure shows the grid routing simulationin MATALAB.

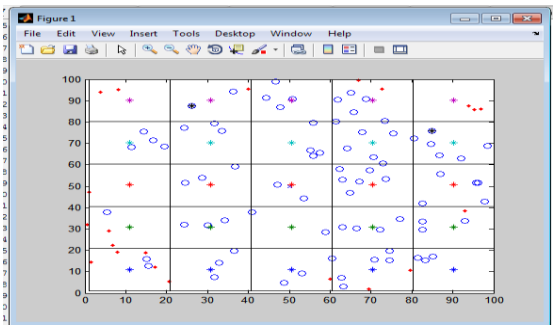


Figure 4.2 Comparison of clusterhead vs ROUNDS in existing and proposed method.

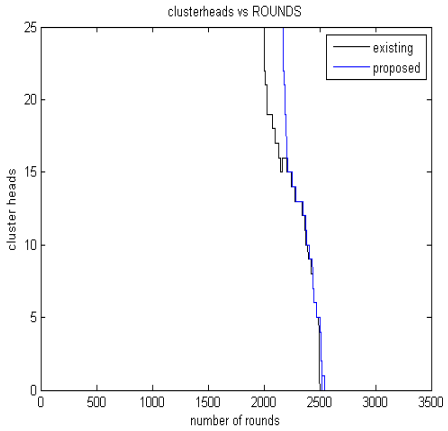
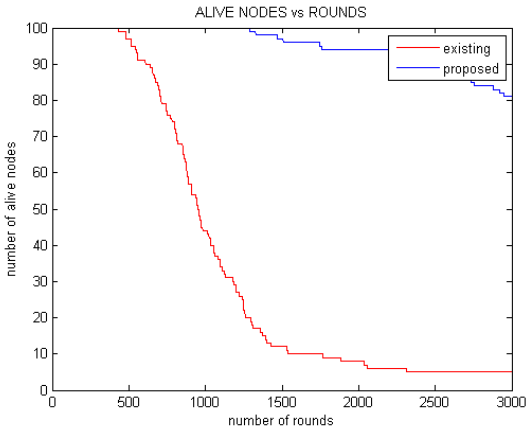


Figure 4.3 Comparison of ALIVE NODES vs ROUNDS in existing and proposed method.



V. REFERNCES

[1]. Ali, Abdul Wahid, Parma Nand, and Rani Astya. "Elongate the lifetime of the network using grid based cluster with backbone spanning tree for wireless sensor networks." *Computing, Communication and Automation (ICCCA), 2016 International Conference on*.IEEE, 2016.

[2]. Manjunath, C. R., SindhuAnand, and G. S. Nagaraja. "An hybrid secure scheme for secure transmission in grid based Wireless Sensor Network." *Advance Computing Conference (IACC), 2015 IEEE International*.IEEE, 2015.

[3]. Abdullah, Manal, Hend Nour Eldin, Tahani Al-Moshadak, Rawan Alshaik, and Inas Al-Anesi. "Density Grid-Based Clustering for Wireless Sensors Networks." *Procedia Computer Science* 65 (2015): 35-47.

[4]. Cheng, Chien-Fu, and Chih-Wei Huang. "An energy-balanced and timely self-relocation algorithm for grid-based mobile wsns." *IEEE Sensors Journal* 15.8 (2015): 4184-4193.

[5]. Pant, Manoj, BiswanathDey, and Sukumar Nandi. "A multihop routing protocol for wireless sensor network based on grid clustering." *Applications and Innovations in Mobile Computing (AIMoC), 2015*.IEEE, 2015.

[6]. Paul, Utpal Kumar, and SudiptaChattopadhyay. "A novel grid based energy efficient routing algorithm for Wireless Sensor networks." *Wireless Communications, Signal Processing and Networking (WiSPNET), International Conference on*. IEEE, 2016.

[7]. Peng, I-Hsuan, and Yen-Wen Chen. "Energy consumption bounds analysis and its applications for grid based wireless sensor networks." *Journal of Network and Computer Applications* 36.1 (2013): 444-451.

[8]. Prince, Bhaskar, Prabhat Kumar, M. P. Singh, and Jyoti Prakash Singh. "An energy efficient uneven grid clustering based routing protocol for Wireless Sensor Networks." In *Wireless Communications, Signal Processing and Networking (WiSPNET), International Conference on*, pp. 1580-1584. IEEE, 2016.

[9]. Swamy, Tata Jagannadha, ThaskaniSandhya, and Garimella Ramamurthy. "Link evaluation of uniform grid based wireless sensor networks to base station with leveling and clustering." *Computer Communication and Informatics (ICCCI), 2013 International Conference on*.IEEE, 2013.

[10]. Thomas, Sanu, and Thomaskutty Mathew. "Lossless address data compression using quadtree clustering of the sensors in a grid based WSN." *Ad Hoc Networks* (2016).

[11]. Liu, Xuxun. "Atypical hierarchical routing protocols for wireless sensor networks: A review." *IEEE Sensors Journal* 15.10 (2015): 5372-5383.

[12]. Singh, Surjit, and Rajeev Mohan Sharma. "Optimization Techniques in Wireless Sensor Networks." *Proceedings of the Second International Conference on Information and Communication Technology for Competitive Strategies*.ACM, 2016.

[13]. Kulkarni, Raghavendra V., and Ganesh Kumar Venayagamoorthy. "Particle swarm optimization in wireless-sensor networks: A brief survey." *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)* 41.2 (2011): 262-267.

[14]. Gaba, Gurjot Singh, Kanwaljit Singh, and Balwinder Singh Dhaliwal. "Sensor node deployment using bacterial foraging optimization." *Recent Trends in Information Systems (ReTIS), 2011 International Conference on*.IEEE, 2011.