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PROPOSED HYBRID ELEPHANT HERDING OPTIMIZATION APPROACH FOR EXTENDING LIFETIME OF WIRELESS SENSOR NETWORKS

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***Abstract*—Wireless sensor networks are focusing for improving the network performance, communication effectiveness, and improving energy efficient using various novel approaches. The interconnecting sensor nodes are performed by sensing task. Here the animals and natural behavior of optimization algorithm improves the performance of large scale networks. Existing approach uses Ant colony optimizer, honey bee colony, bird flocks and fish swarm optimization algorithms. Cluster head selection in WSN is improved by individual strategies based hybrid elephant herding optimization algorithm. In this proposed method, network lifetime improvement in WSN is done with proposed hybrid elephant herding optimization approach. Here the cluster head selection process is done with WSN and it is improved by proposed optimization approach, which selects the cluster head based on tracking process of sensor nodes. Updating the clan operator in optimization algorithm is measures the scale factor of elephant random walk. Potentially updated sensor nodes are selected on the cluster of wireless sensor network. The experimental result analyzed with the parameters of energy efficiency, network lifetime, and throughput. By comparing proposed and existing approach, the performance results are improved for selecting effective and timely efficient cluster head selection process on WSN using proposed hybrid elephant optimization algorithm. Therefore, the proposed approach highly effective gives the performance of network communication in WSN.**

Keywords- Proposed hybrid elephant herding optimization; network lifetime; WSN; cluster head selection; sensor nodes;

I. INTRODUCTION

Bio inspired optimization algorithms are used in recent research works for performing various application in wireless sensor networks and improving the performance result. Clustering on the wireless sensor nodes are chosen to perform the function of WSN communications. The application of WSN is widely used in recent day life style everywhere like military, network communication on large scale data, etc. acoustic localization approach is performed for energy efficient wireless sensor network. Global optimization approach is applied for improving the performance of WSN like network lifetime, energy efficient, transmission rate, selection and performance of sensor nodes [1]. Various mathematical approaches and natural inspired optimization algorithms are employed to improve the performance of WSN in variety of applications. The clustering algorithm on suitable sensor node is selected based on the function of sensors and it is enhanced with optimization approach.

The probability of cluster head is selected by optimal node points and it uses optimization algorithms such as PSO, genetic algorithm and other natural inspired algorithms. Swarm intelligence algorithm is performed based on metaheuristic approach for solving the localization problem in WSN [2]. Here the target node and anchor node is located on the distance between the sensors, which is selected by forming heads. The performance of WSN is done with cluster head selection process, which is enhanced by various optimization approaches. The distribution sensor nodes are

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monitoring the location of sensor for selecting the function of sensors based on the applications. Multiple stages of the optimization algorithm provide the execution performance better through various novelties in the approach. The elephant herding optimization approach is performed well with the WSN applications. Here the cluster head selection is the major process to enhance the performance of WSN. Exiting approach is done with hybrid optimization algorithm for selecting cluster heads to perform function of sensor nodes in WSN. The distance between target node and anchor node is measured to obtain the beat receiver node for selecting cluster head in wireless sensor networks. Here the 2D WSN monitoring environment is used to measure the distance for framing cluster heads from active sensor nodes. Various animal and natural optimization behaviors improves the performance of WSN; mainly for modeling energy efficient Wireless Sensor Network [4]. The fundamental challenge in extending network lifetime of network is based on the generic flow of cluster formation and selection in WSN. The general processing flow model of cluster selection in WSN is given in figure 1.

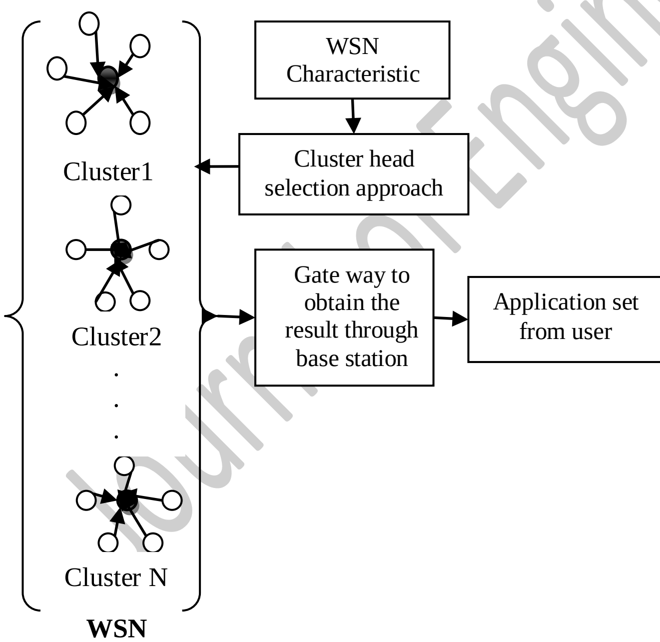

Fig1. Generic process flow of cluster head selection in WSN

The exploitation and exploration of metaheuristic approach searches the optimal clusters based on the active sensor nodes; this process makes the effective local optimization. Balance between these two things improves the searching process of optimal value. In this, the solution of each population is determined by utilizing dynamic search approach. The hybridized EHO is a metaheuristic approach, which is applied based on swam intelligence algorithm [9]. Structural communication between the inside and outside clans of elephant, which is differs with communication environments. Fuzzy environment makes the effective controlling strategy in cluster head process on WSN [5]. The LEACH stochastic algorithm is used to for cluster head selection, which is modifying the probability of sensor node for energy level improvement in WSN while performing transmission of network performance. Spatio-temporal variation is done with the different regions on network layers. Mobility of sensor node in WSN is uniformly energized on the symmetric propagation channel. EHO and tree growth algorithm is used for node localization approach in WSN. Swarm intelligence makes the enhanced performance for reducing localization problem and it determined based on the distance measurement of sensor nodes [12]. NP hardness on tree growth algorithm is tested targeted node. This instance is compared to obtain optimal circuit; the comparisons are PSO, cuckoo search algorithm, butterfly optimization and firefly optimization approaches.

The krill herd optimization algorithm is used for cluster head selection process in WSN. Here the data transformation, conversion of sensor nodes and scalability is measured to enhance the performance of network lifetime [22]. The range based localization technique is applied for selection of cluster head based on the performance of sensor nodes in WSN. The possibility of environmental monitoring has difficult localization approach and it coordinate with position of each sensor nodes. Existing work uses 2D environment monitoring system on WSN for analyzing target and anchor node's positions for updating each instance. The tree growth algorithm is applied for reducing localization process and it will not select the exact clustering formations. Dynamic search optimization is rarely used algorithm in WSN and it observes the domain and range based approaches. Sampling process of spider monkey optimization is used for cluster head selection process [11]. The proposed model uses hybrid elephant herding optimization algorithm for selecting cluster head selection approach on WSN. Here the

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energy efficient and network lifetime improvement is done with novel technique, which helps to utilize the better circuit model in WSN. By updating random walk on the P-HEHO of clan is improving the performance of WSN. The network lifetime is extended to obtain the better selection of cluster head selection approach.

This paper summarizes as follows. Section II describes about the survey of proposed methodology related works and existing algorithms. Section 3 presents the existing methodology and its drawbacks. Section 4 proposes the proposed methodology, algorithms and applications. Section 5 describes the experimental results and evaluation reports. Finally the section concluded with objective and result achievements and also with future scope.

II. LITERATURE SURVEY

Alaa A K Ismaeel, et. al. (2017) has described the elephant herding optimization algorithm for global optimization approach. Based on the population of swarm, the optimization is performed, which mimics the elephant's herding behavior for updating clan. EHO is dealing with NP hard problem task on localization problem in WSN. Here the convergence error is overcome by operators used in this paper, which reduces the localization problem. The operators are clan and separate operators are used here to enhance the global optimization approach. This paper also performs the testing with CEC'17 benchmark framework and it comparing with the other approaches such as EHO, PSO, Ant lion optimizer and Bird swarm optimizer. Here the local optimal problem to demonstrate the benchmark circuit is investigated with this testing experiment. This approach satisfies the limitations of exploration affect by convergence of operators, unbalanced condition in exploration and exploitation and skewed distribution function is reducing the search process of elephant positions.

Palvinder Singh Mann, and Satvir Singh, (2016) have performed the clustering and routing performance in WSN using artificial bee colony optimization algorithm for enhancing the performance of WSN. Metaheuristic approach is applied for swarm intelligence based routing protocol in WSN. Here the linear and non-linear programming formulation is used for cluster oriented protocols in WSN. The sensor nodes are employed on the square field of network model, which selects the cluster formation node. Here the data aggregation process combines the multiple sensor nodes for cluster scheme, which processed with TDMA scheduling approach. Hop count from the sensor node is used to select cluster head in WSN. Fitness function of optimized sensor node has forming the clusters on routing scheme to reduce the energy consumption.

Bandi Rambabu, et. al. (2019) has presented the artificial bee colony optimization algorithm and Monarchy butterfly optimizer for cluster selection approach in WSN. Global search optimization performed with exploitation and exploration approach of sensor node in WSN. Anchor node is to find the optimal value of maximum sensor node and it measures the cluster head selection approach. Active sensor node is searched with the iteration process of optimizer. The overloaded sensor node is deployed on decay mode and it determines the better deployment model of cluster head selection approach. QoS is determined on the WSN by obtaining better cluster head selection process. The probability of fitness value is determined onlooker bee phase algorithm for getting optimal value of sensor node.

Jin-Gu Lee, et. al. (2019) has proposed the cluster head selection approach in WSN using sampling method of spider monkey optimization approach. The stability of WSN is a challenging task in this model, which selected the sampling model for selecting the cluster head from sensor node. Location based searching process sometime leads the problem of execution since it selects the sampling based node. The energy efficient circuit is designed for updating each sensor nodes using adaptive clustering process. This optimization algorithm mimics the spider monkey foraging. Here the probability function of sampling process is distributed on the search place to select the best optimal value of cluster head from the sensor nodes. Learning phase and decision phase is lead with local and global factors of WSN protocols. This protocol provides the communication between base station and cluster head nodes by using time division multiple access approach.

Sandeep Verma, et. al. (2019) has proposed the design model of heterogeneous wireless sensor networks. In this, the optimized cluster head selection is done with genetic algorithm, which performs the single

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and multiple sinks optimization. Clustering based routing approach uses dynamic searching algorithm for reducing hot-spot problem in WSN communications. Stochastic optimization of GA is used for cluster head selection process and it adapted the various species of sensor nodes. Rational operator is applied on the selected chromosomes to find the fitness value, which helps to ensure the network integrity. Distance between node and sink is finding the fitness value of best chromosomes to get the targeted sensor nodes. Intra-cluster communication improves the sensor node density, which represents the framed chromosomes fitness value. Stability of this method proposed method analysis the dead node, throughput, and network lifetime.

Jiang Li, et. al. (2019) has presented the enhanced optimization approach of elephant herding algorithm. Here the novel individual updating strategy is applied on large-scale optimization problem. Here the swarm intelligence approach is used for updating strategy of optimizer. Weight function is determined for all random selection of cluster heads in WSN. Individual elephant updates the position of clan by sensor node and the fitness function is evaluated by varying benchmark model of cluster head selection approach. The test function is determined by utilizing the weight function of individual nodes and the standard value is updated for finding best optimal value.

Huseyin Hakli, (2020) has described the binary variant function on EHO, which reduces the knapsack problem. This algorithm is used to find the location and wind turbine placement. 0-1 knapsack is a NP hard problem, which reduces the network capacity. Therefore the main objective of this paper is to maximize the profit of each constraint. Division of whole population into the clan is updated based on the elitism strategy. Here the clan updating operator counts the round of each random walk of elephant and it measures the dimensions for updating clan to find the optimal value. The grid structure of wind model is considered as sensor nodes of network model, which find the optimal value for location identification process. Search space is strengthening to detect the optimal value. However this method has some binary problem on continuous searching approach. . Pravinthraja et., al (2016) discussed about the performance metrics in the MANET and routing protocols for transmitting the packets in the MANET network. It faces a disadvantage when the topology is changed.

Sandra Sendra, et. al. (2015) has presented the animal and natural behavior based optimization approach for WSN applications. Here this method capable to perform large scale database on WSN, which reduces the unattended operations and it improving the resource constraints of sensor networks. Bio-inspired optimization algorithm is functioning with different behavior of patterns. Routing protocol makes the better network topology on multi-hop wireless network. In this paper, various optimization approaches is studied for different applications. The animal behaviors like monkey, elephant, termites, and predator-prey behaviors are used for various optimizations. PSO and GA is common optimization approach in WSN. Ant-colony, bee honey, fish swarm, firefly and spider optimization technique is employed for various applications. Elephant swarm and elephant herding optimization approach is widely used for large scale database of WSN applications.

Puneet Azad, and Vidushi Sharma, (2013) has proposed the fuzzy based cluster head selection approach in WSN. Here the fuzzy environment is performed under the selection process of clusters from the sensor nodes. The cluster heads are elected with the homogeneous environment for extending the network lifetime. Multiple attributes are analyzed and it performed with decision making process for getting optimized sensor nodes. Here the distributed approach of agglomerative clustering algorithm is designed to perform effective network optimization on homogeneous environment. In this, the pareto optimal plot helps to improve the network lifetime. LEACH algorithm improves the transmission rate on network cycle of WSN. This approach compares the fuzzy based and distributed approach, which also measures the distance BS node and neighbor nodes.

Sergio D Correia, et. al. (2018) has implemented the elephant herding optimization algorithm for application of various acoustic localization processes. Here, various natural inspired algorithms are compared for reducing the np-hard problem. Energy based elephant position searching process improves the overall network model. Here the acoustic measurement is studied and implemented effectively with elephant

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herding optimization approach. In this, the decay model considers the 2D sensor nodes, which has source node on outdoor environment; this performance measures with frequency sampling process. Here the EHO app4oach utilizes clan and separation operator. Here this, stochastic behavior approach implemented and validated for improving the network performance of WSN. The performance is analyzed with field measurements, RMSE, and signal measurements as distance vector. Pravinthraja et., al (2018) described about the applications of sensors and internet of things to manage the cattle farm in terms of feeding, watering and receiving the supplies.

Ivana Strumerger, et. al. (2018) has designed the EHO approach for reducing the localization problem in WSN. The node localization process founds the location/positions of sensor nodes and it randomly selected to form the optimal fitness value. The network routing process covers the overall active sensor nodes on the WSN. Global positioning approach is used for selecting the clusters on the wireless sensor networks. Here the elephant communication is mimics with clan operator and this natural behavior makes the better performance of EHO. Number of nodes, anchor and source node is calculated to compare the other optimization techniques like ABC, PSO, MSABC, etc., here this natural inspired behavior of elephant improves the result on wireless sensor network models.

III. EXISTING METHOD

From this above analysis, the cluster head selection process performed effectively with elephant herding optimization algorithm, which mimics the behavior of elephant. The wireless sensor network model performed for various applications and also it handles the large scale database. In this section, the previous work of individual updating strategy on H-EHO is applied for cluster head selection process on WSN. This method reduces the exploitation and exploration least search process of cluster heads from the sensor nodes.

A. NIUS-Hybrid Elephant Optimization algorithm:

The novel individual updating strategy on the hybrid-EHO algorithm is applied for selecting cluster head from the WSN [9]. The sensor nodes are framing the clusters based on the application or database. This method handles large scale database for improving network performance. NP-hard problem is reduced on the localization approach based on clan and separation operators. This approach searches the distance of 100*100 meters by handling 1000 sensor nodes on the WSN. The distance and location of base station is mapping the search place shorter by elephant herding optimization approach. The implementation of simulated result provides the better result. The network lifetime, communication/transmission rate, throughput, reliability and scalability is measured for obtaining better results. Existing approach designed to improve the network lifetime of sensor node, but it has the drawback in updating each elephant positions therefore it extends also the time consumption. Therefore, this problem is reduced by extending the network lifetime using proposed hybrid-model of EHO algorithm on the routing process of WSN communications.

Initially, it measures the active sensor node then it selected the active function of framed clusters on WSN. This method also measures the percentage of dead sensor nodes for increasing the reliability of WSN communication. In this, the cluster head selection process is improved by varying random walk method for reducing ignorance of updating strategy in the position finding behavior. The previous work utilizes drop tail queue type of network interface model. Every sink node is determined by the hop of WSN model and it determines the optimized value of fitness function in H-EHO. This method validates the result of network lifetime, end-to-end delay, energy, and packet delivery ratio. The next section updates the optimization algorithm for improving network lifetime than this existing approach.

IV. PROPOSED METHODOLOGY

The wireless sensor network application utilizes more energy on sensor network communication. The EHO mimics the elephant behavior for effective optimization in WSN. Here the multi-hop transmission network is aggregating the various transmit data on the member of sensor nodes. The proposed approach aims to reduce the drawbacks of existing approach like, decreased throughput, packet delivery ratio and lower energy transmission. The grouping of sensor nodes is called clusters, which performs the functions of given applications. Local and global optimization approach uses exploitation and exploration of hybridization

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approach. In WSN, the sensor node is considered as elephant and clusters are the clan, which jointly identified with cluster head that is matriarch. Every cluster has equal and fixed sensor nodes, which update the position based on clan operator of optimization approach. The fitness value of every sensor node is determined with separation node. Cluster head is framed with highest potential value of sensor nodes.

Clan operator,

$$X_{new,c,e} = X_{c,e} + \propto \left(X_{best_{clan}} - X_{c,e}\right) O_{fit} \quad (1)$$

$$X_{new,c,e} = \beta(X_{center\_clan}) \quad (2)$$

Where, the center of clan operator is obtained by below equation. In this, the dimension is measured to get the search process effectiveness.

$$X_{center_{clan},dim,c} = \frac{1}{nc} \sum_{e=1}^{n_{clan}} X_{c,e,dim} \quad (3)$$

The elephant clan is denoted as 'c' and elephant of sensor node is represented as 'e'. Both its updates the position of matriarch x(c,e).The scale factor of matriarch is used to obtain the fitness value of updated elephant. The separation operation helps to recognize the clan position for finding the individual nodes for getting optimal value. In clan operator, the best possible value is updated and the separation operator measures the worst clan value based on minimum and maximum instance. The optimizer initializes the upper and lower bound that is Xmin and Xmax.

Separation operator,

$$X_{worst\_clan} = Xmin + (Xmax - Xmin + 1) * R \quad (4)$$

Exploitation and exploration of H-EHO is achieved by updating the position of elephant. Here the maximum fitness value is generated the clan 'c' and matriarch 'M(x)' at the time function't'. Fitness of max_clan is given by,

$$M(x) = \underset{x \epsilon c}{\operatorname{argmax}} F(X) \quad (5)$$

The updating process of clan operator in EHO is updating the position. Based on the scale factor α € [0,1], the position β € [0,1] is updated and it determines the factor ρ.

Matrix form of updated clan is,

$$X_{c,e}(t+1) = X_{c,e}(t) + \propto \left(M(x+t) - X_{c,e}(t)\right) + \beta\left(c(t) - X_{c,e}(t)\right) + \rho R \quad (6)$$

Where, the clan operator with center position c(t) is given by,

$$c(t) = \frac{1}{n} \sum_{e} X_{c,e}(t) \quad (7)$$

The stochastic behavior of distributed function frames the uniform matriarch for making cluster from the sensor node of WSN. Skewed distribution function is initializing with the separation operator based on the position of elephant. Random walk of elephant clan is determined lower and upper bound based on uniform distribution function and the individuals are generated with random vector.

A. Proposed H-EHO

The proposed hybrid EHO uses elitism strategy for updating best position of sensor nodes based on clan and separation operator. Initially, the best position is updated though finding the weight function of uniform distribution on the overall area. The best position is updated and the worst value in separation operator is replaced to update the best position of clan on exploration process. It searches every iteration for updating the value of cluster (elephant_clan). Cluster head selection process updates the matriarch of fitness value and it finds the optimal value of large scale data. The convergence rate is reduced to obtain better time consumption for getting energy efficient network model. The position of each sensor node is determined by,

$$Pi(t+1) = aQi(t+1) + bPi(t) \quad (8)$$

Here the 'a' and 'b' of weight factor is determined y maximum iteration. The fitness vector is randomly analyzed on the clusters based on time 't'.

$$a = Vrand(t) \quad (9)$$

$$b = 1 - Vrand(t) \quad (10)$$

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Where, the position of sensor node Pi(t+1) is updated with iteration of fitness value and it has the weight factor of (a+b+1). The random walk is updated to find the location and it measures the maximum population for getting better optimal value. The cluster head is updated with given equation.

$$Pi(t+1) = aQi(t+1) + b1Pi(t) + b2Pi(t) \tag{11}$$

Number of sensor node is generating the cluster head on WSN and it identifies the maximum population diversity vector. Here the weight factor is considered as a+b1+b2=1, which updates the random vector for getting best population value. In this the weight factor is updated with random walk of elephant and the iteration is finding the fitness value 'Iteration (It € [1,2,…..n])'. The first to third weight factor is given as,

$$a = Vrand\ (It) \tag{12}$$

$$b1 = (1 - Vrand(It))\frac{Fi(t-1)}{Fi(t-1)+Fi(t)} \tag{13}$$

$$b2 = (1 - Vrand(It))\frac{Fi(t)}{Fi(t-1)+Fi(t)} \tag{14}$$

Here the random selection process of cluster head is optimized through updating every sensor node with its iteration. The threshold value is analyzed for selecting cluster head and randomly analyzed position is updated for iteration basis function.

B. Cluster head selection process in WSN

The cluster head is framed based on the functions of sensor node and it measures the position for updating weight factor, which is used to obtain the fitness value of cluster head selection process. Network router is framed to gather information about the sensor node and the number of sensor node framing the cluster, which performs the communication of network model. The router is setup for selection process of cluster head, which is shown in fig2.

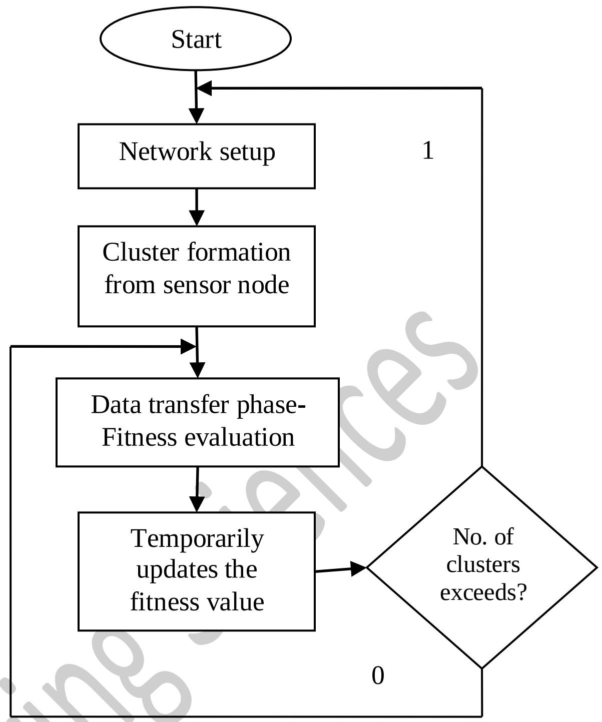

Fig2. Routing process of cluster in WSN

In this, the network model is setup with application of WSN and it forms the clusters based on availability of sensor nodes. Data transformation is performed with active sensor nodes and it selects the cluster randomly for optimization. The fitness value is evaluated by updating position of individual nodes. If it exceeds the cluster counts, the process will continued and for searching missing nodes and performs the operation.

C. Extending the Network lifetime

The main objective of this proposed H-EHO for WSN is extending network life time and energy efficiency. The objective is achieved by time consumption reduction and effective communication in network model, which improves the overall performance of Wireless Sensor Network communication. Here the threshold based random selection of cluster head selection process improves the result than existing approach. The process flow of network lifetime achievement is given in figure 3. In this, the updating strategy is employed only for updating position of elephant–clan (cluster node) and

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every time it gives the recent position for getting effective fitness value.

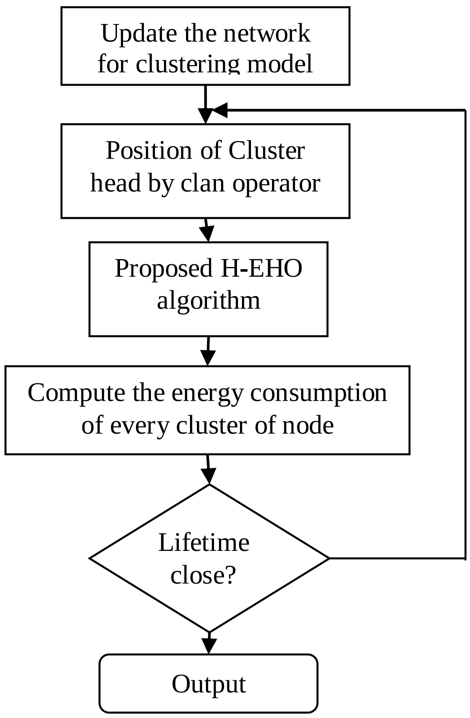

Fig3. Process flow of network lifetime extension

Based on the iteration level and fitness vector, the random value of cluster head is selected. Number of sensor node with its selected iteration is identified to find the maximum population cluster. Therefore, the routing process in WSN communication using hybrid model of threshold based elephant herding optimization approach. In this, the network lifetime extension and energy efficient model is designed and obtain the best result than recent related literatures.

V. EXPERIMENTAL RESULT AND DISCUSSION

The design model of proposed H-EHO is performed the cluster head selection approach. Here the routing process of cluster formation and selection is performed on WSN. Benchmark design simulation is compared with other existing approaches like Artificial Bee colony optimization for cluster selection approaches in WSN and KHA optimized cluster selection approach. The setup parameter of simulation is implemented with 400*400 meters of area, in this, 2000 sensor node is used and it searches for random selection process. Setup parameter of simulation experiment is tabled for implementation, which is given in table 1. The communication overhead is changed under the network size and the network lifetime extension is the major thing to enhance the performance of WSN, which utilizes network overhead, size and throughput. End-to-end delay and network size improves the performance of energy efficient system.

Table1: System parameters for implementation

Simulation Parameters	The values used for simulation
Simulation Area	400*400 meters
Number of sensor nodes	2000
Initial Energy of sensor nodes	1 Joules
Speed	1-15 meters per second
Control packet length	50 bytes
Data packet Length	512 bytes
Mobility Model	Threshold-Random way
Interface Queue Type	Drop tail
Size of the packets	2000 bits
Distance to the base station	50 meters
Location of the base station	(200,200)
Communication Model	Bidirectional

The simulation process investigates the benchmark model of existing ABC-MBOA-OCHS, ABC-OCHS, EEST-OCHS, KHA-OCHS and NIUS-HEHO scheme. Here the evaluation process of Proposed H-EHO algorithm is modeled for improving the performance of WSN communication. Active and inactive sensor node is analyzed for getting effective cluster scheme in WSN.

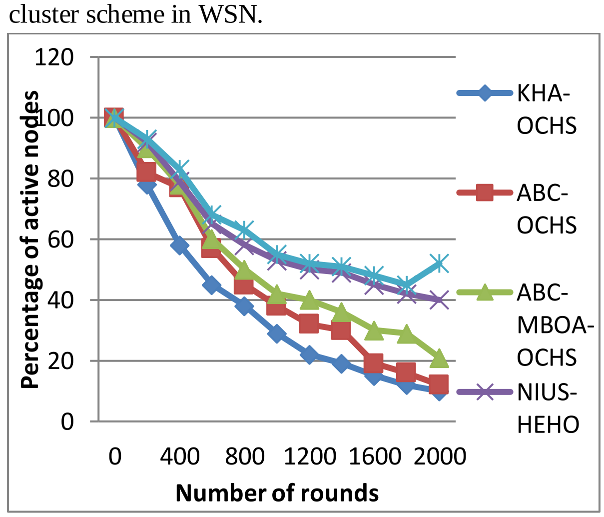

Fig4. Percentage of active node under number of rounds

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Here this active and dead sensor node helps to analyze the energy consumption of WSN and the network overhead is evaluated based on the network size. Here the percentage of active node and dead node is mapped with number of rounds (sensor node); in this the active sensor node vs number of round is given in the figure4 and dead sensor node vs number of round is shown in figure 5.

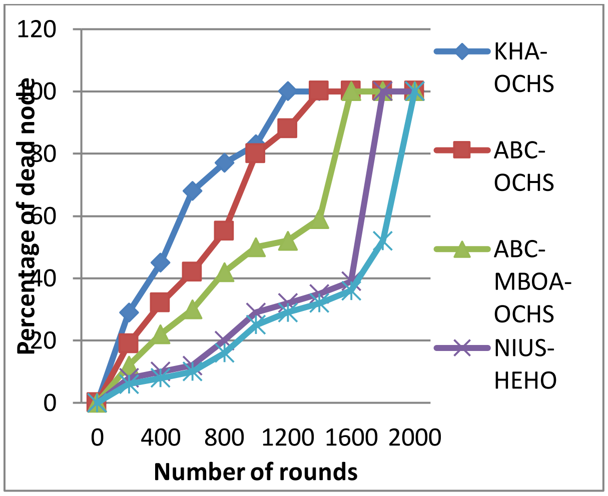

Fig5. Percentage of dead nodes under number of rounds

The throughput and energy efficient system is created with proposed approach and it measures the unit of throughput (bits/sec) and energy (Joules). The throughput analysis is given in figure 6 and the energy graph is given in figure 7.

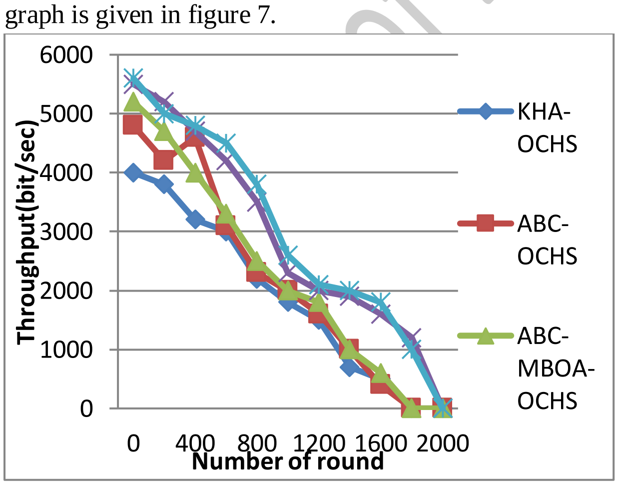

Fig6. Throughput evaluation

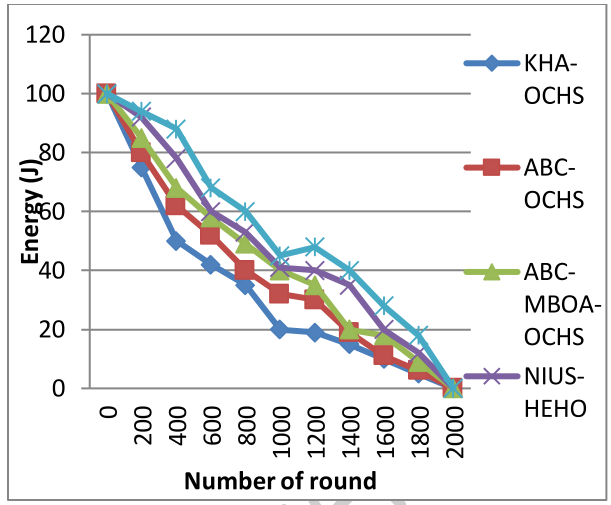

Fig7. Comparison of energy consumption

The performance analysis of WSN in the process of cluster head selection is done with proposed H-EHO algorithm. Here the threshold based random analysis of position mapping helps to enhance the performance. The overall performance analysis of existing and proposed method is given in the figure 8.

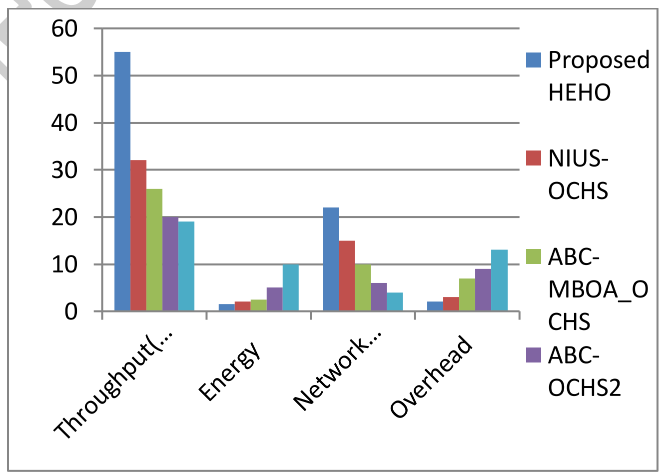

Fig8. Comparison result of overall performance at increased 1000 sensor nodes

The comparison results of proposed and existing approaches are done for improving the performance of WSN communication. The proposed methods objective is achieved the network lifetime and communication throughput. The overhead of network performance is measured for reducing the network overhead problem, which is done by analyzing network size and it depends on cluster node.

Table2: Overall performance of WSN in the process of cluster head selection

Methods	Through put (Mbps)	Energy (J)	Network lifetime	Overhead
KHA-OCHS [22]	19	10	4	13
ABC-OCHS [2]	20	6.6	6	9
ABC-MBOA-OCHS [6]	26	4.01	10	8
NIUS-OCHS	32	3.2	15	4
Proposed H-EHO [9]	55	2.5	22	2.5

Thus the design model of proposed hybrid-Elephant Herding Optimization algorithm is applied for cluster head selection process in WSN. Energy dissipation is reduced for getting energy efficient WSN communication and the overhead problem is also helpful to reduce the dissipated energy. The network lifetime is extended by this proposed methodology and it process with large scale model. The comparison result shows the improved performance model of Proposed H-EHO than existing approach. Distance measure of each sensor node is evaluated for updating property/function of clan and it selects the optimal value through optimization algorithm in WSN.

VI. Conclusion and Future Scope

Thus the proposed research work concluded with the effective communication protocol on WSN using proposed Hybrid model of Elephant Herding optimization algorithm. In this paper, the selection process of cluster head in WSN using proposed threshold based Hybrid-Elephant Herding Optimization algorithm is modeled for extending the lifetime of WSN application. Here the clan and separation operator are applied for selection process of cluster head from the WSN; in this the updating strategy utilizes maximum population of highest potential sensor node based on weight factor. Cumulative distance between each cluster head is determined to find the intra-cluster communication. Fitness function of highest potential value is updated on iteration of clan and it measures the weight function then it selects the cluster head based threshold value. The best fitness value is obtained with timely manner, which depends on iteration of optimizer. The comparison of existing and proposed method; in this the provides the energy efficient and extension of network lifetime using proposed hybrid model of elephant herding optimization approach in cluster selection process of WSN communication. In future enhancement of proposed work is analyzed for improving the performance of WSN communication model. Various optimization algorithms are performed with the concept of particle swarm optimizer algorithm. The future work may designed with large scale application for improving the availability of wireless sensor network applications.

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