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Pragmatic Distribution Based Routing Cluster to Improve Energy Efficient Cluster lifetime for Wireless Sensor Networks

Harish SV, and Archana NV

***Abstract*—Energy consumed by the sensor nodes are more sporadic in a sensor networks. A skilled way to bring down energy consumption and extend maximum life-time of any sensor present can be of evenly and unevenly distributed random area networks. Cluster heads are more responsible for the links between the source and destination. Energy consumption are much compare to member nodes of the network. Re-clustering will take place if the connectivity in the distributed network failure occurs in between the cluster networks that will affects redundancy in the network efficiency. Hence, we propose pragmatic distribution based routing cluster lifetime using fitness function (PDBRC) prototype is better than the existing protocol using MATLAB 2021a simulation tool.**

***Keyword*—Cluster; Routing protocol; Energy hole; fitness function; throughput; energy delay; hopping; fairness**

I. INTRODUCTION

IN present scenario, sensor networks having an sufficient set of sensor nodes called mote which are indiscriminately distributed across exclusive area network through a wireless medium. The wireless sensor networks are classified in to two types, namely evenly or uni-formal or homogeneous and unevenly or non uni-formal or heterogeneous networks. In this present scenario of the networks, the nodes create a routing path with neighbouring nodes to communicate between the cluster head node called source node and the base-station also called as destination address. The sensor nodes which are close to the destination will have more energy consumption than other nodes. This phenomenon called as Energy hold problem.This can be reduced with suitable deployment techniques algorithms or fitness function so that to suffice life-time of any random network. The primary accusative of this research is to improve effectiveness of the existing system and also reduce energy consumption problems at the destination nodes. The methodologies to gain lifetime in a network, reduce the nodes transmission power consumption and select the nodes to the farthest neighbour which can improve the throughput of the desired network [1]. Another method to solve the problem is by using scheduling protocol. Once the network discovers the path between the neighbouring nodes few members nodes which are not in the path can turn off their mode (sleep mode). This will prevent energy intake in the network.

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II. RELATED WORK

Sensors have a limited battery charging capacity, hence energy has to be saved if only one node sends the information to the destiny (Base-Station). Such sensors are called as Cluster-Heads (ch's). The left over nodes are said to be acts as member nodes (CM's) throughout the process ends. As there is likelihood that sensed randomized data can be laid off. Hence Cluster-Heads (ch's) need to do the effective extra duty of accomplishing load balancing of information and sends data to its destiny(Base-station).

Cluster-Head (ch's) selection in a randomized distribution of sensor network is based upon some author's decision used in load balancing techniques with certain limitations. Very low average communication distance. And based on election process or autonomous selection among the selected nodes one Cluster Head will be selected. Selected cluster head continue their job with until its half of the energy remains. The neighbouring nodes so called member nodes has to obey the order of work given by the cluster head and it continues based on the residual energy.

If cluster head selection by its energy level is greater than one tenth of average energy, then offered reformation of cluster head selection will be chosen according to distance coverage between Base Station and Cluster Head node. It conserves rising value for each node and huge energy will consumes with more time [2].

Many research authors presented on the cognitive content of clustering. Later studying related articles, few benifits and limitations have been reason out.

Hao Wu, et.al. and A Damianos Gavalas, et.al. [1,3] Projected their article by entitled Type-based clustering algorithm (TCA) which re-creates rank of a node called Lowest ID and fitness cluster function called Weighted Clustering Algorithm. In this protocol for each node a unique ID has been added so that each node essential be aware of their own Cartesian coordinates with allotted specific Internet-protocol (IP) address in the selective networks. With this address and ID, the networks gets communicates to neighbouring nodes in the cluster network. To nominate as a Cluster Head, nodes having Lowest ID will be preferred among the sum of nodes in a distributed network. By searching lowest ID on the basis of rank of the nodes among

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their neighbouring nodes or by electing process, possible and salient node has been created as a Cluster-Head. If sensor node dwells to aggregates as cluster, then it will function as a gate-way connection to that of two cluster networks. The unequaled Cluster-Head (ch) has to satisfy for long-lasting time as any other ch's chosen in progress. It is particularly created for maintaining load balancing and energy consumption between all distributed mobile nodes. This flexure battery life of the ch's and energy intake dealt out uniformly passim the node.

Mahajan et al. [3,4]. framed a proposal on Cluster-Chain-Weight-Metrics-Approach (CCWM), In this proposal, range of the ch is chosen based upon load measures. To cut-down the energy cost of the conceptualization and communication, local clustering approach has been adopted. The projected model has been analyzed with present protocols. It has been determined using formulated approach and has outstanding improvement in compatibility with much life spanand less energy intake. But it could reduce the over-head and also minimizes energy uptake between transmission and receiving. Yet, this proposal needs more execution time.

Amit Karmaker and Hasan MM et al., [5] spoke about fairness method to choose CH as ECHs. To choose the ch, The amount of neighbour nodes, redundancy in energy & one hop neighbour information are proposed. Due to hindermost transmission problem, it cannot create symmetrical clustering hence selecting a system can't ensure fairness and balance the state of affairs that cover every region over the network .

Kannan and Raja et al., [6] projected "Distributed-Cluster-Head-Scheduling"(DCHS) algorithm for increasing the distributed life-time of a distributed networks. This model is much sensitive to noise deviation. The randomized distributed network are classified into 2 standoff property of the node information targeted. This is can be done only with faultless Cluster Head distribution with repeated Cluster Head selection and formulate the efficiency of the proposed prototype. The graded clustering, could extend the life-time of the nodes and can showcase effective energy control.

Hong J, Ke, W Yangrui, et al., [7] planned a proposal about new "Energy-Aware-Hierarchical-Cluster-based" protocol (NEAHC) to bring down the total usage of energy and substantiating the quality of energy reduction among the randomized distributive network nodes. This protocol extends the count of packet delivery ratio and alive nodes.

Ray and De et al., [8] proposed EECPK cluster algorithm using K-mean algorithm Here, the middle of the protocol was used to modify the first centre of collective nodes choosing process. Additional residual energy was added to the process parameter to find the ch process accomplished on the location from Base-Station. Hopping message been interpreted. This protocol has come through harmonious clusters for load grading and also widening the network life-time. This protocol take up less energy to sustain the life-time of the network. Still, it is difficult to predict K-value and less execution with orbicular cluster.

Kaur, L., & Kad, S. et al [9] proposed Modified EECPK algorithm In this many number of clusters sooner or later communicates to reduce in cluster size.This moreover reduce in load on the Cluster-Head. The PDR leads to downfall. But This can reinforced using multi-hop communication from ch's to base-station.

Singh and Mann et al. [4,11] have projected "Bee-Cluster" founded on i-ABC semi trial-and-error protocol. This has been evidenced over some other accepted methods in term of perfomaance metrics like packet delivery, throughput etc., Cluster is based upon i-ABC meta-heuristic model proposes to enhance solution search equation and to increase the usage abilities. But this cut down the end-end delay and transmit much more packets. Nevertheless, for real-time application this cannot be implemented.

Pothula and Arjunan et al. [12] conferred on unequal distributed clustering techniques. In this proposal, three generic classes characterized as deterministic, preset and probabilistic. Each abstraction were analyzed in-terms of properties and process clustering. Based on the parameters as lifetime and energy consumption.

Ojha A and Sharma D et al. [13] proposed a summary on "Heterogeneity-Routing-Algorithms"(HRA)in wireless sensor networks.They concentrated on non-uniformity routing in the area of clustering network, the benifits, demarcation and challenges of the designing algorithms and were compared with some parameters like cluster head selection, base station position, and nodes non uniformity levels.

Shokouhi Rostami et-al, [10,14] proposed clustering protocol based on homogeneous and heterogeneous clustering in a sensor networks based upon the origin of the node's capabilities. Based on the the challenges, the networks are compared based on clustering features like cluster-count, ch's selection, complexity, clustering object, and intercluster communication, and few more.

RK Yadav and Mahapatra etal., [15] proposed to acquire "Novel-Hybrid-Energy-Aware"(NHEA) ch's process graded by routing in WS networks. This process has been interpreted by reducing the distance among member-nodes, energy normalization, and reduction in time delay. Non-linear mathematical model has earned life-time extension via selecting optimal Cluster-Head. By comparing with the existing protocol like Firefly Cyclic Randomization, Moth flame Ant Lion Optimization, Firefly Cyclic Grey-Wolf Optimization and Self Adaptive Whale Optimization Algorithm for 2000 iteration.

Tsimenidis,B.S.& NA.Latiff, etal.,[16] have framed a novel based PSO to select suitable cluster-head by semi-distributed method. This applies to reduce fitness function in the region from the ch's to the member nodes. The weight of the function is modify at the Cluster-head location. That causes expected number of packets on the established path, to modify overall energy intake of selective network. This results carrying out in-terms of network life-time, reduces energy, and an Through-put to communicate the destiny (Base station).

III. Network Model

Cluster optimization technique is an conceptualization for insight best solution to any complex problems for preponderance of one or more functional objectives based on determination variables. Linear and Nonlinear cluster programming with optimization are premeditated to measure a broad scope for solving research problems. Optimization proficiency are classified as heuristics & meta-heuristics techniques. Cluster optimization techniques are used in several fields like decision-making processes

A WS networks consists of "N" number of sensors in an randomized distributed network in a per-defined region "m X n". Assume that no two nodes have the same location the maximum distributed transmission range of each node be "R". Network lifetime can be defined based on the effective established cluster networks, the first node dies due to the ability of a computing process used or due to produce in a range of capabilities.

A. Objective mathematical relation

To insight the best of the cluster head in the randomly distributed networks, important parameters of wireless sensor networks such as a). Area coverage between the ch's to CM's and ch's to BS, b). node delay and c). Energy consumption between the nodes while transmission d). Throughput. e). Quality of Services to cost-efficient network operation. If the network performance is having broad QoS, and less delay in energy to enhance the performance in the network.

The objective of mathematical model and the Cluster Head protocol selection, β is the invariant that set to a measure of 1/3 adopted in the existing protocol [17,18].

$F_0[\, 1-(1-\beta) - \beta * F_0\,] = 0$

Or can be written as

Fitness Function

$[F_0] = (1-\beta) * F_0^1 + \beta * F_0^2$ for $0 < \beta < 1$ (1a)

Then the distance from the cluster-head nodes to the base station is founded on the parameters added to Eq. 1a, as

Fitness Function

$[F_0] = \alpha_{Bs} * F(Location) + E_{Bs} * F(Energy) + \delta_{Bs} * F(Delay)$ (1b)

Consider an information data packet of node '*dp*' at the source denoted as si which is the current aggregation of the result and sj will be the final aggregation with an intermediate data φ_i and φ_j.

If φi = φj then the data is aggregated on both the source will be

$\varphi(s_i, s_j) = \max(\varphi_i, \varphi_j) + (1 - C_{ij}) \min(\varphi_i, \varphi_j)$ (2)

where Ci,j is the constant of correlation coefficient of i and j shown in Eq. (3)

$$C_{i,j} = \frac{1}{e^{(d_{ij}^2/c)}} \quad (3)$$

Where, d_{ij} , the distance from sensor node s_i to s_j.

c the constant of parallel coefficient. when c = 0

cij refers to no correlation

if c increases higher data and packet length will get decreased after being aggregated.

B. Energy Consumption framework:

In a distributed random WS networks, the model free space and channel fading in multipath routing are depends upon the distance from the source (transmitter) to the base station (receiver). If the length is less than the offset or outset value d0 then free space 'f_s' framework are used other than the multi-path 'm_p' frameworks are used.

Let E_{mp}, E_{elec}, and E_{fs} be the energy requisite by the amplifier in a randomized unoccupied space and routing path. Then energy required by the source node has '*l*' bit messages over a distance 'd' are as shown in Eq. (4)

$$E_{TX}(l,d) = \begin{Bmatrix} \begin{Bmatrix} l * E_{elect} + l * E_{fs} * d^2 & for \;\; d \le d_0 \\ l * E_{elect} + l * E_{mp} * d^4 & for \;\; d > d_0 \end{Bmatrix} \end{Bmatrix} \quad (4)$$

E_{elec}, be the distance between the source and destiny based on the adequate bit error rate.

$$d_0 = \sqrt{\frac{4\pi^2 * l * h_t^2 * h_r^2}{\lambda^2}} \quad (5)$$

Where, h_t and h_r are the base transmitting and receiving point at the same time. λ be wavelength. The energy requirement to receive the '*l*' bit message is given by

$$E_{RX}(l) = l \times E_{elec} \quad (6)$$

Where,

E_{fs} =Total energy consumption in a free space

E_{mp}=Total energy consumption by the transmitting circuit.

E_{elec}= The device loss at the transmitter

$$\boldsymbol{E_{elec}} = \frac{E_{fs} d^2}{E_{mp} d^4} \quad (7)$$

Where,

d^2= power loss in free space

d^4 = the multipath fading

Network Life-time is the time progress till first node in a network exhausts energy. Once the sensor node fails, the detection susceptibility of the network starts degrading. There may be many various reasons for the failures in the network model at the time of extended network lifetime. Firstly, battery power in the randomized sensor node, malfunctioning of the circuit at the time of installation, or damage due to an external event. Secondly, failure is due to network partitioning and dynamic changes in the network configuration.

Let E_i be initial energy of each node. The energy consumption for one iteration data selection of any sensor network S_i be e_i then intial time $t_i = {}^{E_i}/_{e_i}$.

Suppose if Cluster-Head may have failed or malfunction in the network, complete energy gets inadequate, or permanent failure in the distributed network.

Using probability density function of weibull distribution random variable

$$f(t;\eta,\beta) = \begin{cases} \frac{\beta}{\eta} * (\frac{t}{\eta})^{\beta-1} * e^{-(\frac{t}{\eta})^{\beta}} & , x \ge 0 \\ 0 & , x < 0 \end{cases} \quad (8)$$

Where β and η are the scaling parameter of failure at time *t*.

The reliability function depends on device should operate for a certain amount of time without failure. *If*

$$f(t) = \begin{cases} \beta = 1 & failure\ rate\ is\ consant \\ \beta > 1 & failure\ rate\ increases \\ \beta < 1 & failure\ rate\ decreases \end{cases} \quad over\ time\ t \tag{9}$$

Let us consider the Cluster-Head is far off from the Destiny or Base-station. The ch's receives '*l*' bits standard information from $\left[\frac{N}{C} - 1\right]$ member nodes and perform source scattering. The energy exhausted when distributing the data used to transmit collective data to the destiny. The sum of energy consumed while transmitting messages to the base station are shown in Eq (10).

$$E_{CH\text{-}BS} = \{l * E_{elec} * [\frac{N}{C} - 1]\} + \{l * E_{data} * [\frac{N}{C} - 1]\} + \{l * E_{mp} * d_{BS}^4\} \tag{10}$$

Where,

E_{data} = *Energy consumed for one bit message*

d_{BS} = *The mean distance from ch's to base station*

Total energy in the cluster information in the distributed random network is given in Eq (11) and (12). as

$$E_{cluster} = E_{CH\text{-}BS} + [\left(\frac{N}{C}\right) - 1] * E_{ch} \tag{11}$$

For N number of rounds in an M^{th} iteration will be

$$\begin{aligned} E_{round} &= C * E_{cluster} \\ &= C * E_{CH\text{-}BS} + [\left(\frac{N}{C}\right) - 1] * E_{ch} \\ &= C * \{l * E_{elec} * [\left(\frac{N}{C}\right) - 1]\} + \{l * E_{data} * [\left(\frac{N}{C}\right) - 1]\} + \{l * E_{mp} * d_{BS}^4\} \end{aligned} \tag{12}$$

Where, E_{mp} is the energy intake of each sensor node that send '*l*' bits standard message to the cluster head.

$$E_{mp} = l * \{E_{elec} + E_{fs} * d^2\} \tag{13}$$

C. Maximum coverage for ch's assortment

In a simple LEACH algorithm the selection of randomized Cluster head results in high density over specified area, hence the cluster head may be distributed raggedly throughout the system hence coverage ratio should be considered for preventing the uneven distribution. A coverage action is used to guarantee that nodes are progressive when Cluster coverage ratio is gathering coverage fault.

For cluster head selection, consider the area of the distributed random network be rectangular whose h be the length and w be the width . Let h and w be the Cartesian coordinate and M be the sensor node coordinates in the two dimensional set up systems with a radius R.

Assume target Cartesian coordinates are {x,y} with a distance along topographic point and node is shown in Eq (14).

$$d(c_i) = \sqrt{(x_i - x)^2 + (y_i - y)^2}\,. \tag{14}$$

The physical phenomenon that observation is jeweled by a node e_i, and the probability $P\{e_i\}$ of the consequence is the probability of the topographic point $\{x,y\}$ is converged by a node c_i. Consider the state of affairs, the noise hindrance, where the probability occurance of the sensor node i on j is given in Eq (15) as

$$P_{cov} = \begin{cases} 1 & if\ R^+ \le d(s_i, p_j) \\ e^{-Q} & if\ R^+ < d(s_i, p_j) < R^- \\ 1 & if\ d(s_i, p_j) \le R^- \end{cases}$$

where,

$$Q = \frac{\alpha_1 \beta_1 \varphi_1}{\alpha_2 \varphi_2 + \beta_2} \tag{15}$$

Where,

$R^+ = r + r_e$: *Sum of uncertainty range and the sensing range*

$R^- = r - r_e$: *Difference of uncertainty range and the sensing range*

$d(s_i, p_j)$: *Euclidean distance*

$\alpha_1 = -R^- + d(s_i, p_j)$ & $\alpha_2 = R^+ - d(s_i, p_j)$

Suppose P_j exerts an striking force on sensor P_i ,when the distance between d_e is bigger than the determined target λ_T level but lesser than the sensor node distance C_i and repugnant force when d_e is less than the user defined sensor density. Then the probability detected which effects on sensor node will be 1 or 0 based on

$$P_i = \begin{cases} 1 & \text{if } d_e \le R^+ \\ \{W_i * (T_R)_j * d^{-\beta}, \alpha_{ij}\} & \text{if } R^- < d_e < R^+ \\ 1 & \text{if } d_e \le R^- \end{cases} \tag{16}$$

Where,

W_i = *Constant coefficient*

β = *Constant that weighted according to the physical properties of the sensor network*

α_{ij} = *Line-segment from the sensor j to i.*

To approximate the target range detected from Eq 16

$$R_{conf} = d_e * (-1)^c \tag{17}$$

Sensor security is more crucial for any primal sensing nodes. To calculate the coverage loss in a distributed network at point j to non sensing point then

$$\Delta\{p_j, C_n\} = S_n(P_j) * \Pi_{i \neq n}[1 - S_i(P_j)] \tag{18}$$

IV. Experimental Results and Discussion

The simulation of Pragmatic Distribution Based Routing Cluster to Maximize Energy Efficient Cluster (PDBRC) lifetime for WSN's environment. The proposed research results are evaluated for ch's assortment based on the existing protocol using parametric synthesis and relative analysis are performed.

A. Experimental Evaluation setup

The performance of PDBRC lifetime for WS networks is evaluated using MATLAB.The environmental setup are based on the Performance assessment metrics [19] shown in Table I.

TABLE I
EVALUATION METRICS FOR SIMULATION

SL No.	Simulation parameter	symbol	Standard measures
1.	Initial Energy	E_0	2J to 6J / Battery
2.	Energy used up per bits of the transmitter circuits	E_{elec}	50 *10^{-9} J/Bit
3.	Energy exhausted to achieve an acceptable SNR by the amplifier	E_{amp}	100 * 10^{-12} J
4.	Energy utilized for information gathering	E_{fs}	10*10^{-12}J/ Bit/m^2
5.	Energy used for multi-path fading	E_{mp}	0.003*10^{-12}J/Bit/m^4
6.	Energy intake of data point per unit	E_{DA}	5X10^{-9}J/bit/signal
7.	Idle power ingestion	P_{idle}	13.5X10^{-3}W
8.	Sleep power ingestion	P_{sleep}	0.05X10^{-3}W
9.	Threshold value for distance Transmission	d_0	75m
10.	Number of nodes	N	100,200 and 500
11.	Base position	BS	(50,50) , (50,100)
12.	Number of gateways		6,12,25
13.	Node distribution		Random distribution (even & uneven)
14.	Sensing radius	r	10m to 50m
15.	Communication Radius	R (R=2r)	20m to 100m
16.	Data packet size	l_d	2000, 4000 bits
17.	Cluster Header size	l_h	200 bits
18.	Broadcast packet size	l_b	50 bits
19.	Cluster head probability	C_i	0.1 (5%)
20.	Rounds initiated Entire interation		1500 and 5000
21.	Control packet size	l_c	200 bits
22.	Network Density	N_D	0.2 Sensor/m^2
23.	Weight-factor	W	W_1=0.8, W_2 =0.2
24.	Energy Coefficient of the node	α_i	Random number in (1,10), i ϵ [1,N]

B. *Parameter appraisal in proposed cluster head selection model*

Performance appraisal Metrics comprises of Quality of Service (QoS) is based on generic parametric quantity such-as energy, average-jitters, average-delay, distance between the nodes and Base station, end-to-end delay, throughput, Packet-delivery fraction, packet loss, few more are considered.

Based Experimental parameter values shown in Table I, this work is mathematically characterized and modeled as follows:

1. *Energy:* Defined as the ratio of weighted selected ch's node to weighted nominal member node in the bounded area of the network

$$\text{Energy} = \frac{F_{CH}^{energy}[EN(D_i)]}{F_{NM}^{energy}[EN(CH_j)]} \tag{19}$$

Where,

$F_{CH}^{energy}[EN(D_i)]$ *is the member or secondary node of the ith area of the network*

$F_{NM}^{energy}[EN(CH_j)]$*is the weighted cluster head node of the jth area of the network*

For N number nodes in general can be written as

$$F_{CH}^{energy}[EN(D_i)] = \sum_{i=1}^{N}\sum_{j=1}^{M}\{1 - F_{CH}[EN(D_i)]\} * F_{NM}[EN(CH_j)] \quad for\ 1 \le j \le M \tag{20}$$

$$F_{NM}^{energy}[EN(CH_j)] = M * Max_{i=1}^{L}[(EN(D_i)] * Max_{j=1}^{n}[EN(CH_j)] \tag{21}$$

2. *Distance:* It is the ratio of distance from weighted member node to the ch's and vice versa.

$$\text{Distance} = \frac{F_{CH}^{distance}[EN(D_i)]}{F_{NM}^{distance}[EN(CH_j)]} \tag{22}$$

$F_{CH}^{distance}[EN(D_i)]$ *is the member or secondary node of the ith area in the network.*

$F_{NM}^{distance}[EN(CH_j)]$*is the weighted cluster head node of the jth area in the network.*

For 'N' number of nodes in general writtern as in Eq (23) and (24)

$$F_{CH}^{distance}[EN(D_i)] = \sum_{i=1}^{L_N}\sum_{j=1}^{M} \begin{matrix}[|D_i| - |CH_J|] + \\ [|CH_i| - |BS|]\end{matrix} \tag{23}$$

$$F_{NM}^{distance}[EN(CH_j)] = \sum_{i=1}^{L_N}\sum_{j=1}^{M}[|D_i| - |D_J|] \tag{24}$$

3. *Average Delay:* The ratio of total time of waiting to the number of incoming data-packets at the Base-station. Latency is the time taken by the source packets, move from source to destination,based on process-delay, propagation-delay, network-delay.

$$Average\ Delay = \frac{sum\ of\ [Time\ of\ Data\ arrival - Packet\ yet\ to\ start\ for\ transmission]}{Total\ number\ of\ nodes}$$

$$F^{\text{Delay}} = \frac{\sum_{j=1}^{M} CH_J}{L_N} \tag{25}$$

4. *Packet Loss:* Occurs when broadcasted data packets fails to transpire at their destination.Packet loss affects the detected prime nodes of the area of networks. The many causes for packet loss would-be a). bit errors in deficient WS network, b). Inadequate buffers due to traffic congestion.

$$\%\ of\ Packet\ Loss = \frac{\sum Packet\ Lost}{\sum Packet\ Transmitted} X\ 100 \tag{26}$$

5. *Packet delivery ratio:* The total number of packets earned by base-station to the total number of data packets generated by source node.

$$\%\ of\ Packet\ Delivery = \frac{\sum Packet\ delivered\ successfully}{\sum Packet\ sent\ by\ the\ transmitter} X\ 100 \tag{27}$$

6. *Network delay:* The sum of latency accomplished by a data-packet to traverse network from source to destination.

$$\text{Network Delay} = \left[\frac{Distance\ between\ the\ neighboring\ nodes}{Transmission\ speed}\right] + \left[\frac{Packet\ size}{Transmission\ rate}\right] \tag{28}$$

The end-to-end packet time interval is the total number of processing delay(d_{Proc}), transmission-delay(d_{Trans}), queuing-delay(d_{Queue}) and propagation-delay(d_{Prop}).

End-to-End packet time interval

$$= \Sigma[\, d_{Proc}\,,\, d_{Queue}\,,\, d_{Trans}\,,\, d_{Prop}] \qquad (29)$$

Typically Processing delay d_{Proc} and propagation delay d_{prop} will be few microsecond or less. d_{queue} depends on the congestion in the area of networks, d_{Trans} is the ratio of Length of the packets to the Link bandwidth.

7. *Network Life-time:* The period of time that node could live and capable to communicate with the neighbouring nodes in the network, The lifetime bring up to the energy hole problem without considering the sources of the death nodes.

$$\%\ of\ network\ Lifetime = \frac{Profit\ in\ time\ Period}{Total\ number\ of\ actives\ nodes\ in\ Time\ period\ (1-Retention\ rate\ of\ the\ nodes)} X\ 100 \qquad (30)$$

$$Retention\ ratio = \frac{Non\ active\ time\ period}{Total\ number\ of\ last\ node\ time\ period} \qquad (31)$$

It depends on the average energy consumption for each activity finished rendered in a distributed network. Lower the intake energy of the node, supplies wider network lifetime.The number of iteration when first node fails (FND), Half node fails (HND) in the area of network at specific time period. In a network life-time if the nodes are very close to the neighborhood of the cluster network its very easy to communicate from cluster source to cluster destiny. But for larger network size, the lifetime rapidly decreases due to far locality and energy will be consumed more. That results to network failure or decrease in network lifespan.

C. *Experimental Results*

The operating system platform used is windows 8.1 enterprises, with Intel Core(TM) i5-3317U CPU at 1.70GHz and 64 bit, 7.88 GB usage of RAM. The performance appraisal of proposed PDBRC protocol using MAT-LAB simulation outcomes are shown in graphs based on the evaluation parameter values. The proposed PDBRC mathematical function protocol has been given consistently to improve better performance than existing routing protocols.

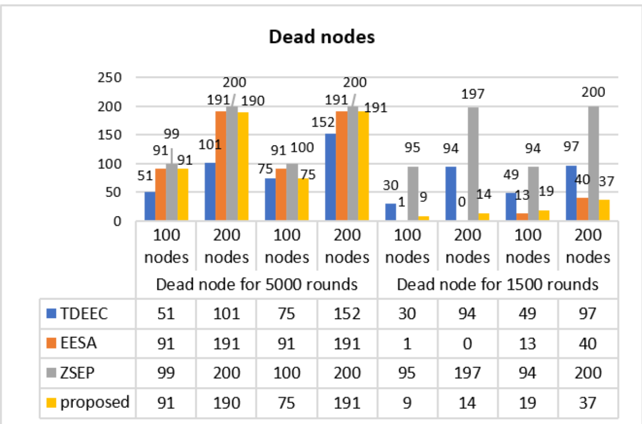


Fig.1. Simulation for Dead nodes for random nodes with uniform and non-uniform distribution area

In the proposed protocol the number of nodes are 100, 200 nodes with are distributed area with uniform and non uniform area, The simulated results are compared with each different rounds. based on the analysis the existing protocol results less efficient compared to PDBRC protocol. Is shown in Figure 1.

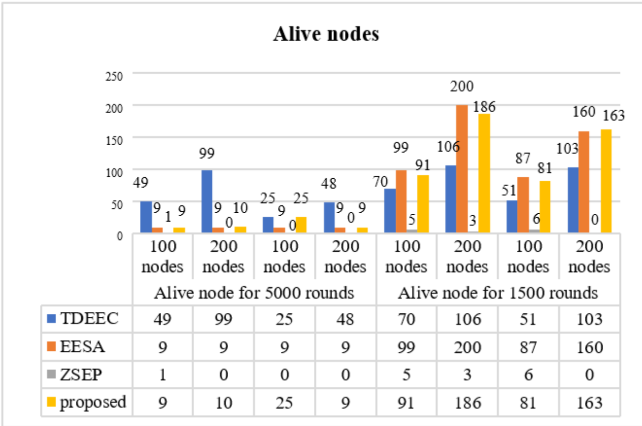


Fig. 2. Simulation for alive nodes for random nodes with uniform and non-uniform distribution area

Based on the Proposed function protocol the dead nodes are compared less to the existing simulated protocol as shown in Figure2. From this graph chart can say that efficiency is increased when the alive node are more compared to the existing protocols

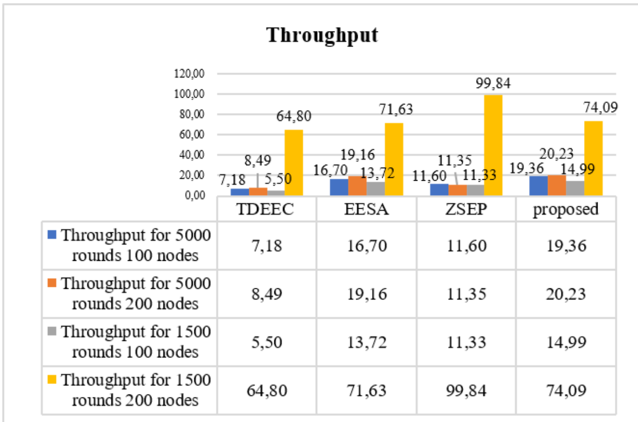
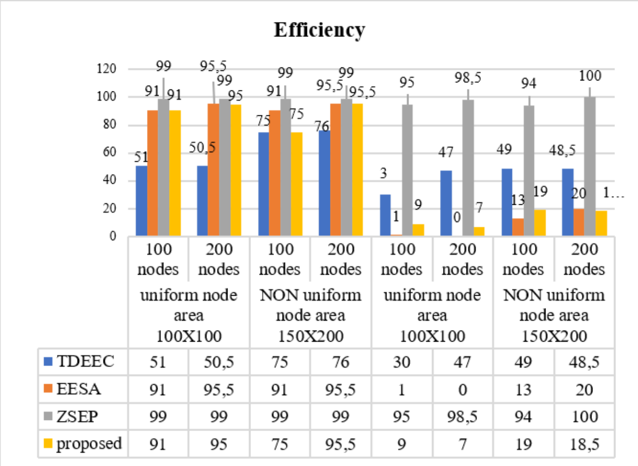


Fig. 3. Simulation for Throughput for random nodes with uniform and non-uniform distribution area

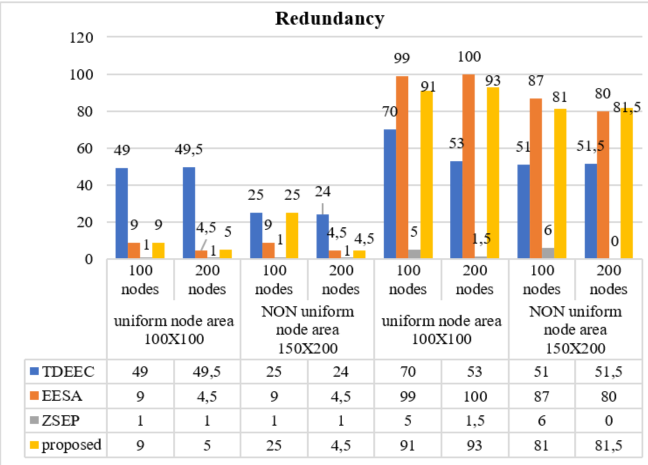
The Existing protocol and proposed protocol are Simulation for Throughput calculation based on the sum of packets send to the cluster head to the total number of packet accepted by the Base-Station is shown by graphical chart in Figure 3. It is to be known that the members of the Cluster node cant transmit the data directly the Base-Station. Hence hopping may happen due to delay in a random nodes with uniform 100*100 area and non-uniform 150*200 distribution area with a distance of 50m and 100m distances.

As the number of sensor nodes increases, the energy ingestion and the network latency also raises in the PDBRC protocol hence the efficiency increases for a given network.



	100 nodes	200 nodes	100 nodes	200 nodes	100 nodes	200 nodes	100 nodes	200 nodes
	uniform node area 100X100		NON uniform node area 150X200		uniform node area 100X100		NON uniform node area 150X200	
TDEEC	51	50,5	75	76	30	47	49	48,5
EESA	91	95,5	91	95,5	1	0	13	20
ZSEP	99	99	99	99	95	98,5	94	100
proposed	91	95	75	95,5	9	7	19	18,5

Fig. 4. Simulation for Efficiency for random nodes with uniform and non-uniform distribution area



	100 nodes	200 nodes	100 nodes	200 nodes	100 nodes	200 nodes	100 nodes	200 nodes
	uniform node area 100X100		NON uniform node area 150X200		uniform node area 100X100		NON uniform node area 150X200	
TDEEC	49	49,5	25	24	70	53	51	51,5
EESA	9	4,5	9	4,5	99	100	87	80
ZSEP	1	1	1	1	5	1,5	6	0
proposed	9	5	25	4,5	91	93	81	81,5

Fig. 5. Simulation for Redundancy for random nodes with uniform and non-uniform distribution area

The proposed protocol (PDBRC) are more energy efficient compared with simulation and observed through the graphical notation shown in Figure 4 and Figure 5, that uniform distributed networks have more efficient than non uniform distributed network with an increase of 18% in its energy efficiency .

CONCLUSION

The prime Outcomes of proposed paper is-to fulfill improvement in life-time for WS Network using a pragmatic distribution routing based cluster (PDBRC) protocol. WS Network constitutes of more sensor nodes, they are indiscriminately deployed widely in homogeneous and heterogeneous area networks. These main cluster nodes continuously process and sends signals to the base-station. In this process it devour lot of energy, hence network life-time in a network becomes inferior. An algorithm was proposed to improve network life-time and total energy intake by the distributed networks. Step-down in energy consumption is completed by Cluster fitness mechanism using weibull distribution. Based on the performance of proposed protocol energy efficient for both heterogenous and homogenous clustering schemes for a parametric quantity such as FND and HND and PDR has been evaluated. The development enhances the network life-time, the network size also is increased by finding packet failure probability among the clusters, among ch's and members node in the distributed area of the networks. When network size is increased and analyzed with the existing protocol results the efficiency was increased from 49% to 51.3% for 100 and 200 nodes. And also found that proposed system is more efficient in terms of overall network life time and has a nodes decay rate of 18%.

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