OPTIMIZED CLUSTERING PROTOCOL TO ENHANCE ENERGY EFFICIENCY WITHIN WSN

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Abstract:
Today WSN are highly approached technology that used to interact several sensor nodes corresponding to at least common application. The WSN is affected by the problem of energy dissolutions of the sensor node that collects and report the specific data to application monitoring node. The main reason to develop WSN network is to increase the lifetime of the batteries that are constrained by the nodes during transmission. The clustering mechanism is the best and most efficient one to resolve the issue with the requirement of energy in WSN. The network is divided into small nodes as a cluster and each cluster have one cluster head. It is very much useful for reducing the energy dissiaption and enhancing the lifetime of the network. In this paper we propose new clustering protocol optimized clusterhead selection using genetic based approch along with priority queue to maintain the energy in the WSN network and prolonging the life period of the network. The simulation results revealed the performace of the proposed technique is more efficient than existing protocol DEEC. Result improvement of 20% is observed through the proposed mechanism. Proposed system uses DEEC along with BAT and priority queue to save from packet drop. The dropped packet first of all stired within the priority queue from where it is afected and given to next cluster head having sufficient energy for transmission. In addition separations between the nodes and cluster head are also considered to reduce the energy consumption during transmission of packets. Energy consumed during overall packet transmission, packet drop ratio, counts of packets transmitted to the base station and cluster head are considered parameters. In addition, nodes becoming dead at various intervals or rounds are also obtained through the proposed simulation.

Keywords: WSN, DEEC, Energy Consumption, Packet Drop Ratio, Packets to base station, packet to cluster head.

1. INTRODUCTION

The present world needs a few innovations to satisfy their normal work. WSN is that innovation which satisfies the standard work of the general public. Wireless sensor network detects the physical world whether it is temperature, weight, humidity and some other condition exercises. WSN is utilized as a part of a domain where the wires or link are unrealistic to reach. A sensor network is an arrangement of minute independent frameworks, known as a sensor nodes which coordinate to understand at the minimum one normal application.[1] There assignments incorporate some sort of impression of human property. The fundamental use of wireless sensor network is to detect and gather information from a specific space, undertaking them and send it to the sink where the approach lies. [2]

Presently, WSN are utilizing for the most part for the information exchange reason. Sensor nodes in the wireless network exchange the information parcels from source to goal. Wireless sensor network incorporates sensors nodes and a base station (sink) and there are such a large number of sensors which make a network. Every sensor nodes in a network speak with each other and exchange the information parcel from source node to the sink. Detectors can discuss straightforwardly with the main office. Detectors expend a considerable measure of energy while information exchange.[3] Then again, sensor nodes additionally consume energy in exchanging the information packets. Because of this utilization, the life

period of the network likewise gets diminished. This is the real issue of the sensor network. There are more issues of the network however energy utilization and maximizing the life period of the network. Taking these issues in worry, there is one strategy which is particularly helpful to determine these issues called grouping or clustering. Grouping, the procedure in which expansive network area is separated into littler one. [4] With this strategy, sensor nodes don't require correlative with the base station. In every cluster, there is a group head which gathers the information from every network nodes and after that transmits that information to the main office. The cloistered is chosen based on greatest energy of the hub. The hub which has highest energy is chosen for group head. Essentially just Cluster head is in charge of the correspondence in the network. Cluster head needs more energy for the information total and transmitting the information. [5] So after transmission of the information, its energy lessens and the hub which has second highest energy is chosen for cluster head. There is such a significant number of clustering conventions which decreases the energy utilization as well as upgrade the network lives. [6] These conventions are LEACH, HEED, DEEC, EDEEC, and SEP and so on.

These conventions are group based convention and a considerable measure of work has been finished with these conventions. LEACH is the primary convention which came into the presence in the grouping convention. DEEC is likewise a group based convention in which bunch head is chosen in light of the existing energy of the sensor nodes and the normal power of the network. EDEEC is the upgraded adaptation of the DEEC convention and requires a heterogeneous network. LEACH is the homogeneous network.[7] In this paper, we studied Distributed Energy Efficient Clustering (DEEC) protocol by figure out dead nodes for network lifetime, energy dissipation and energy make up for and latency clustering protocol has been introduced which is the converted form of DEEC and it supplementary improves the consummation. Protocols used to conserve energy of the networks can be homogeneous or heterogeneous in nature. LEACH is a homogeneous protocol

This paper is coordinated as follows. Section 2 given the affiliated work which has been done on cluster-based routing protocols. Section 3 provides the technicalities of the proposed system. Section 4 shows the simulation results of the cluster-based routing protocols. The paper is finally capitulating in section 5.

2. RELATED WORK

2.1 DEEC

[7][8]A distributed multilevel clustering algorithm for heterogeneous wireless sensor networks is considered with following characteristics. The cluster head is elected by a probability based on the ratio between the amount residual energy present at each node and the average energy of the network. The lifetime of a cluster head is decided according to its initial energy and residual energy. So always the nodes with high initial and residual energy have a better chance to become a CH. DEEC is implemented based on the concepts of LEACH algorithm. The role of cluster head is rotated among all nodes of the network to uniform the energy dissipation. Two levels of heterogeneous nodes are considered in this algorithm to achieve longer network lifetime and more effective messages than other classical clustering algorithms. It also works better for multilevel heterogeneous networks. In DEEC, all the nodes must have the idea about total energy and lifetime of the network. Average energy of the network is used as the reference energy.

2.2 LEACH

[9]–[11]Low-energy adaptive clustering hierarchy (LEACH) is a TDMA-based MAC convention which is coordinated with clustering and a basic directing convention in Wireless sensor systems (WSNs). The objective of LEACH is as follows. To bring down the energy utilization required making and keep up groups

with a specific end goal to enhance the life time of a remote sensor arrange. Drain is a various leveled convention in which most hubs transmit to Cluster heads, and the bunch heads total and pack the information and forward it to the base station (sink). Every hub utilizes a stochastic calculation at each round to decide if it will end up being a bunch head in this round. Filter expect that every Cluster head has a radio sufficiently capable to specifically achieve the base station or the closest bunch head, however that utilizing this radio at full power all the time would squander energy. Nodes that have been cluster heads can't move toward becoming bunch sets out again toward P rounds, where P is the coveted rate of bunch heads. From that point, every hub has a 1/P likelihood of turning into a group head once more. Toward the finish of each round, every hub that is not a group head chooses the nearest bunch head and joins that bunch. The cluster head then makes a calendar for every hub in its group to transmit its information. All hubs that are not group heads just speak with the bunch head in a TDMA mold, as indicated by the calendar made by the group head. They do as such utilizing the base energy expected to achieve the bunch head, and just need to keep their radios on amid their schedule opening.The DEEC protocol is modified in the proposed paper for minimum distance handling and priority queue.

2.3. PRIORITY QUEUE

[12],[13]Priority queue is maintained in order to store the packets in case congestion is high. The priority queue is a queue which holds the jobs with priority number. The CH having minimum energy is giving highest priority for storing the packets. Least priority packets are dropped if queue becomes full. Subsequently packet drop ratio is decreased. Priority Queue is maintained to receive the packets transferred through nodes. Using priority queue reduces the packet drop ratio. Hence more packets are transferred from nodes to CH and from CH to BS. Rather dense network is considered in which Intra-cluster correspondences are performed at lower power level and just those cluster heads are permitted to seek cluster head determination, which have remaining energy over an edge level.

2.4 BAT APPROCH

The BAT based approach is used for the selection of cluster head. The BAT approach uses pheromone for reducing the execution time in cluster head skeleton phase. The pseudo code for the same is given as under

For each BAT

{

Initialization of BAT

}

Do until minimum iterations or maximum error criteria is fulfilled

{

For each BAT

{

Fitness value of data is calculated

If the fitness value is greater than pBest

{

Set pBest is equal to current fitness value

}

If pBest is greater than gBest

{

Set gBest = pBest

}

}

For each BAT

{

Velocity is calculated of BAT

Use velocity and gBest for updating BAT Data

}

3. OPTIMIZED CLUSTER HEAD SELECTION PROCEDURE

The proposed system consists of advance, normal and super nodes. Distance handling mechanism is associated with the system to reduce energy consumption. The structure of the proposed model is given as follows:

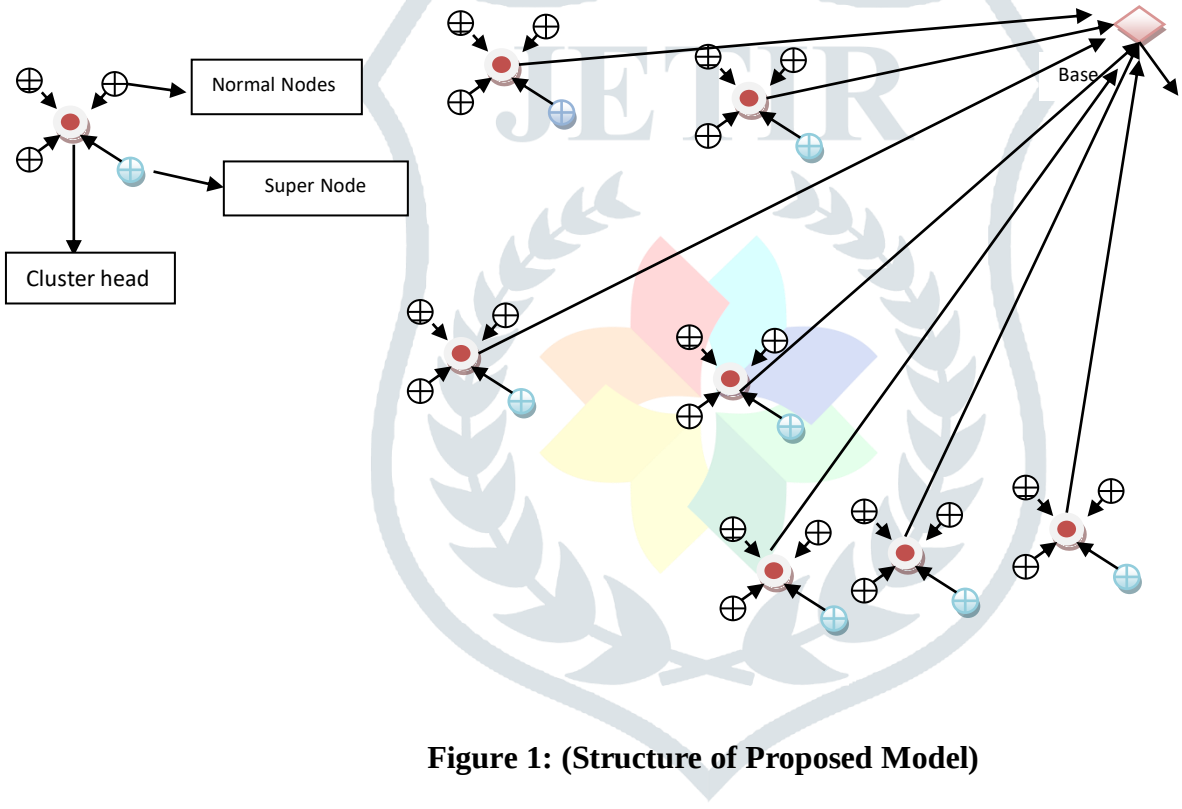

Figure 1: (Structure of Proposed Model)

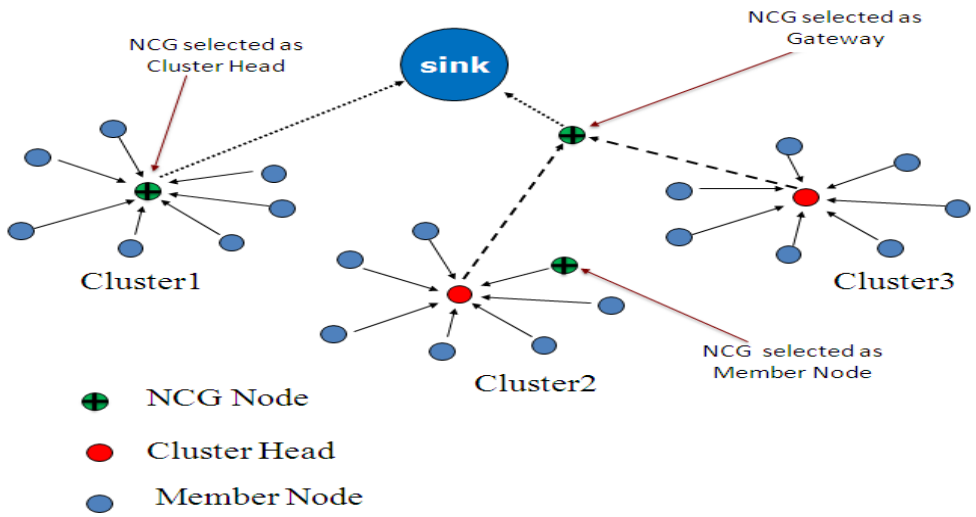

Figure 2: (Structure of Proposed Model)

FLOW CHART

The flow of the system using modified DEEC and priority queue is given below.

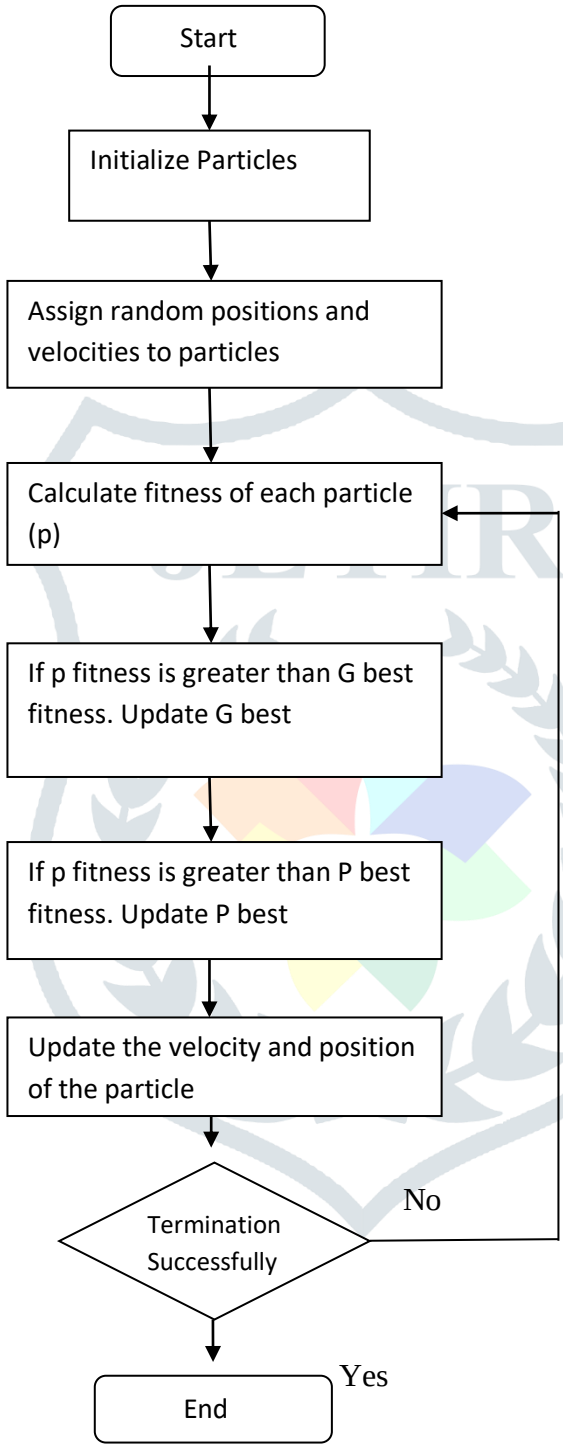

Figure3: (Flow Chart of proposed System)

This approach is based on selection of local and global best solution. The local best solution is based on the energy consumption. In case energy consumption is lesser than the previous local solution then global best solution is replaced with the new solution. Overall cluster head selection with highest energy is achieved. Priority queue is helpful in the reduction of packet drop ratio.

4. EXPERIMENTAL RESULTS

Simulation is conducted in MATLAB. The simulation results are obtained up to round 5000. Number of dead nodes is evaluated at interval of 5 in rounds. Energy consumed is evaluated on an average and maintaining fixed area of 100*100. Packets are transferred towards cluster head and then cluster head transfer the data towards base station.

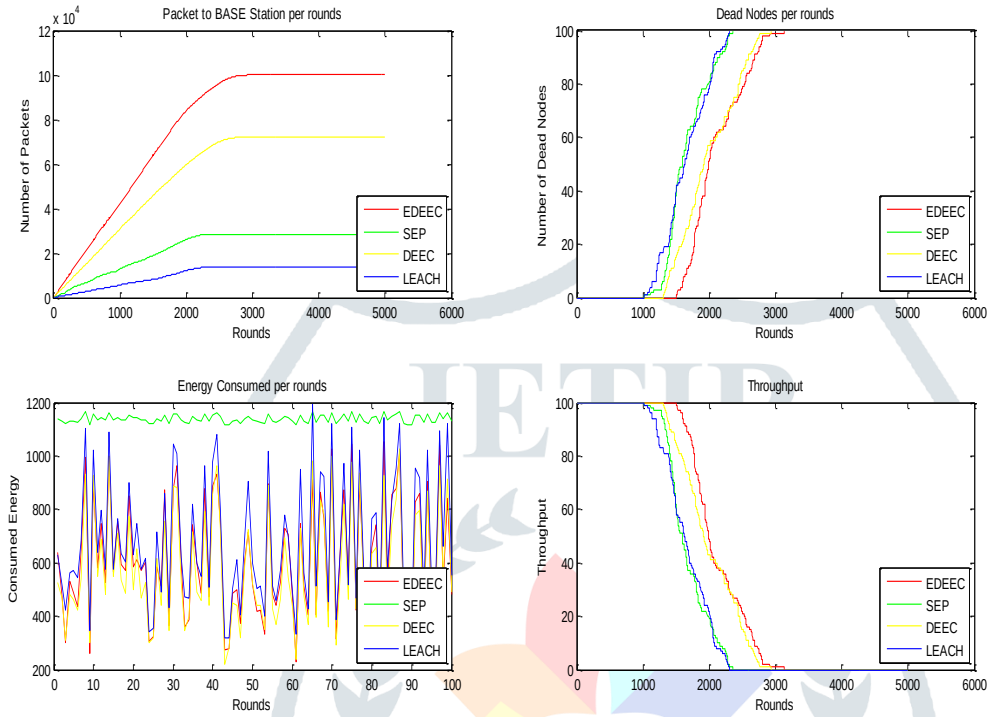

Figure 4: Plots from the simulation showing LEACH, DEEC, TDEEC, Proposed

5. DEAD NODES

Protocols	DEAD NODES After 1000 ROUNDS	DEAD NODES AT 5000 ROUNDS
LEACH	100	500
DEEC	95	465
TDEEC	80	400
Proposed	50	250

Table 1: Indicate dead nodes through LEACH, DEEC, TDEEC, proposed

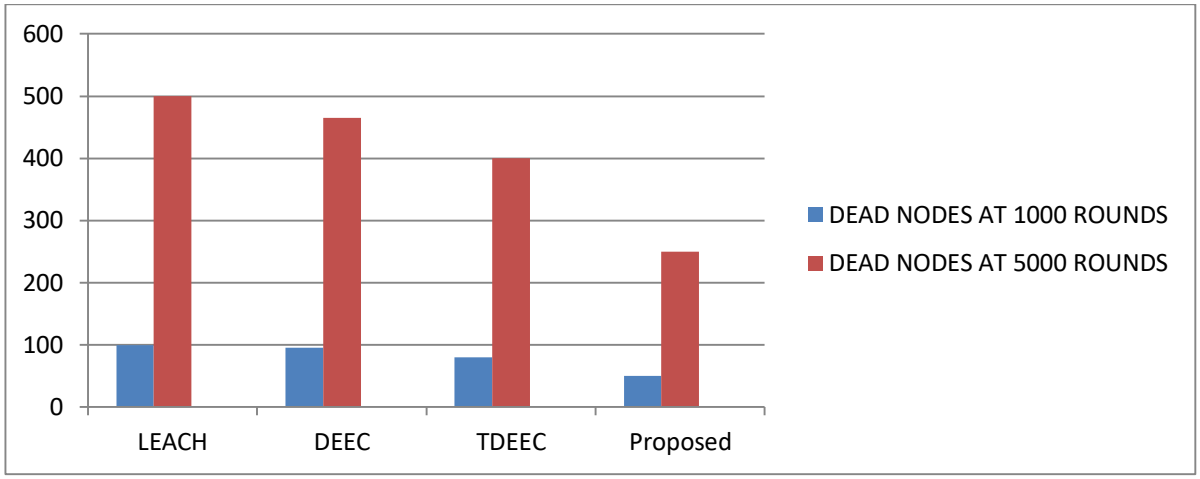

Figure 5: Indicate dead nodes through LEACH, DEEC, TDEEC, Proposed

6. PACKETS TO BASE STATION

PROTOCOLS	ROUNDS 1000 PACKET TO BASE STATION	ROUNDS 2000 PACKET TO BASE STATION
LEACH	1000	2000
DEEC	2000	4000
TDEEC	3000	6000
Proposed	4000	8000

Table 2: Packet to base station through LEACH, DEEC, TDEEC, and Proposed

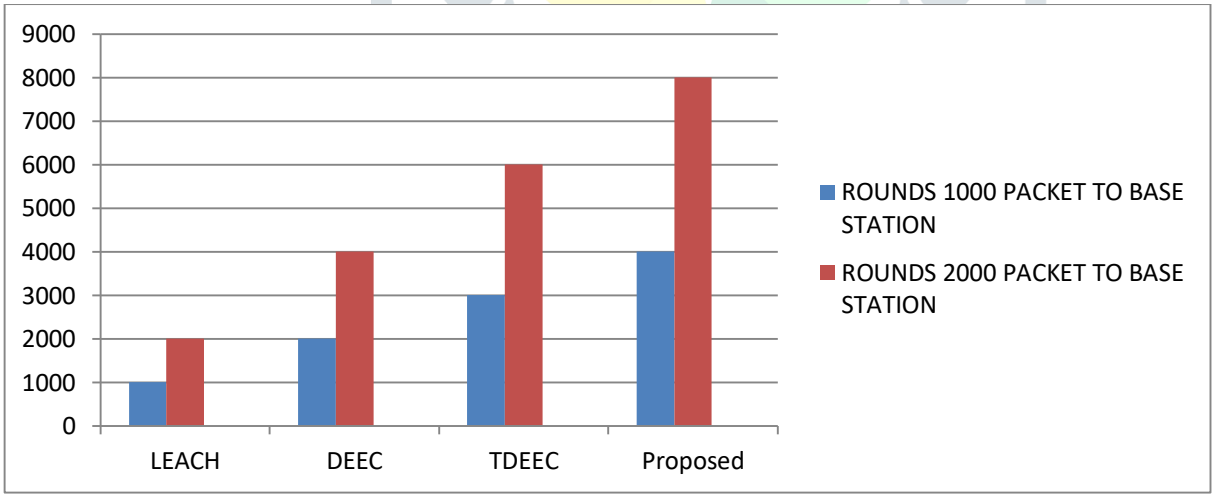

Figure 6: Packet to base station through LEACH, DEEC, TDEEC, and Proposed

7. ENERGY CONSUMPTION

PROTOCOLS	ENERGY CONSUMPTION (JOULE) AT 1000 ROUNDS	ENERGY CONSUMPTION (JOULE) AT 3000 ROUNDS
LEACH	95	285
DEEC	85	255
TDEEC	78	234
Proposed	65	195

Table 3: Energy Consumption through LEACH, DEEC, TDEEC, Proposed

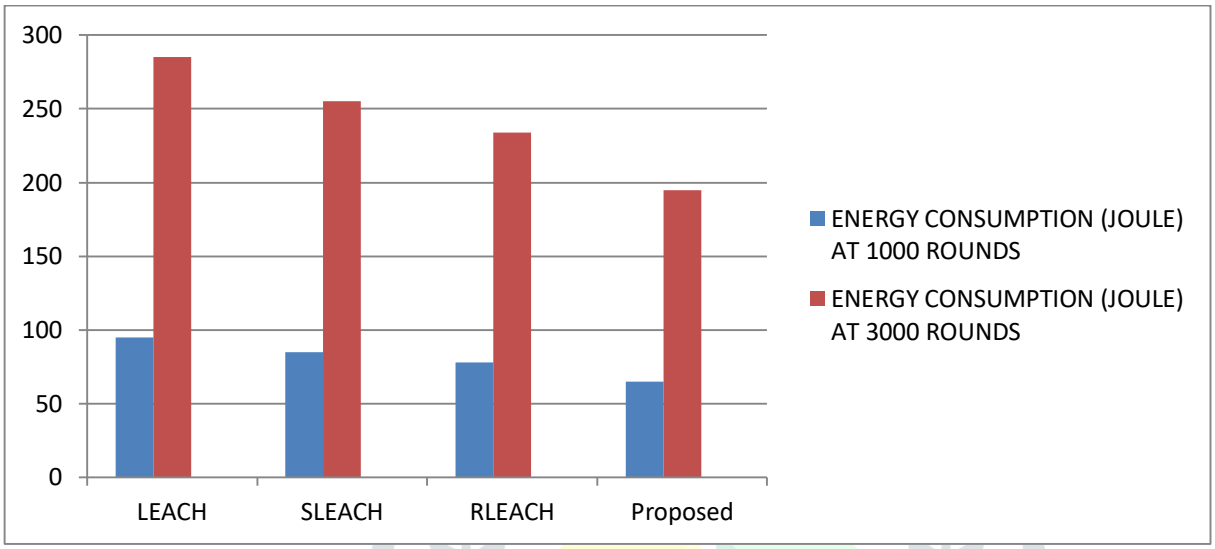

Figure 7: Energy Consumption through LEACH, DEEC, TDEEC, Proposed

8. THROUGHPUT

PROTOCOLS	THROUGHPUT AT 2000 ROUNDS	THROUGHPUT AT 4000 ROUNDS
LEACH	20	40
RLEACH	21	42
SLEACH	65	130
Proposed	76	152

Table 4: Throughput through LEACH, DEEC, TDEEC, Proposed

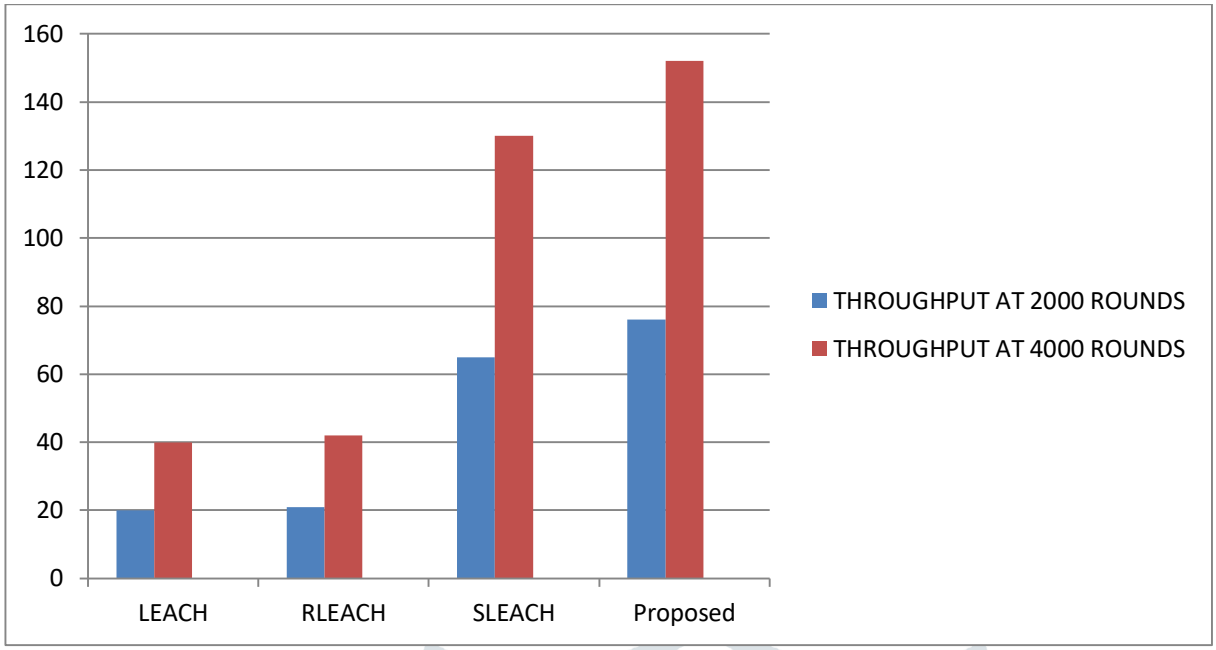

Figure 8: Throughput through LEECH, DEEC, TDEEC, Proposed

In this segment, we examine the execution of LEACH, DEEC, TDEEC, and EDEEC and contrast the execution of DEEC and that of different conventions. In our re-enactments, we consider arbitrary organization of 100 sensor hubs in a square field of measurement 100 M x 100 M. The base station is situated at the middle and it can be at the most extreme separation of 70 roughly from any hub. The underlying vitality of a typical hub is set as E0 ¼ 0:5 J. In spite of the fact that this esteem is subjectively taken for re-enactment reason, yet this does not influence the conduct of our simulation. Results indicate better performance of EDEEC in almost every aspect. The performance of LEECH is obtained to be least and can be improved using distance reduction mechanisms. Number of dead nodes, energy consumption, throughput and packets to base stations are considered parameters. The DEEC protocol can also be enhanced by using dense network of nodes to reduce energy consumption and subsequently enhance throughput.

9. CONCLUSION

In Proposed paper the analysis performance of optimal energy aware routing protocols is considered. DEEC is found to optimal but requires improvement to match the performance with other algorithms. In order to accomplish that task priority queues are used and result has been improved and performance is enhanced by the factor of 20%. In this paper, we have suggested modified DEEC protocol with the priority queue in which number of data transmitted to the base station is more as compared to the existing DEEC. In the existing DEEC, priority queue is not taken so packet drop ratio is high and fewer messages transmitted. In future, same dense network can be implied upon SEP, EDEEC and other cluster based protocols.

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