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Enhancing Lifetime of sensors by reducing energy consumption of sensors in Centos OS

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Abstract

Wireless sensor network is used to make the packets transferred from source towards destination. The packets will be transferred at the cost of energy consumption. There are mechanisms which can be used to minimize the energy consumption however the mechanisms have the limitations associated with them. There is a protocol known as low energy aggregation cluster protocol that can be used to minimize the energy during the transmission of the packets. The problem however is only one cluster head is selected per round. To solve the problem multiple cluster heads can be selected per round. Furthermore, the load will be distributed among multiple nodes. When the load distributed then there must be a storage mechanism to store the packets received from multiple nodes. For this purpose, priority queue will be maintained weather enhanced distributed energy efficient clustering protocol. The result of the proposed approach will be expressed in the form of throughout, energy efficiency and packet drop ratio. The validity of the enhanced DEEC for reducing energy consumption of sensors in centos OS is made with the stable election protocol and low energy aggregation clustering protocol. The result in the form of packet drop ratio, throughput and energy efficiency shows improvement and worth of study.

Keywords: SEP, LEACH, modified DEEC, throughput, energy efficiency

Introduction

Wireless sensor network generally has large number of nodes associated with it. These nodes can be in the form of hardware as well as software. Nodes which have cheaper prices generally preferred. The problem however is the cheaper nodes may not have high quality and hence may degrade quickly. The energy efficient clustering mechanism must be applied to resolve the software issues however the hardware issues still remain persistent within wireless sensor network the hardware issues can be resolved if routing protocols are implemented. The routing protocols that can be deployed include distance vector routing, shortest path routing and many more. The shortest path routing can be employed as it is simple in nature however the cost associated with the implementation is high. To resolve the issue distance vector routing can be deployed. The distance vector routing has least energy consumption and low price as well. The implementation of distance vector routing scheme is complex and is avoided. In most of the sensor node applications shortest path routing is applied which means the wireless sensor network becomes unreliable in certain situations. To overcome the problem, priority queue must be merged with the cluster head.

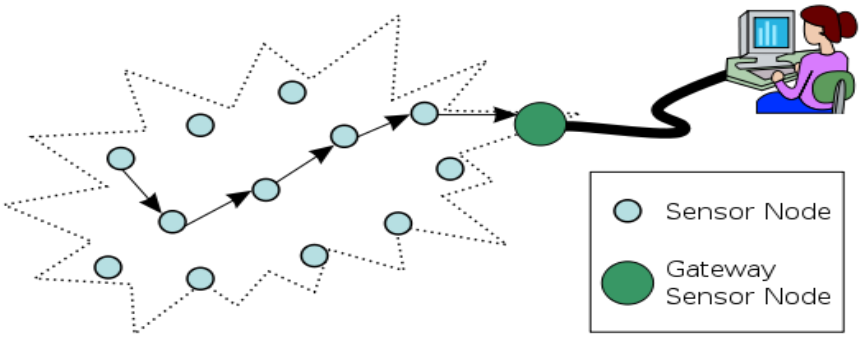

Figure 1: Structure of WSN

As the cluster head transfer the packets towards destination, energy of the cluster head depreciates. Routing schemes and shifting cluster head within each round present solution to the loss of energy associated with cluster head. Wireless sensor network has limited energy associated with it. Some sort of mechanism is required in order to increase the lifetime of the network. The lifetime of the network can be increased only if nodes are grouped together to form a cluster. The cluster will be formed depending upon the distance between the nodes. The distance if high then the nodes will participate within some other cluster otherwise the nodes will be entered into the clusters having minimum distance. The packets will be transmitted from the cluster head toward the base station. The cluster head will be shifted within each round. The nodes which have the highest energy will be recruited as the cluster head in around.

Next section represents the literature survey of the techniques used for achieving energy efficiency within WSN.

Literature Review

This section presents literature review of the techniques used to achieve energy efficiency. The clustering and highest energy aggregation protocols are discussed in this section. (Wang et al., 2017)The LEACH and SEP protocols are evaluated in this paper. The quantity of sensor nodes in WSN is adequate and a cluster head is incredibly constrained in resources. The primary goal of the cluster head configuration is to reduce the energy consumption and increase the system lifetime. This paper has chosen the LEACH protocol for cluster head selection per round. The problem of single cluster selection causes reduced lifetime of the network. (Pal et al., 2016) proposed a cluster head selection mechanism by the use of stable election protocol. The stable election protocol conducts polling for the selection of cluster head. The energy efficiency was achieved with this approach. The problem however was increased load over the cluster head. The single cluster head selection within each round caused additional load over the cluster head causing packet drop ratio to increase. The metric used for evaluation includes throughput, energy efficiency, packet drop ratio. (Saini & Sharma, 2010)**[23]** discussed the application of stable election protocol for cluster head selection. the stable election protocol in this case does not consider distance between nodes for the selection of cluster head. The problem becomes aggravated when cluster head is far from the base station. In that situation, less number of packets will be transmitted towards the base station. This means throughput associated with the node will be reduced. (Alla & Ezzati, 2011a) Proposed a stop and forward approach for packet transmission. The mechanism ensures that packets are transmitted towards the base station only if channel is available. The channel in case is not available, packets are stored within the buffer. The multipath channel is considered in this case. The sensor nodes energy consumption however is not considered causing decreased throughput of the network. (Alnawafa, 2017) proposed to utilize connections to upgrade arrange operations as far as energy efficiency and information quality for packet aggregation applications. This paper introduced a novel approach that utilizations spatial relationships between geographic neighboring nodes to increase throughput of the network. LEACH protocol is used for conducting the aggregation of packets at cluster head. The cluster head will be responsible for transmission of packets towards the base station. The simulation is conducted within MATLAB and metric used for evaluation includes throughput, energy efficiency, packet to base station and packet to cluster head. (Midasala, 2016a)Proposed a distributed protocol for transmission of packets towards the base station. The distributed protocol, share the load between the cluster head. The energy efficiency achieved with this approach is substantial. The aggregate packets at cluster head will be transmitted depending upon the availability of channels. The priority queue is used for storage of packets temporarily. The result of the approach is

expressed in the form of energy efficiency, packets to base station, packets to cluster head , throughput and lifetime of the network. (Elbhiri et al., 2010) Proposed a distributed energy efficient clustering protocol for achieving energy efficiency associated with wireless sensor network. The throughput of the network will be exceedingly high. The packets to base station is also improved by the applications of DEEC protocol. The improved results were obtained as compared to LEACH protocol. Overall 30% result improvement in terms of packet to base station was achieved. (Saini & Sharma, 2010) proposed a distributed energy efficient clustering protocol was used for improving the performance of the wireless sensor network. The packets to base station will be improved as energy of the network will remain even if large number of packets are transmitted toward the base station. The concept of Euclidean distance is used to select the best possible cluster head in this case. The problem however is the selection of single cluster head per round. This means every cluster head will be overloaded in this case. Overall throughput of the network will go down due to the applications of load enhancement on cluster head. (Khalid et al., 2016) Purposed improved cluster head selection mechanism with the help of distributed energy efficient clustering protocol. The cluster head workload has been decreased in this case. For decreasing the workload, priority queue has been implemented. Packets are not directly transmitted from the cluster head toward the base station. Packets are first of all aggregated at the cluster head and by selecting the appropriate channel, packets will be transmitted toward the base station. The advantage of using this mechanism is decreased in packet drop ratio. Furthermore, packets to base station as well as packets to cluster head will be improved. (Midasala, 2016b) proposed application of improved distributed energy efficient clustering protocol for transmitting the packets towards the base station. Single cluster head will be selected by round. All the neighbouring nodes will transmit the packets towards that cluster head. It will be the responsibility of the cluster head to transmit the packets toward the base station. Overall throughput will be improved by the application of this mechanism. The problem however is the single cluster head selection per round. This means workload over the single cluster head will be huge. Thus, overall lifetime of the network will be reduced. (Alla & Ezzati, 2011b) purposed the application of enhanced distributed energy efficient clustering protocol using shortest path in routing. It is based on the principle that shortest the distance least will be the energy. This means overall energy efficiency associated with this mechanism will be reduced. As the energy consumption is reduced so packets to base station will be increased proportionally. Lifetime of the network will also improve. This procedure can be improved further increase multiple cluster heads are selected per round.

Methodology

The proposed work consists of sensors that are deployed randomly. The randomly deployed nodes are grouped together to form a cluster. The nearest nodes will be grouped together to form a cluster. The node having maximum energy will be selected as cluster head. The priority queue will be associated with the cluster head. The packets thar dropped will fall within the priority queue. The packets from the queue will be picked by cluster head and transferred towards the base station.

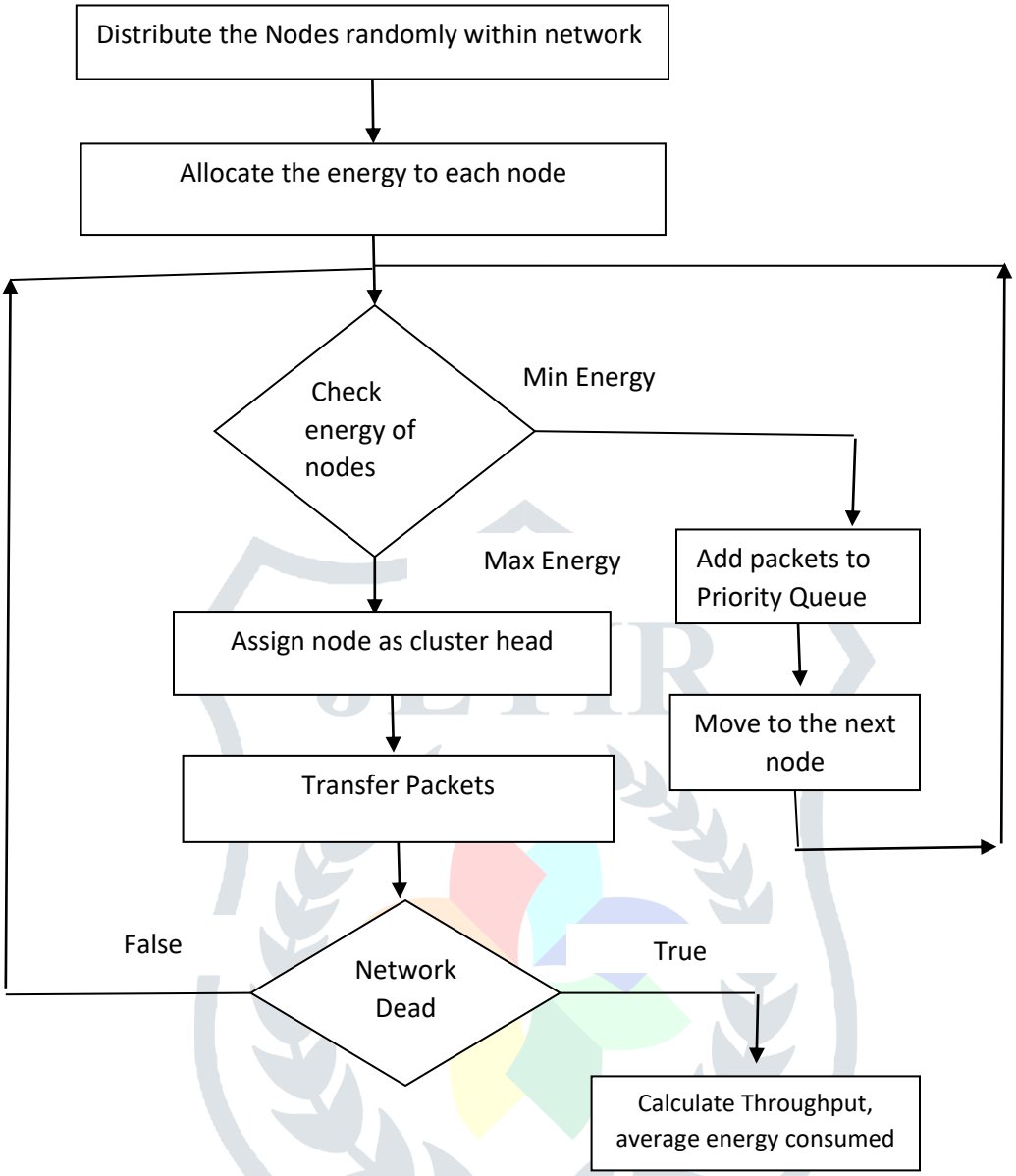

Figure 2: Structure of proposed methodology

Performance Analysis and Results

The results indicates that performance of the modified DEEC is better as compared to existing systems. The average of 1000 rounds were considered for evaluation. The number of dead nodes in 1000 rounds for the proposed system is 29 as compared to 100 for LEECH protocol.

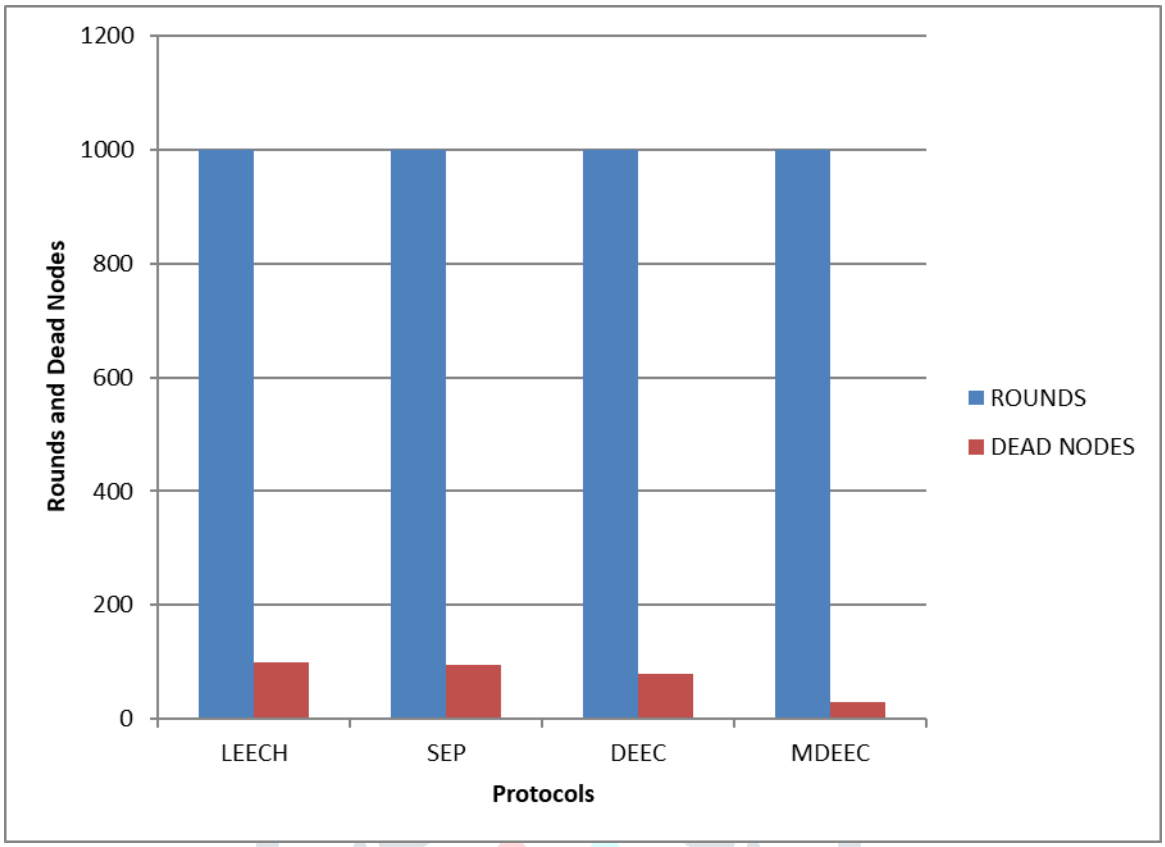

Figure 3: Number of dead nodes

The packets to base station means finalized packets that reach the base station from the cluster head. This metric ultimately contribute to the throughput of the sensor network. The packets to base station for 1000 rounds are highest for proposed DEEC.

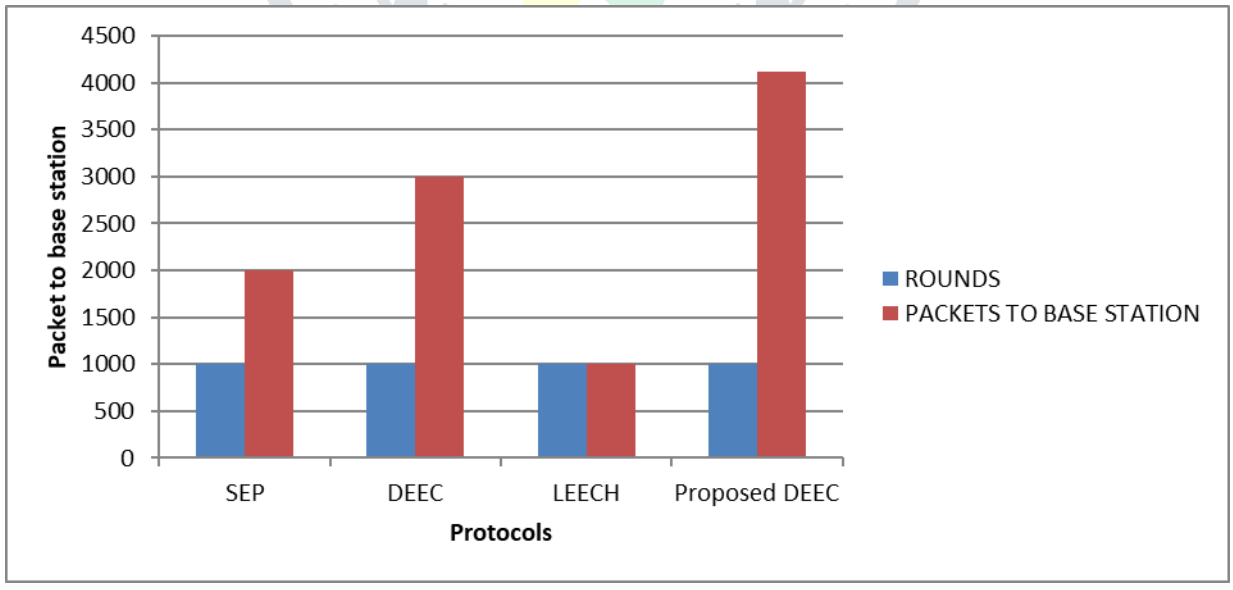

Figure 4: Packets to base station

The energy consumed is the metric that must be reduced while packets are being transmitted towards the destination. The proposed DEEC protocols energy consumption is significantly reduced as shown in figure 5

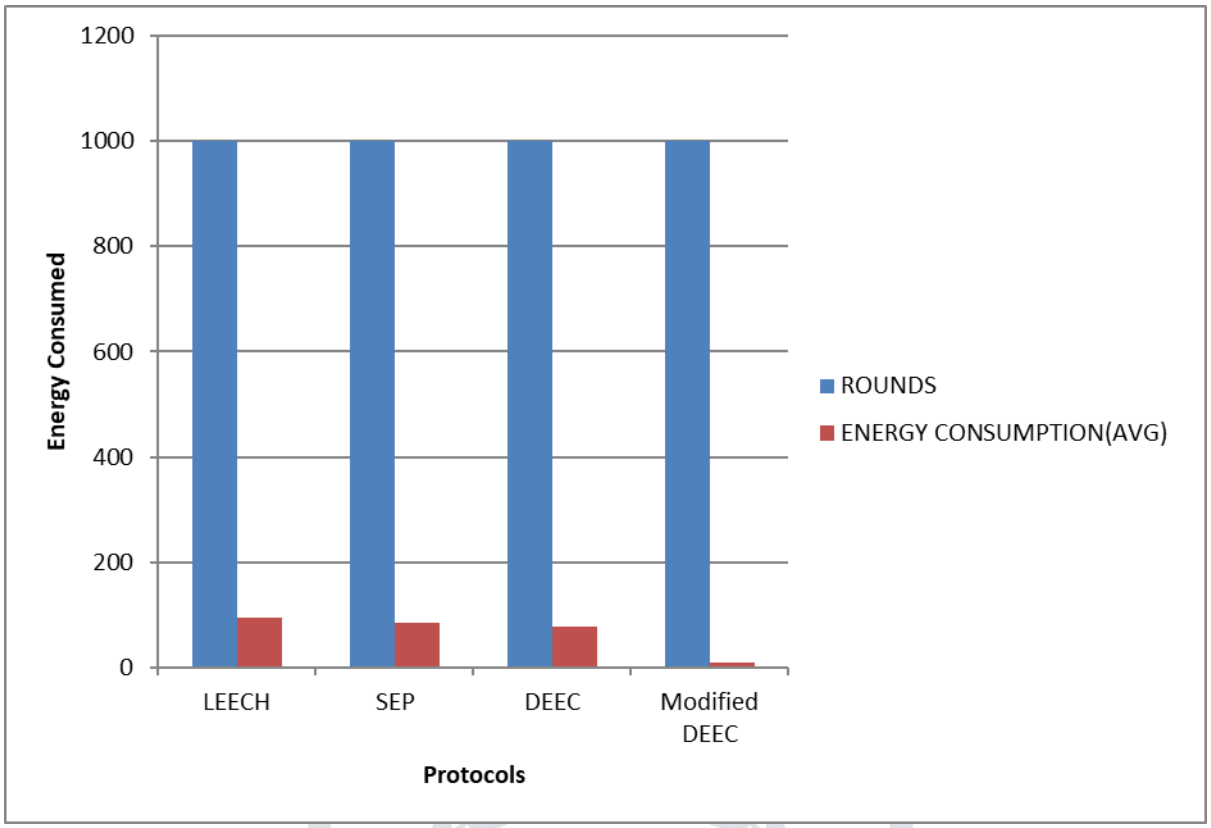

Figure 5: Energy consumed

Total packets transferred to the base station to the total number of packets received at cluster head is known as throughput. The result of the throughput is given as under

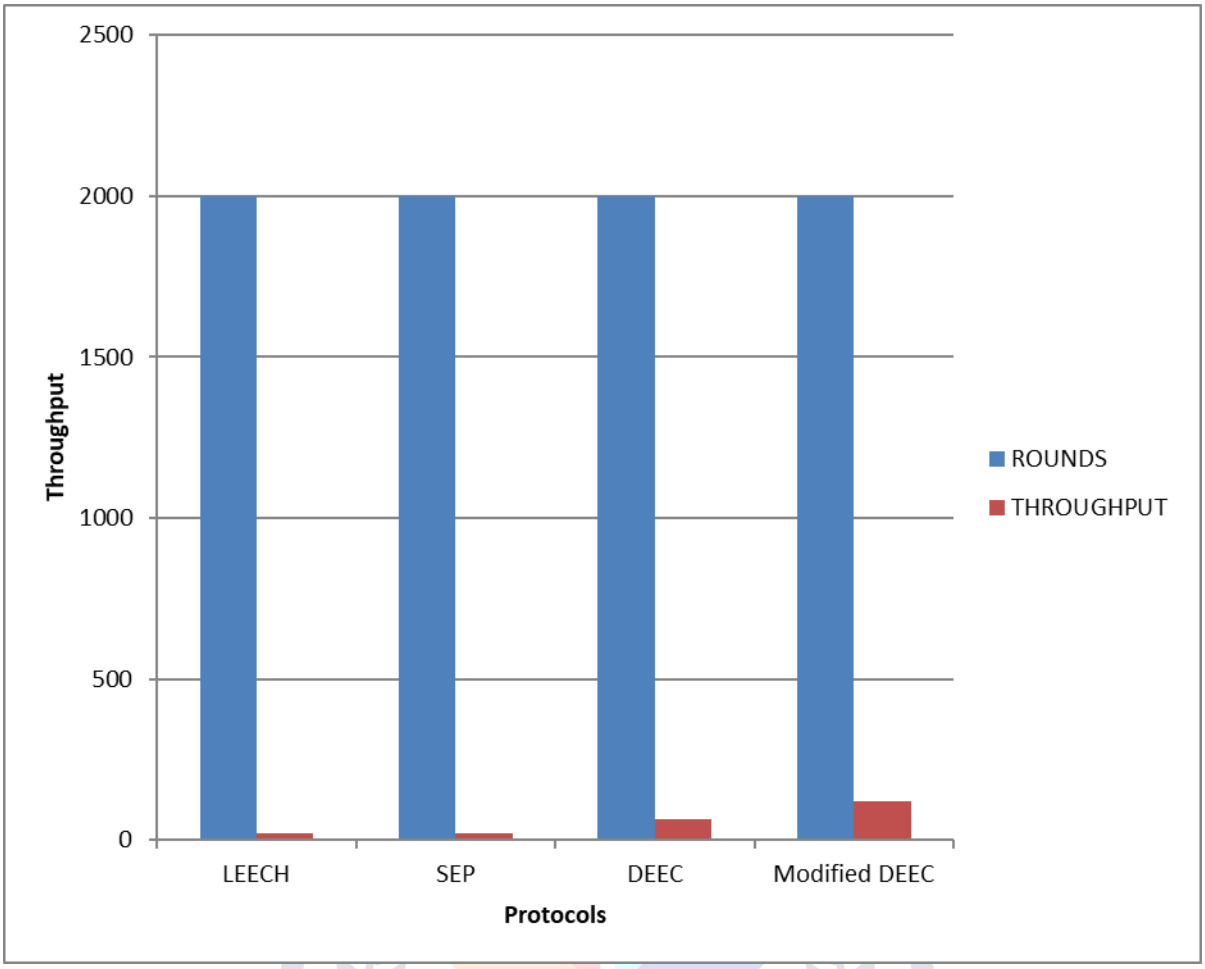

Figure 6: Throughput of existing and proposed work

Conclusion and future work

The WSN is a filed of study and is selected as most of the work in modern era is oriented towards wireless signal transmission. The sensors have limited energy associated with them. This means energy associated with sensors will decay quickly. To overcome the issue of energy efficiency , this research work proposed a new modified distributed clustering protocol based upon multiple cluster head selections per rounds along with priority queue. The cluster head will be selected on the basis of energy possessed by sensors along with the distance from bases station. Once the cluster head is selected, nodes having minimum distance from it transfer the packets towards the selected cluster head. It is the responsibility of the cluster head to transfer the packets towards the base station. This cluster head selection process is applied on multiple nodes per rounds. This means pressure of all the nodes will not be present on single cluster head. Furthermore, it is possible that even if some cluster head is dead even then packets are not lost due to presence of priority queue.

Using the modified DEEC, packets to base station, packets to cluster head, energy efficiency, throughput and number of dead nodes per rounds improved significantly.

The compression can be implemented along with the modified DEEC to improve the performance of the proposed protocol. The compression mechanism can reduce the size of the packets. This means energy consumed to transfer the packets towards the base station is decreased significantly. The overall throughput of the network can be improved by the use of the compression within modified DEEC approach.

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