Improved ECRSEP Protocol for Heterogeneous WSNs

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ABSTRACT
This paper enhances the performance of the ECRSEP using enhanced CH selection and segment based optimization. The sensor field optimization is a dangerous problem in wireless sensor networks and has been ignored by several researchers. As in numerous real-time sensing fields the sensor nodes on the corners i.e. on the segment boundaries will become lifeless before time because no special safety is available for them. Therefore, in this research work the major objective is on the segment based optimization by separating the sensor field among advance segments and normal segments. The inspiration at the back this sensor field optimization is to extend the time when the first sensor node dies. Because in normal sensor nodes which were exist in on the boundaries may become lifeless early because the space among them and the base station is more so they consume more power so ultimately will become lifeless soon.

Index Terms
WSNs, ECRSEP, SEP, field optimization, energy

1. INTRODUCTION
A Wireless sensor network (WSN) is a increase wireless set of connections which is a combination of self-governing devices like nodes, routers, gateway where each node having connectivity to sensor. Information is transmitted in a sprinkled way from creation to finish these sensor nodes and monitoring of the physical situation is done from isolated position. The sensor nodes are deployed in an unexpected method and be in touch wirelessly. In [1] five type features have been told which desire to be considered when growing wireless sensor networks solutions. Heinzelman et al. (2000) [2] has been formulated a most recent approach for equally distribution of energy weight among the sensor in wireless sensor network. According to writer, this technique is additional helpful as weight can be sprinkled among all the nodes equivalently and thus reduces the communication power as compare to with the direct communication (DT) and minimum energy transmission (MTE).Author has also explained that this technique chooses CHs in such a randomized revolution way that each sensor node would get the opportunity to become Cluster Head. Additional author has discussed the method of CH selection and thus cluster arrangement. In the end how information is aggregated at CHs and it is being passed to base station. By replication consequences in MATLAB author has exposed a vast space between this most recent approach and conventional communication approaches. Smaragdakis et al. (2004) [3] Explained that stability period can be enhanced for various position which has a big concern in wireless sensor network. Author has represented a most recent protocol, which is heterogeneous-conscious and is correct for two-level hierarchical WSN. As discussed by author according to this newest protocol, nodes have the opportunity to become a CH on the base of the remained power in every node of the WSN. Author has also explained that if we presume two kind of nodes like sensor nodes with extra energy which would be called as advanced node and latest one is having a lesser amount energy would be known as normal nodes so on the base of the simulation outcome it can be accomplished that the arrangement of SEP is investigational to be lock up to that of an best better bound obtained by distributing the additional energy of advanced nodes regularly over all nodes in the sensor field. In the conclusion author has proficient that as stable period of wireless sensor network is limitless so, the throughput of SEP is also higher to that of existing (heterogeneous-oblivious) clustering protocols. Heikki Karvonen et al. [2004] [4] has considered the effect of coding on the power utilization in wireless embedded networks. An analytical model of the radio power utilization is developed to study how dissimilar DC balanced codes affect the power consumption for the one-hop case. Zach Shelby et al. [2005][5] has provided an analytical model for the study of power utilization in multihop wireless embedded and sensor networks where sensor nodes are extremely energy constrained. Short energy optimization techniques developed for conventional ad hoc networks are not enough as they do not properly address exacting features of embedded and sensor networks. It is not sufficient to lessen overall power utilization, it is also significant to capitalize on the life span of the whole network, that is, uphold full network connectivity for as extended as possible. Guisheng Yin et al. [2008] [6] Since the sensor nodes of wireless sensor networks are in the situation of a highly-limited and un replenish able power resource such as battery power, computation, and storage space, the power efficiency is the most significant key point of the network routing designing. In this paper, a novel routing algorithm which combines with hierarchical routing and geographical routing is planned. Islam et al.(2009)[7] has explained a new approach called Extended SEP for prolonging the recognized period in Three level Hierarchical Clustered mixed WSN through reorganizing the network topology. In the discussed approach, it is understood that sensor nodes are motionless and spread randomly in the mixed network, and it is understood that the coordinates of the sink and the size of the sensor field are beforehand identified. To give a vision of real time surroundings author has analyzed a three level hierarchical clustered mixed sensor network having three types of sensor nodes with different initial energy and named them as advanced sensor nodes, moderate sensor nodes and normal sensor nodes have been considered. Advanced and moderate nodes have additional energy, longer communication range, and higher information rate in compare with the normal nodes. So the advanced and moderate nodes have higher chances to become CHs at a particular round compare to a normal node which lengthily make longer the sensor network. By using the theoretical approach, the number of live nodes can be increase by a significant issue compared to the existing protocol. As the energy consume rate is fewer in moderate and advanced nodes, it increases the life time of the network. Author has exposed by

simulation outcome that the extended SEP achieves improved presentation than the existing SEP algorithm in terms of network life time and throughput. Ma Chaw Mon The in et al. [2010] [8] Modern advances in WSNs have led to lots of latest protocols specifically designed for sensor networks where power awareness is an essential consideration. Clustering is a key routing method used to decrease power utilization. Clustering sensors into groups, so that sensors communicate information only to CHs and then the cluster-heads communicate the aggregated information to the sink, saves power and thus prolonging network life spam. Power efficient CH selection algorithm for adapting clusters and rotating CH positions to evenly distribute the power load between all the sensor nodes. Our planned model is extended to the LEACH's stochastic CH selection algorithm by modifying the probability of each sensor node to become CH based on residual energy level of nodes for transmission. Simulation results show that our planned model could superior implement load balance and prolong the life span of the network. Haosong Gou et al. [2010] [9] Wireless sensor networks have been considered as a promising technique for consistently monitoring both civil and military environments under hazardous or unsafe environment. Due to such environments, the energy supplies for sensors in the network are not usually replaceable. Therefore, the power effectiveness is critical for the life span and cost of wireless sensor network (WSN). Several methods have been planned to decrease the impact of communication protocols on the on the whole power dissipation of WSN. The low-energy adaptive clustering hierarchy (LEACH) and another enhanced centralized LEACH deploys randomized rotation of CHs to uniformly allocate the power load among all sensors in a WSN. This paper proposes an improved LEACH (LEACH-C) algorithm called partition-based LEACH (pLEACH), which initially partitions the network into optimal number of sectors, and then selects the sensor node with the maximum power as the head for every sector, using the centralized calculations. The simulation results and analysis show that pLEACH could achieve a large amount superior performance of wireless sensor network in terms of the power dissipation, network life span and quality of communication. . Melese et al. (2010)[10]has paying attention on energy, which is a most important concern while controlling a WSN. Shuo Shi et al. [2012] [11] LEACH-C is a cluster algorithm in which CHs are arbitrarily selected from the sensor nodes with power above the average, and the simulated annealing algorithm is utilized to find the optimal solution with superior position to lessen the power loss of cluster heads. A power-efficiency Optimized LEACH-C. Initial, we select a group of CHs using LEACH-C. Next, taking retransmission and recognition into consideration, we produce a model of cluster head power consumption. We will compute the quadratic sum of the distances from every CH to its member sensor nodes in the optimal solution. As a final point, the largest power utilization for a single CH in the next round will be estimated, and all sensor nodes with remaining power larger than the calculated utilization will be taken to a latest round of simulated annealing to find a enhanced result. Thus, loss of the CH for every round can be minimized, and the WSN life span can be extended ultimately. MATLAB simulation outcome show improve of about 47-575% is capable to best in terms of network life time. According to author advantages of discussed technique is with longer distances between the each and every one node and base station. Thu Ngo Quynh et al. [2012] [12] Wireless Sensor Network (WSN) is a promising technique for a diversity of applications. Because of limitation of power resource, memory space and processing capability of nodes, it is very hard to implement IP-based routing protocols in wireless sensor network. Recently, lots of research focuses on developing particular routing protocols for WSNs with the main design criteria: power efficiency, load balance and reliability. The most well known routing protocol class is hierarchical which divides network into several clusters. Every cluster is represented by a CH that is responsible for receiving information from all non-CH members, aggregating this information and sending to the sink. In order to balance power consumption of the whole network, CHs are not fixed but rotated. Therefore, the hierarchical protocols can reduce and balance the energy utilization and prolong network life span. LEACH is one of the primaries cluster-based for WSN, which includes distributed cluster development. In this paper, we propose a new hierarchical routing protocol (called EL-LEACH: Energy and Load balance LEACH) which achieves power efficiency and load balance. Our simulation result shows that our new scheme EL-LEACH achieves enhanced power consumption, load balance and network duration than other well known LEACH protocols. Ahlawat et al. (2013) [14] has discussed a latest approach to advance network lifetime. Author has suggested choosing a secondary CH as a resulting CH which will job in case our CH would die .Author has explained that how secondary CH would be selected. According to author, these criteria could be less space among nodes, highest remaining energy in nodes, and lowest quantity energy loss. So according to author the CH would on no account die. There is secondary CH which will replace with the lifeless cluster .Simulation results shows that this new technique increase lifetime in compare of the conventional approaches. Beiranvand et al. (2013) [15] has focused on consumption of energy during communication in internal network. Author has discussed a newest routing technique which is energy capable in which sensor nodes are selected as CH ,on the base of these assured criteria- sensor nodes with advanced residual energy, nodes having more neighbour's, and nodes which have smaller distance from the base station. According to author this choice process of CH choice prolongs WSN lifetime and it minimizes energy dissipation per each sensor node. The discussed approach has been evaluated using of MATLAB simulator that this technique has the elasticity of varying the position of base station in Wireless Sensor Networks.

2. PROPOSED ALGORITHM

Following are the various steps required to achieve the objectives of this research work:-

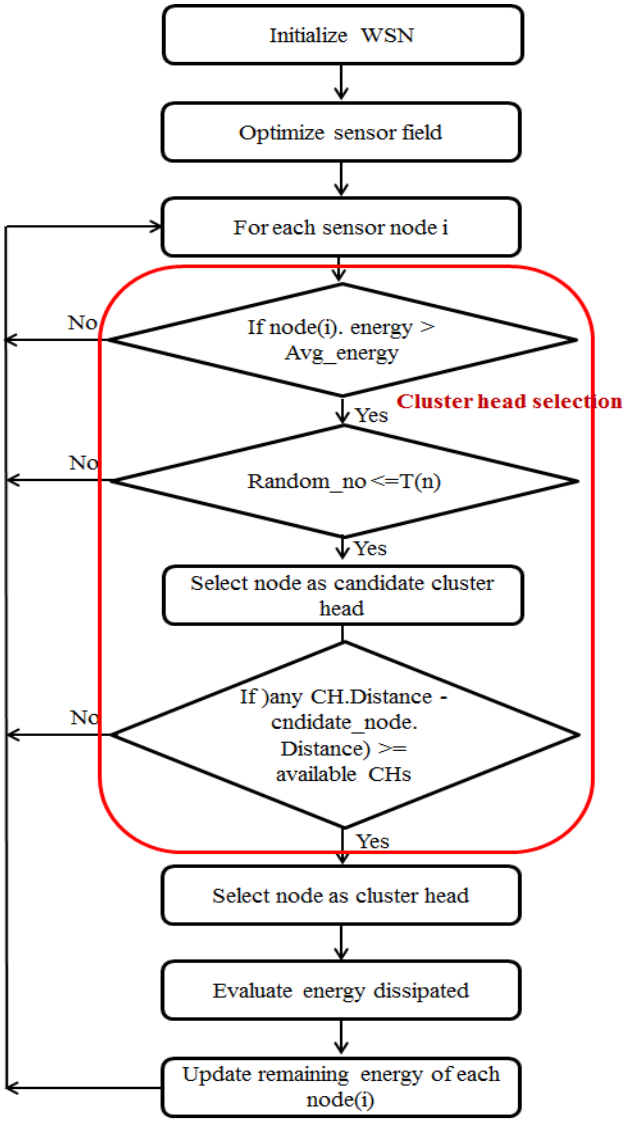

Fig 1: Flowchart of the Proposed Work

3. RESULTS AND DISCUSSIONS

Once the implementation begins, the initial view that comes to be perceived is shown in Figure. The screen is separated in to a variety of regions that are called clusters. Every cluster thus formed has a cluster head, normal, advance and super sensor nodes. The whole network has a sink that is responsible for the collection of information from all other nodes.

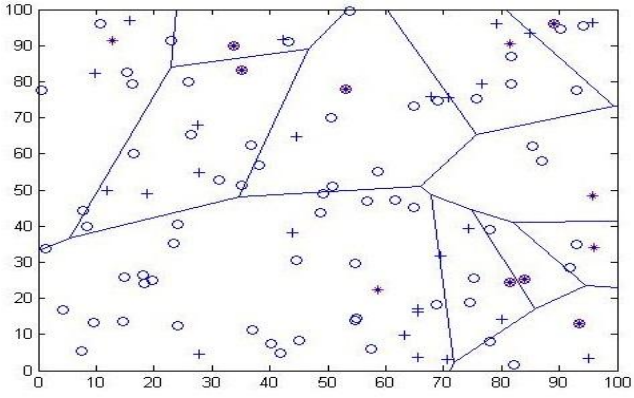

Fig 2: when all the sensor nodes are active

Figure 2 is showing the WSN in active mode where all sensor nodes are active. Nodes represent by circles are normal nodes and nodes with circle and star (*) are cluster heads. Nodes represent by plus are advance sensor nodes and nodes with plus and star (*) are cluster heads. The whole network has a sink that is responsible for the collection of data from all other sensor nodes.

Figure 3 is demonstrating the with active as well as with some dead nodes represent by red diamond.

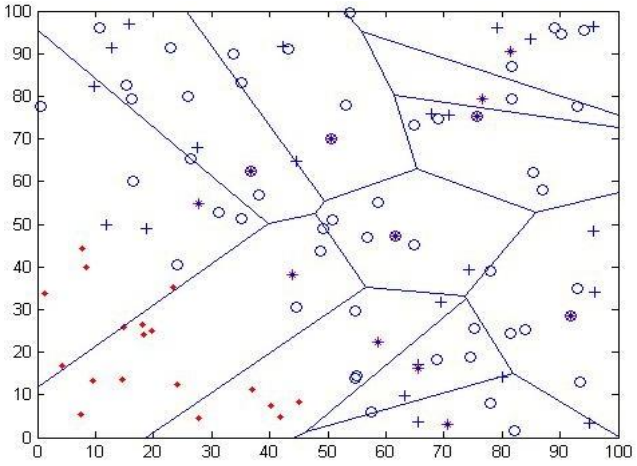

Fig 3: when some sensor nodes are dead

Figure 3 shows the dimension area of 100*100, there are 100 sensor nodes in total in which some are active represent by circles (o), some are cluster head represent by using circle and star (*) , plus and star (*) , and also red diamonds represent the sensor node dead so far during the life cycle of wireless sensor network.

Figure 4 is representing all dead sensor nodes represent by red diamond. Figure 4 also shows the dimension area of 100*100, there are 100 sensor nodes and red diamonds represent the sensor node dead so far during the life cycle of WSN. The entire network has a sink that is responsible for the collection of data from all other nodes.

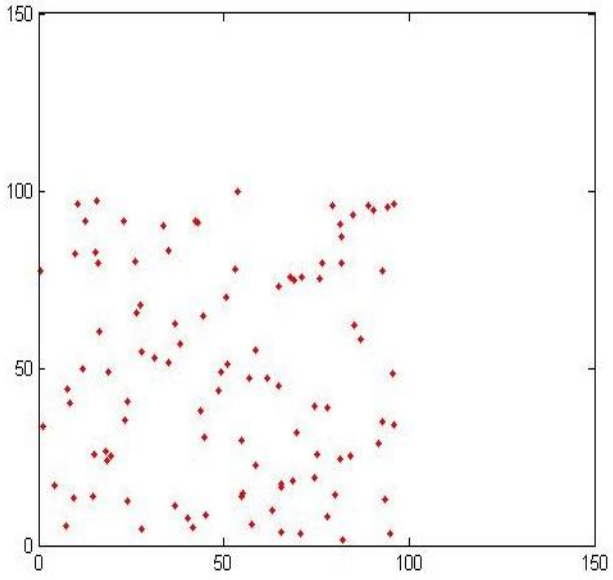

Fig 4: when all the sensor nodes are dead

3.1 Performance Evaluation of SEP, ECRSEP, ESEP, PROPOSED when n=100

It is the amount of time that a WSN would be fully operative. It is the time interval from the begin of the operation until the death of the last alive sensor node.

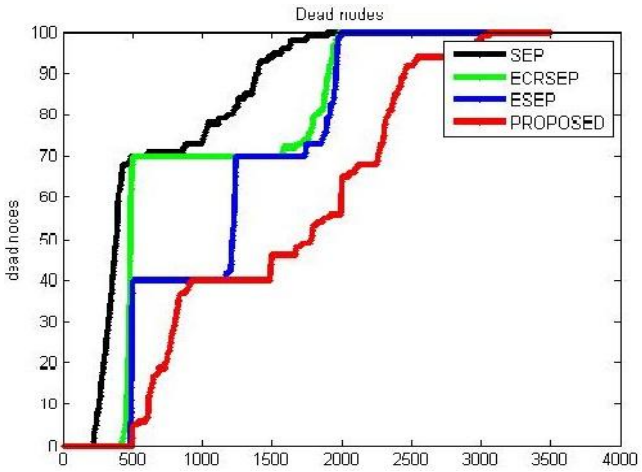

Fig 5: Dead nodes during network lifetime

Figure 5 shows the comparison of total number of dead nodes of SEP, ECRSEP, ESEP and PROPOSED protocols. X-axis represents the total number of dead nodes. Y-axis represents the total number of rounds. It clearly depicts that the PROPOSED is the majority efficient than SEP, ECRSEP, ESEP in terms of network life span. It is measured by the total rate of information sent over the network, the rate of information sent from cluster heads to the base station as well as the rate of information sent from the sensor nodes to their cluster heads.

Figure 6 shows the comparison of throughput of SEP, ECRSEP, ESEP and PROPOSED protocols. X-axis is representing packets sent to base station. Y-axis is representing the total number of rounds. It depicts that information sent to base station is more for PROPOSED than SEP, ESEP and ECRSEP. Thus this figure clearly shows that the PROPOSED is the majority efficient than SEP, ESEP and ECRSEP in terms of packet sent to base station.

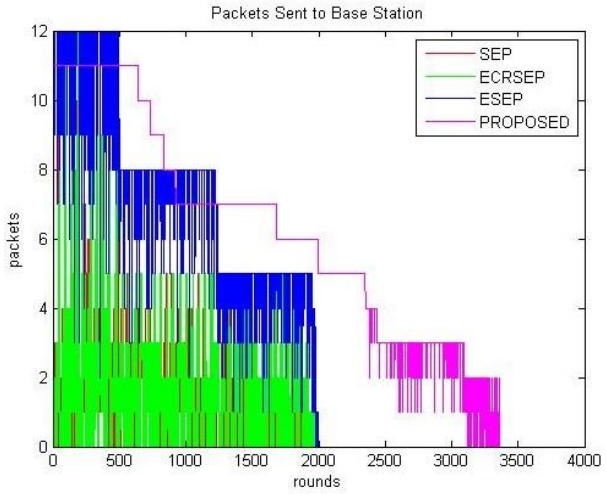

Fig 6: Total number of packets sent to base station

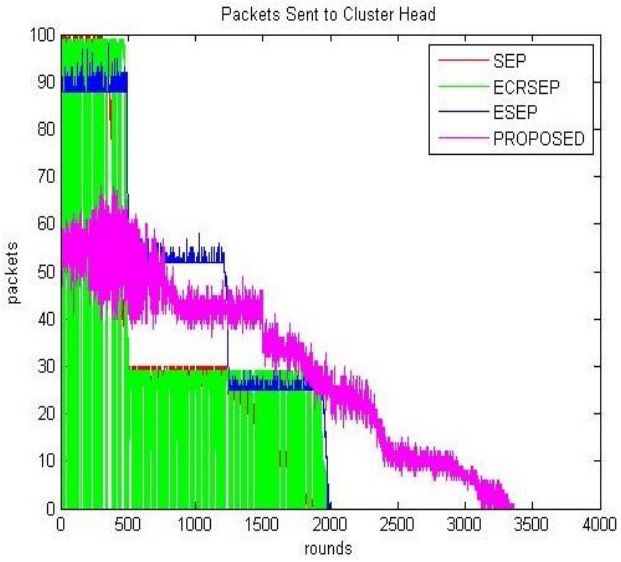

Fig 7: Total number of packets sent to cluster head

Figure 7 shows the comparison of total number of packets sent to cluster head of SEP, ESEP, ECRSEP and PROPOSED protocols. X-axis is representing packets sent to CH. Y-axis is representing the total number of rounds. It depicts that data sent to CH is more for PROPOSED than SEP, ESEP and ECRSEP. In this figure PROPOSED shows best throughput than SEP, ESEP and ECRSEP.

Figure 8 shows the comparison of remaining energy of SEP, ESEP, ECRSEP and PROPOSED protocols. X-axis is representing remaining energy. Y-axis is representing the total number of rounds. It shows that PROPOSED has more remaining energy than SEP, ESEP and ECRSEP. Thus this figure shows that the PROPOSED is the majority efficient than SEP, ESEP and ECRSEP in terms of remaining energy.

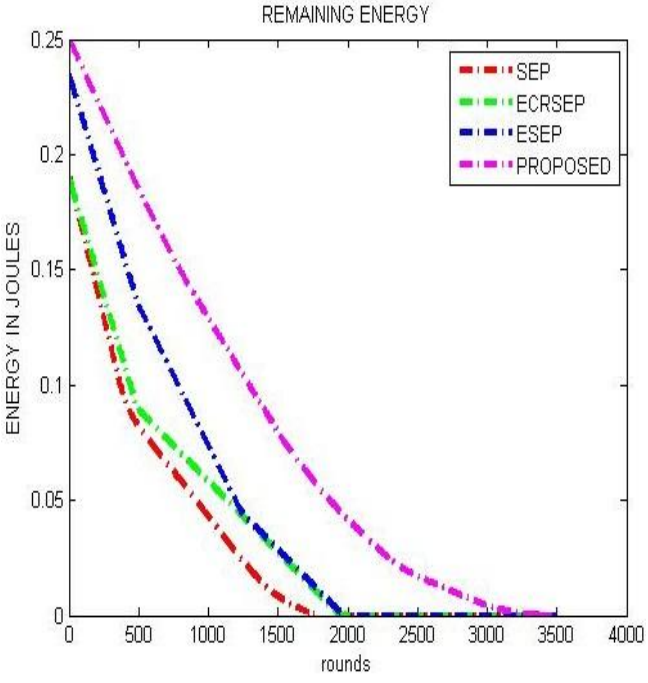

Fig 8: Remaining Energy

3.2 Performance Evaluation of SEP, ECRSEP, ESEP, PROPOSED when n=100, BS= (50,150)

It is the amount of time that a WSN would be fully operative. It is the time interval from the start of the operation until the death of the last alive node.

Figure 9 shows the comparison of total number of dead nodes of SEP, ECRSEP, ESEP and PROPOSED protocols. X-axis represents the total number of dead nodes. Y-axis represents the total number of rounds. It clearly depicts that the PROPOSED is the majority efficient than SEP, ECRSEP, ESEP in terms of network life span.

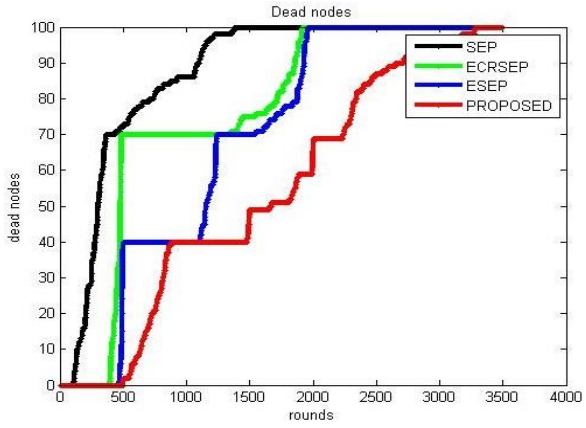

Fig 9: Dead nodes during network lifetime

It is measured by the total rate of information sent over the network, the rate of data sent from cluster heads to the base station as well as the rate of data sent from the sensor nodes to their cluster heads.

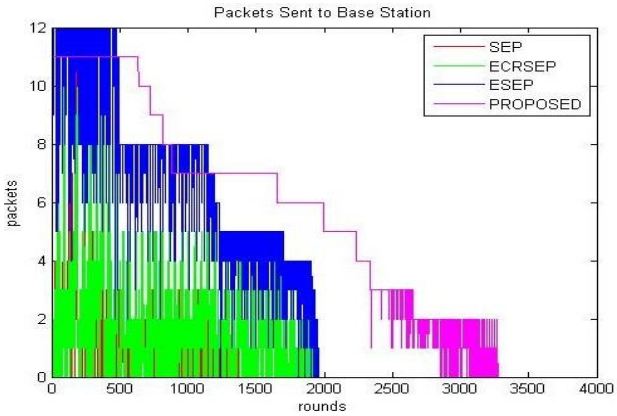

Fig 10: Total number of packets sent to base station

Figure 10 shows the comparison of throughput of SEP, ECRSEP, ESEP and PROPOSED protocols. X-axis is representing packets sent to base station. Y-axis is representing the total number of rounds. It depicts that information sent to base station is more for PROPOSED than SEP, ESEP and ECRSEP. Thus this figure clearly shows that the PROPOSED is most efficient than SEP, ESEP and ECRSEP in terms of packet sent to base station.

Figure 11 shows the comparison of total number of packets sent to CH of SEP, ESEP, ECRSEP and PROPOSED protocols. X-axis is representing packets sent to CH. Y-axis is representing the total number of rounds. It depicts that data sent to CH is more for PROPOSED than SEP, ESEP and ECRSEP. In this figure PROPOSED shows best throughput than SEP, ESEP and ECRSEP.

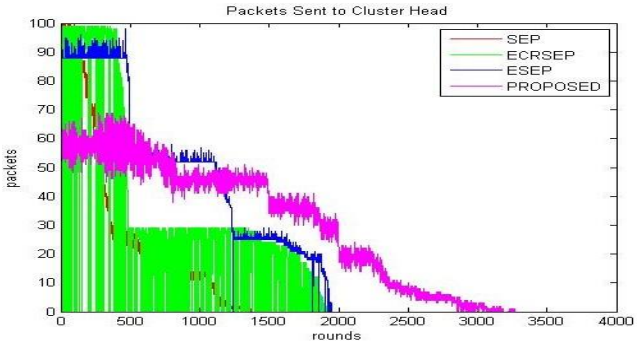

Fig 11: Total number of packets sent to cluster head

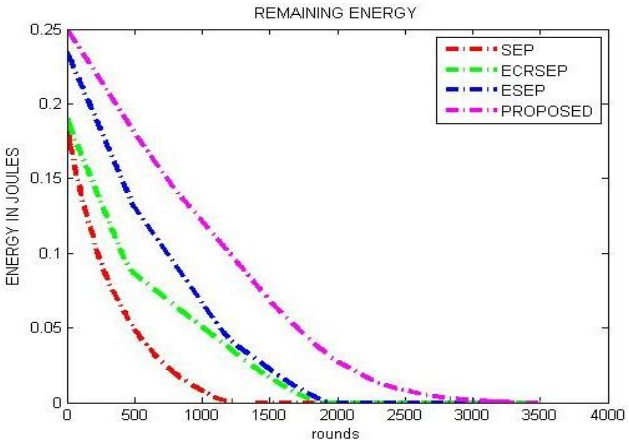

Fig 12: Remaining Energy

Figure 12 shows the comparison of remaining energy of SEP, ESEP, ECRSEP and PROPOSED protocols. X-axis is representing remaining energy. Y-axis is representing the total number of rounds. It shows that PROPOSED has more remaining energy than SEP, ESEP and ECRSEP. Thus this figure shows that the PROPOSED is the majority efficient than SEP, ESEP and ECRSEP in terms of remaining energy.

4. CONCLUSION

This paper has enhanced the performance of the ECRSEP using improved CH selection and segment based optimization. The sensor field optimization is a critical issue in Wireless Sensor Networks and has been neglected by lots of researchers. As in many real-time sensing fields the nodes on the corners i.e. on the segment boundaries will become dead early because no special protection is available for them. Therefore, in this research work the main objective is on the segment based optimization by dividing the sensor field among advance and normal segments. The motivation behind this sensor field optimization is to extend the time when the first sensor node dies. Because in normal sensor nodes which were reside on the boundaries may become dead early because the distance among them and the base station is more so they consume more energy so ultimately will become dead soon. The ECRSEP has used different probability function for cluster head selection for selecting the best cluster head by using the remaining energy and also use single hop for communication. But ECRSEP has neglected the distance among base station and cluster head and also use multi hop for communication. Therefore the proposed technique has shown more proficient outcomes than the existing techniques.

5. REFERENCES

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