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SFO-ECRSEP: SENSOR FIELD OPTIMIZATION BASED ECRSEP FOR HETEROGENEOUS WSNS

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ABSTRACT

The sensor field optimization is a serious issue in WSNs and has been ignored by many researchers. As in numerous real-time sensing fields the sensor nodes on the corners i.e. on the segment boundaries will become lifeless early because no extraordinary safety is presented for them. So, in this research work the central objective is on the segment based optimization by separating the sensor field between advance and normal segments. The inspiration at the back this sensor field optimization is to extend the time spam when the first sensor node dies. For the reason that in normal sensor nodes which were exist on the borders may become lifeless early because the space among them and the base station is more so they consume more power so at last will become lifeless soon.

INDEX TERMS: *WSNs, ECRSEP, SEP, FIELD OPTIMIZATION, ENERGY.*

I. INTRODUCTION

A Wireless sensor network (WSN) is an extend wireless set of relations which is a combination of autonomous devices like nodes, routers, gateway where each node having connectivity to antenna. Information is transmitted in a spread method from start to finish these sensor nodes and monitoring of the ecological condition is made from remote position. The sensor nodes are deployed in an unexpected mode and be in contact wirelessly. In [1] five solution features have been told which would like to be considered when expanding WSN solutions. Lots of studies on Wireless sensor network have been accepted out in Laboratories. Wireless sensor network technology is more and more demanding with latest applications in a variety of areas WSNs are consisted of thousands of tiny sensors that cover a huge ecological region. These sensors are capable to exchange an information with each other to collaboratively identify objects, gather information and broadcast messages. However, as sensors are typically little in size, they have a lot of physical restrictions – such as battery, computational power and memory. Because of those restrictions, power-efficient techniques are most important research challenges in WSNs.

A numeral of techniques have been planned to answer these challenges. LEACH (Low-Energy Adaptive Clustering Hierarchy) is one of the well-known techniques in wireless sensor networks. This is a cluster-based protocol that utilizes randomized rotation of local cluster sinks (cluster-heads) to uniformly share out the energy load amongst the sensors in the network. This technique can decrease a number of transmissions in clusters. However, the strong information flow can be damaging, mainly in wireless sensor networks, since congestions and collisions may be occurred. Conventional server/client-based techniques like a LEACH cannot consume autonomous-repair and scalability and so on. And moreover it gives too much load on sink. Therefore it is require applying the distributed approach to improve this serious issue.

II. LITERATURE REVIEW

Heinzelman et al. (2000) [2] has been formulated a newest approach for regularly distribution of power weight among the sensor in wireless sensor network. According to writer, this approach is additional useful as weight can be dotted among all the nodes equivalently and thus reduces the communication power in compare with the direct communication (DT) and minimum energy transmission (MTE). Author has also explained that this approach chooses cluster-heads in such a randomized uprising technique that every sensor node would get the opportunity to become Cluster Head. Further author has discussed the process of cluster head selection and thus cluster arrangement. In the last how information is aggregated at Cluster Heads and it is being sent to base station. By duplication penalty in MATLAB critic has uncovered a huge space among this newest approach and predictable communication approaches. Smaragdakis et al. (2004) [3] Explained that stability time can be enhanced for diverse position which has a huge concern in WSN. Author has represented a newest 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 cluster head on the support of the remained power in each node of the WSN. Author has also explained that if we presume two kind of nodes like sensor Nodes with extra power which would be called as advanced nodes and latest one is having a lesser quantity power would be known as normal nodes so on the base of the simulation outcome it can be talented that the arrangement of SEP is investigational to be close up to that of an finest superior bound obtained by distributing the additional power of advanced nodes frequently over every nodes in the sensor field. In the last author has talented that as steady time of WSN is limitless so, the throughput of SEP is also better to that of presented (heterogeneous-oblivious) clustering protocols. Heikki Karvonen et al. [2004] [4] has studied the result of coding on the power utilization in wireless fixed networks. A logical model of the radio power consumption is developed to study how dissimilar DC balanced codes involve the energy utilization for the one-hop case. A Rayleigh fading channel is assumed, the investigation is unlimited to contain multihop scenarios in order to learn the tradeoff among coding overhead and energy utilization. The mathematical consequences obtained show that power efficiencies of the codes used in a multihop routing scenario are powerfully needy on the channel circumstances and on the numeral of hops used. 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 power controlled. Low power optimization techniques developed for predictable ad hoc networks are not enough as they do not correctly address exacting features of embedded and sensor networks. It is not sufficient to decrease overall power utilization, it is also significant to increase the life span of the whole network, that is, sustain full network connectivity for as long as probable. Unusual multihop scenarios to calculate the power per bit, efficiency and power consumed by individual sensor nodes and the network as a entire are also considered. Mathematical computations demonstrate the things of packet routing, and discover the effects of coding and medium access control. Guisheng Yin et al. [2008] [6] Since the sensor nodes of WSNs are in the situation of a highly-limited and un refill capable power resource such as battery power, calculation, and storage space, the power efficiency is the majority significant key point of the network routing designing. In this paper, a narrative routing algorithm which combines with hierarchical routing and geographical routing is planned. Based on the hierarchical network architecture, the procedure of forwarding packets among the source sensor nodes in the aim region and the sink consists of two phases—inter cluster routing and intra-cluster routing, a greedy algorithm is adopted in the procedure of the inter-cluster routing and an multi-hop routing algorithm based on the forwarding limitation angle is designed for the intra cluster routing. The analysis and simulation consequences show that our routing algorithm has enhanced presentation in terms of power utilization and interruption; it is fit for the information transmission in a high-density WSN. Islam et al.(2009)[7] has explained a new approach called Extended SEP for prolonging the recognized instance in Three level Hierarchical Clustered mixed WSNs through reorganizing the network topology. In the discussed approach, it is understood that sensor nodes are inactive and broaden randomly in the varied network, and it is understood that the coordinates of the sink and the size of the sensor field are earlier recognized. 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 original power and named them as advanced, moderate nodes and normal nodes have

been considered. Advanced nodes and moderate nodes have extra energy, longer communication range, and advanced information rate in compare with the normal nodes. So the advanced nodes and moderate nodes have higher chances to become CHs at a particular round compare to a normal node which at length extend the sensor network. By using the hypothetical approach, the number of living nodes can be increase by a main issue compared to the presented protocol. As the power consume rate is a smaller amount in moderate and advanced nodes, it increases the lifetime of the network. Author has uncovered by simulation outcome that the extended SEP achieves improved arrangement than the existing SEP algorithm in terms of network lifetime and throughput.

Ma Chaw Mon Thein et al. [2010] [8] Modern advances in WSNs have led to a lot of latest protocols particularly designed for sensor networks where power consciousness is a necessary deliberation. Clustering is a key routing technique 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 span. Power efficient CH selection algorithm for adapting clusters and rotating CH positions to uniformly allocate the power load between all the sensor nodes. Our planned model is extended to the LEACH's stochastic CH selection algorithm by modifying the possibility of each sensor node to become CH based on residual power level of sensor for broadcast. Simulation results show that our planned model could an enhanced execute weight balance and prolong the life span of the network.

Haosong Gou et al. [2010] [9] Wireless sensor networks (WSNs) have been measured as a promising technique for consistently monitoring together civil and military environments under hazardous situation. Due to such environments, the energy supplies for sensors in the network are not generally rechargeable. Therefore, the power effectiveness is dangerous for the life span and cost of wireless sensor network. Several mechanisms have been planned to decrease the impact of communication protocols on the overall power dissipation of wireless sensor network. The low-energy adaptive clustering hierarchy (LEACH) and another enhanced centralized LEACH deploys randomized rotation of CHs to regularly allocate the power load between all sensors in a wireless sensor network. This paper proposes an enhanced LEACH (LEACH-C) algorithm called partition-based LEACH (pLEACH), which initially partitions the network into optimal numeral of sectors, and then selects the sensor node with the highest power as the head for every part, using the centralized calculations. The simulation consequences and analysis illustrate that pLEACH could attain a large amount improved presentation of wireless sensor network in terms of the power dissipation, network life span and quality of communication. Melese et al. (2010)[10]has paying concentration on energy, which is a major concern while calculating a WSN. As because nodes which have encouraged their energy finish soon and paying concentration on why we should have encouraged power as an issue For CH Selection in WSN. Author has discussed a customized entry technique for LEACH in which encouraged energy is as a part. This approach enables to reduce the threshold T (n) without stucking system. Thus, this element enhanced the life time of the wireless sensor network. Author has also explained that nodes with lesser quantity encouraged power have affinity to become CHs as compare with nodes with more encouraged energy in a given round. MATLAB simulation outcome illustrate improve of about 47-575% is capable to finest in terms of network life time. According to author advantages of discussed technique is with longer distances between the all the nodes and base station.

Shuo Shi et al. [2012] [11] LEACH-C is a cluster algorithm in which CHs are arbitrarily selected from the sensor nodes with power higher than the average, and the simulated annealing algorithm is utilized to discover the optimal solution with improved location to decrease the power loss of CHs. An energy-efficiency Optimized LEACH-C. Primary, we choose a collection of CHs using LEACH-C. After that, taking retransmission and recognition into consideration, we produce a model of CH power utilization. We will compute the quadratic sum of the distances from every CH to its member sensor nodes in the optimal solution. At last, the biggest power utilization for a single CH in the next round will be predictable, and all sensor nodes with remaining power larger than the calculated utilization will be taken to a latest round of simulated annealing to discover a better solution. Thus, loss of the CH for every round can be minimized, and the wireless sensor network life span can be extended ultimately.

Thu Ngo Quynh et al. [2012] [12] Wireless Sensor Network (WSN) is a promising technique for a diversity of applications. Because of restriction of power resource, memory space and processing

ability of nodes, it is very complicated to implement IP-based routing protocols in wireless sensor network. Recently, numerous research focus on developing particular routing protocols for wireless sensor networks with the major design criteria: power efficiency, load balance and consistency. The majority well known routing protocol class is hierarchical which separates network into numerous clusters. Every cluster is represented by a cluster head (CH) that is accountable for receiving information from all non-CH members, aggregating this information and sending to the sink. In order to stability power utilization of the whole network, CHs are not fixed but rotated. Therefore, the hierarchical protocols can reduce and balance the power utilization and prolong network life span. LEACH is one of the primaries cluster-based for wireless sensor network, which includes dispersed cluster formation. In this paper, we suggest a new hierarchical routing protocol (called EL-LEACH: Energy and Load balance LEACH) which achieves power effectiveness and load balance. Our simulation result shows that our latest scheme EL-LEACH achieves improved power utilization, load balance and network life span than other well known LEACH protocols.

Khan et al. (2012) [13] has been planned an improved approach which works for nodes with heterogeneous energy and having two level of hierarchy means node with dissimilar energy. According to author this technique minimizes the space among CH and sink in a wireless sensor network which reduces the communication energy and thus it expands the network lifetime by extending the interval between stability times. In this approach author has used two types of CHs, main CHs and derived CHs. The later one can be from presented main CHs, and select on base of opportunity, from those nodes, which already become main CH and only main CHs can take part in process of electing derived CHs. Main CHs check distance between each other's and transmit their information to those CHs which are at smallest amount space from them. However, these smallest amount space CHs are derived Cluster Heads. Simulation outcomes show that by simulation that this technique prolongs the stability time, as compare to rest of the selected protocol.

Ahlawat et al. (2013) [14] has discussed a newest technique 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 fewer spaces among nodes, high est. remaining power in nodes, and lowest quantity energy loss. So according to author the CH would on no account die. There are secondary CH which will replacement the lifeless cluster .Simulation results shows that this latest approach 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- nodes with advanced residual energy, nodes having more neighbour's, and nodes which have smaller space from the base station. According to author this choice procedure of CH choice prolongs wireless sensor network lifetime and it minimizes energy dissipation per each sensor node. The discussed technique has been evaluated using of MATLAB simulator that this technique has the elasticity of varying the situation of base station in WSNs.

III. PROPOSED ALGORITHM

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

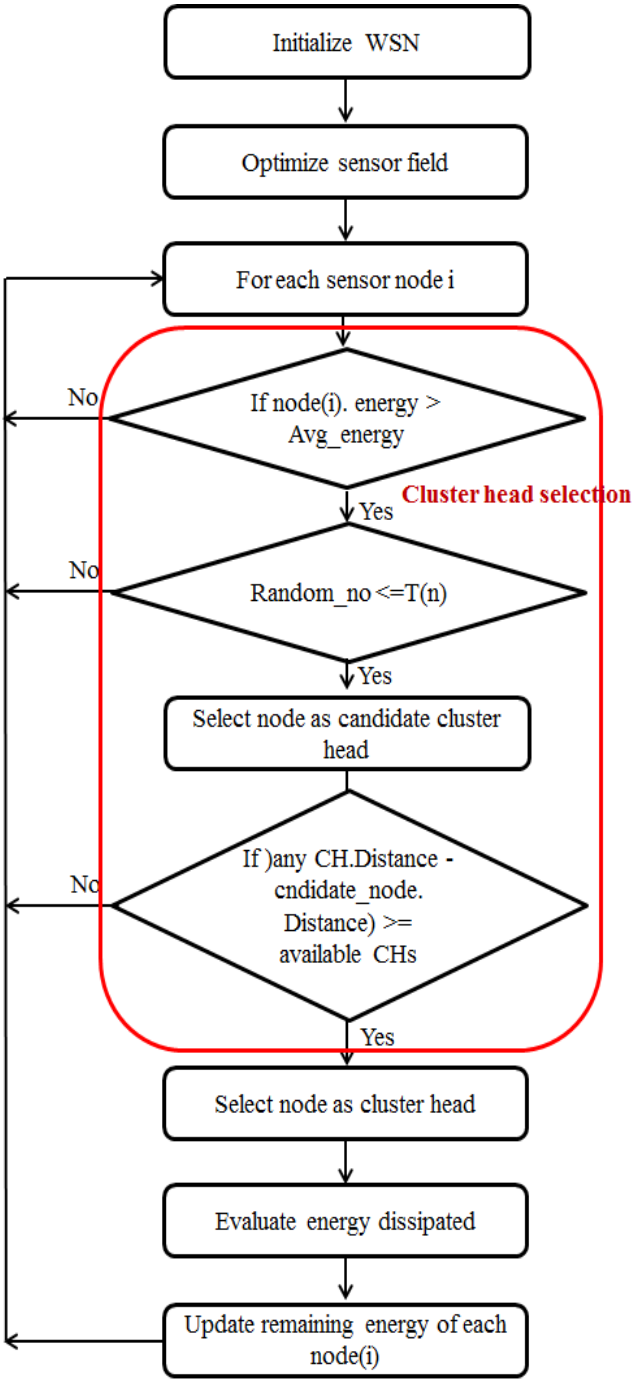

Fig 1: Flowchart of the Proposed Work

IV. RESULTS AND DISCUSSIONS

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

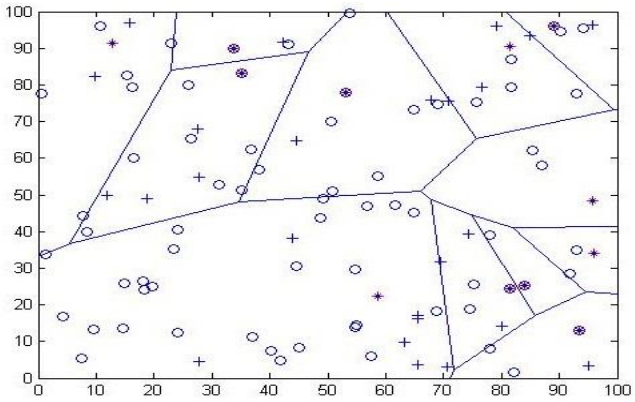

Fig 2: when all the sensor nodes are active

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

Some Dead node

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

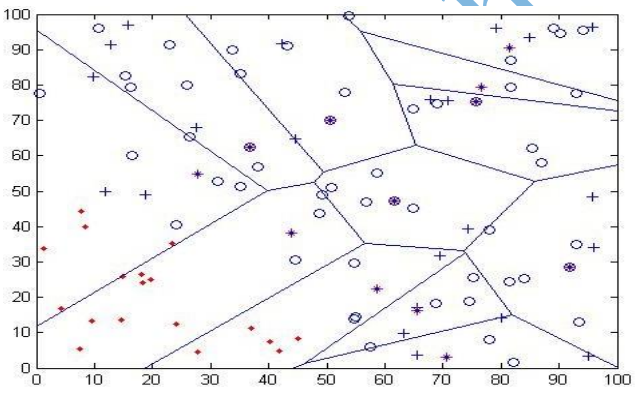

Fig 3: when some sensor nodes are dead

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

ALL Dead nodes

Figure 4 is representing all dead sensor nodes signify 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 whole network has a sink that is responsible for the collection of information from all other sensor nodes.

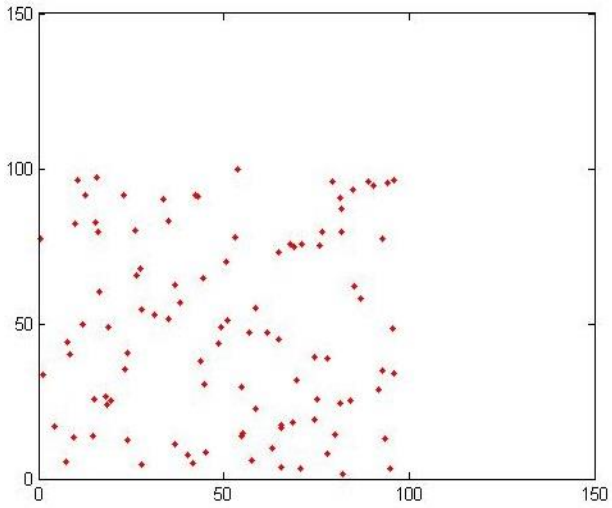

Fig 4: when all the sensor nodes are dead

Analysis And Discussion When Test Scenario 1 When N=100

1. Network Lifetime:

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

Figure 5 shows the comparison of total number of dead sensor nodes of SEP, ECRSEP, ESEP and PROPOSED protocols. X-axis represents the total number of dead sensor nodes. Y-axis represents the total number of rounds. It clearly depicts that the PROPOSED is most efficient than SEP, ECRSEP, ESEP in terms of network life span.

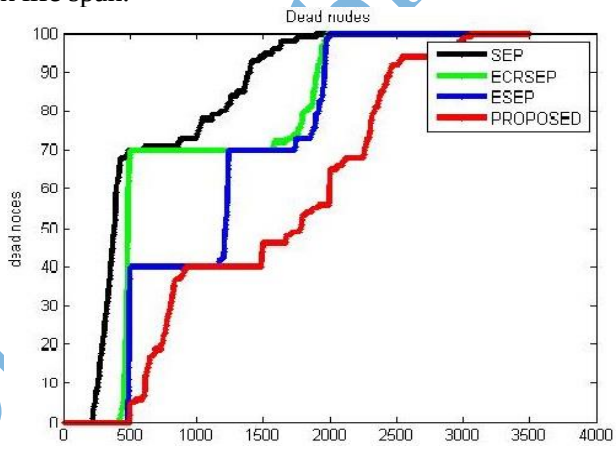

Fig 5: Dead nodes during network lifetime

2. Throughput:

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

Throughput= Total amount of data received from sender/ Time takes for the receiver to get the last packet (bits/sec).

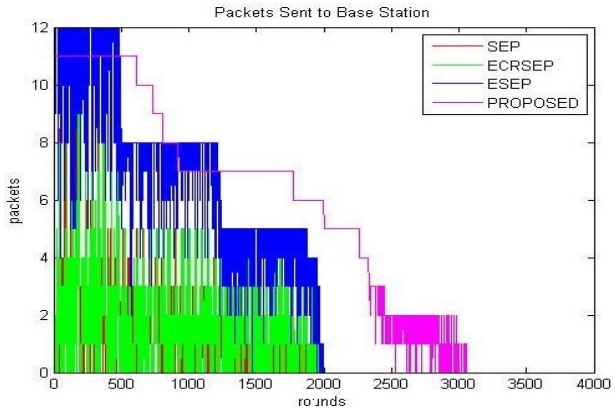

Fig 6: Total number of packets sent to base station

Figure 6: shows the contrast of throughput of SEP, ECRSEP, ESEP and PROPOSED protocols. X-axis is representing packets sent to sink. Y-axis is representing the total number of rounds. It depicts that information sent to sink 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 sink.

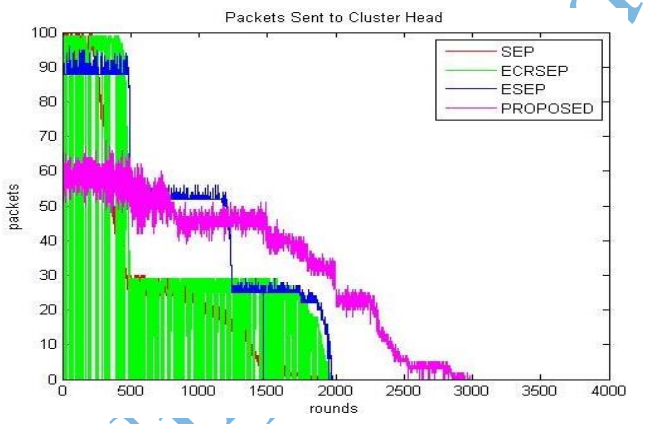

Fig 7: Total number of packets sent to cluster head

Figure 7 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.

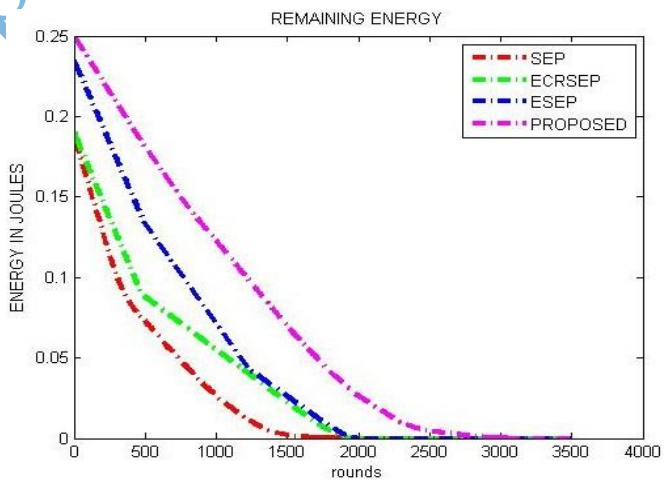

Fig 8: Remaining Energy

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

V. CONCLUSION

This paper has enhanced the performance of the ECRSEP using enhanced CH selection and segment based optimization. The sensor field optimization is a critical issue in wireless sensor networks and has been ignored by several researchers. As in many real-time sensing fields the sensor nodes on the corners i.e. on the segment boundaries will become dead before time because no particular protection is available for them. Therefore, in this research work the major objective is on the segment based optimization by separating the sensor field between advance and normal segments. The inspiration behind this sensor field optimization is to extend the time when the first sensor node dies. Because in normal sensor nodes which were exist on the boundaries may become dead early because the distance among them and the base station is more so they consume more power so ultimately will become dead soon. The ECRSEP has used different probability function for CH selection for selecting the best CH by using the remaining power and also use single hop for communication. But ECRSEP has neglected the distance among sink and CH and also use multi hop for communication. Therefore the proposed technique has shown more capable outcomes than the existing techniques.

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Reviewers Comments:

1. Include authors biography with photographs.
2. Include future scope of work after conclusion.