

# Review Paper on Routing Protocol Centralized Energy Efficient Clustering (CEEC) for Wireless Sensor Networks

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## ABSTRACT

Wireless sensor networks have been widely used in many important areas. WSNs become progressively attractive in wide variety of applications because of their low cost, low power, small in size, self-organizing behavior in harsh environments. Energy usage is an important issue in the design of WSNs. Routing is a vital technology in WSN. There are many routing protocols like: location based, multipath, data centric, mobility based, hierarchical routing, hybrid routing etc. Clustering is used to prolong the lifetime of the wireless sensor networks. Clustering is the process where sensing area is divided in groups to balance the energy level of sensor nodes known as clusters. An Optimal Clustering technique can reduce the energy consumption in WSN and increase the lifetime of the network. Energy is the main consideration when we analyze routing protocols for WSN.

**Keywords:** Clustering, Energy Efficient clustering, wireless sensor networks, network lifetime, energy efficient algorithms, energy efficient routing, Routing Protocols

## 1. INTRODUCTION

Energy usage is an important issue in the design of WSNs which typically depends on portable energy sources like batteries for power. WSNs have discovered a wide range of applications in the recent era. A wireless sensor network (WSN) is typically composed of a large number of low-cost sensor nodes, which work collectively to carry out some real-time sensing and monitoring tasks within a specific area.

Energy efficient routing protocol for Wireless Sensor Networks (WSNs) is one of the most challenging tasks for researcher. Hierarchical routing protocols have been proved more energy efficient routing protocols, as compare to flat and location based routing protocols. Heterogeneity of nodes with respect to their energy level, has also added extra lifespan for sensor network. In this paper, we propose a Centralized Energy Efficient Clustering (CEEC) routing protocol. We design the CEEC for three level heterogeneous networks. CEEC can also be implemented in multi-level heterogeneity of networks. Energy efficiency and reliability is one of the most important factors in WSNs. In this hierarchical (clustering) techniques can aid in reducing useful energy consumption. routing protocols are discussed based on three categories: Flat based routing, Hierarchical-based routing and Location-based routing on the basis of network structure. They have the

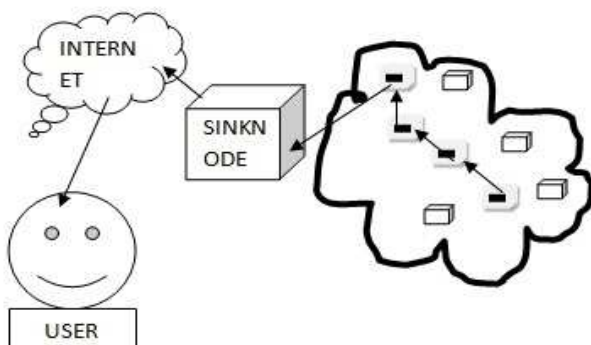


Fig-1: Wireless Sensor Network

common objective of trying to extend the lifetime of the sensor network.

## 2. CEEC- CENTRALIZED ENERGY EFFICIENT CLUSTERING

### 2.1. CEEC'S Advanced Heterogeneous Model

In WSNs, nodes are randomly dispersed in network area without any deployment management. Although nodes deployment is very challenging task in WSNs, however, we can still address this issue by dividing whole network area into multiple logical regions. We present an advance heterogeneous network model in this section. Our proposed network model contains three different types of nodes called, normal, advance and super nodes. These nodes preserve different levels of energy. We divide whole networks  $M \times M$  area into three equal rectangular regions Low Energy Region (LER), Medium Energy Region (MER), and Higher Energy Region (HER).

### 2.2. Proposed CEEC

In current section, we propose a Centralized Energy Efficient Clustering (CEEC) routing protocol. In earlier section, we propose advance heterogeneous network model, in which nodes with different energy level are deployed in separate regions. In CEEC, BS performs central clustering formation in network, with help of central control algorithm of CEEC. Advance central control algorithm considers four factors for selection of cluster-heads, initial energy of nodes, residual energy of nodes, and average energy of each region and location of nodes.

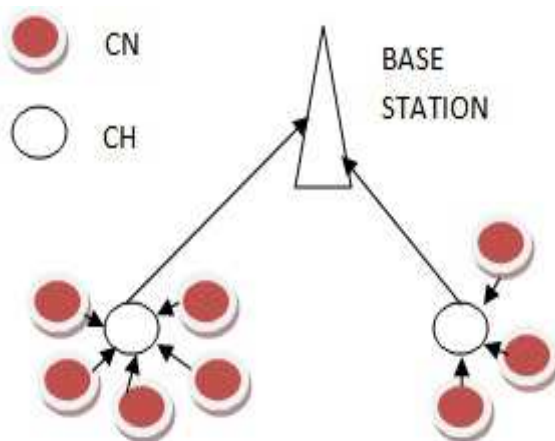


Fig-2: Clustering in WSNs

Operation of CEEC is based on rounds, with adjustable duration. Each round is divided into Network Settling Time (NST) and Network Transmission Time (NTT). During NST cluster-heads are selected and multiple clusters are formed. During NTT, sensed information from all nodes is transmitted to BS with help of cluster-heads.

## 3. LITERATURE REVIEW

M. Aslam [1] In this paper, Energy efficient routing protocol for Wireless Sensor Networks (WSNs) is one of the most challenging task for researcher. Hierarchical routing protocols have been proved more energy efficient routing protocols, as compare to flat and location based routing protocols. Heterogeneity of nodes with respect to their energy level, has also added extra lifespan for sensor network. We propose a Centralized Energy Efficient Clustering (CEEC) routing protocol. We studied that the CEEC has maximum throughput and network lifetime.

Naveen Sharma [2] In this paper, In recent times wireless sensor networks have grown enormously and become progressively attractive in wide variety of applications because of their low cost, low power, small in size, self-organizing behavior in harsh environments. Routing is a vital technology in WSN. There are many routing protocols like: location based, multipath, data centric, mobility based, hierarchical routing, hybrid routing etc. Clustering is used to prolong the lifetime of the wireless sensor networks. Clustering is the process where sensing area is divided in groups to balance the energy level of sensor nodes known as clusters. An Optimal Clustering technique can reduce the energy consumption in WSN and increase the lifetime of the network. Energy is the main consideration when we analyze routing protocols for WSN. In this paper we present the study of different clustering based energy efficient routing protocols of wireless sensor networks and compared them on various parameters. In last few years, energy conservation in wireless sensor networks has become one of the most important research areas. The main objective behind the routing protocol design is to keep sensors alive as much as possible, thus prolonging the lifetime of network. For heterogeneous wireless sensor networks, many energy efficient clustering protocols are proposed which are based on residual energy, density etc. We have surveyed the

past research works which mainly focuses on energy efficient clustering based routing protocols for wireless sensor networks and we have systematically analyzed a few classical WSN clustering routing protocols in deep, and compared these different approaches based some primary metrics. WSN is a broad area so this paper covered only some clustering based routing protocols. Although these routing protocols shows the improvements but still there is possibility of improvements in Wireless sensor networks. Further research would be needed to address issues related to Cluster formation, cluster head communication and data fusion etc.

M.Sheik Dawood [3] In this paper, Use of wireless sensor networks has increased to monitor the disaster management, surveillance and industrial automation. For such applications the sensors have to be grouped together to deploy in large numbers and to operate autonomously in the network. Several researchers have provided different cluster based routing protocol for sensor networks to enhance power control and node lifetime improvement. Wireless sensor network (WSN) require a various power management protocols to reduce the energy consumption. Different cluster-based schemes are discussed as a solution for this problem. We surveys different clustering algorithms for WSNs; give emphasis to their purposes, characteristics, importance, complexity, etc. We also analyse these clustering algorithms based on metrics such as energy efficiency, cluster stability, location awareness, node mobility and QoS support. We conclude that Grouping sensor nodes into clusters is an effective way to improve the network performance .This study reviews some of these proposed clustering algorithms involving with its terminology and attributes. The parameters which are mostly included energy efficiency, cluster stability, location awareness, node mobility and QoS support. The general framework of clustering algorithms is discoursed here, which unseals up the panorama of enhancement on widely-used algorithms.

Maotao Xie [4] In this paper Wireless sensor networks have been widely used in many important areas. Medium access control(MAC) protocols have a significant effect on the function and performance of sensor networks. Though the TDMAbased MAC protocols are inherently collision free and can rule out idle listening since nodes know when to transmit, it is difficult to change the frame size and time slot assignment

due to network topology or traffic load changes. In this paper, we present an energy-efficient TDMA protocol for clustered wireless sensor networks(EC-TDMA), which is an intra-cluster communication MAC protocol. EC-TDMA dynamically changes the length of TDMA frame according to the number of sensor nodes and the sensor node traffic load within a cluster, reduces the idle listening and improves channel utility, thus prolongs networks lifetime. The simulation results show that this proocl performs better than existing protocols in the average energy consumption, packet delivery ratio and average latency. base station. It resulted in increase in the lifetime of the network.

Danyan Luo [5] In this paper, Wireless sensor networks consist of large number of sensor nodes which have a constraint energy capacity, so energy-efficient mechanism is important. Specially, sending packets from the source node to the destination node is the more majority part than merely sensing some events. Thus, energy-saving routing protocol in wireless sensor networks is necessary for increasing the network lifetime. Less energy consumption can be achieved by reducing the node transmission radius. We present a transmission radius self-adjust energy-saving routing protocol (RSES) for wireless sensor networks. Using RSES, node reduces its max transmission radius only to reach the farthest neighbor before it sends the first packet. The on-demand route discovery process is initiated whenever a source sensor node needs to communicate with another node for which it has no routing information in its route table, and energy-saving strategy has been designed for the route discovery. When remnant energy reaches a certain threshold, node reduces its transmission radius again in order to achieve less energy consumption under the premise of the certain coverage ratio. Simulation results demonstrate that RSES can prolong the network lifetime and has a balanced network load and routing traffic. We present a transmission radius self-adjust energy-saving routing protocol RSES. Using RSES, node reduces its initial transmission radius to the farthest neighbor before it sends the first packet. RSES can prolong the network lifetime and has a balanced network load and routing traffic.

Farhana Ashraf [6] In this paper Synchronization and signaling are two common approaches used for coordination in duty-cycling wireless sensor networks. In this paper we

analyze the tradeoff between these two approaches used for energy-efficient communication. Finally, we present Neighborhood-based Power Management (NPM), a hybrid MAC protocol that minimizes signaling overhead through opportunistically gained knowledge about neighbor wakeup schedules. Unlike the synchronization-based MAC protocols, NPM does not require a priori knowledge of the wakeup schedules. Using only a minimal exchange of schedule information, NPM reduces the signaling overhead by combining adaptive preambleing with its neighborhood wakeup mechanism. Our simulations show that NPM outperforms popular B-MAC, X-MAC and SCP protocols under all network conditions. This paper presents a hybrid protocol for energyefficient communication in wireless sensor networks, called Neighborhood-based Power Management (NPM). By combining synchronization and signaling effectively, NPM reduces energy consumption across a large variety of network conditions.

Xiao-Min Hu [7], maximizing the lifetime of a sensor network by scheduling operations of sensors is an effective way to construct energy efficient wireless sensor networks. After the random deployment of sensors in the target area, the problem of finding the largest number of disjoint sets of sensors, with every set being able to completely cover the target area, is nondeterministic polynomial-complete. Here proposes a hybrid approach of combining a genetic algorithm with schedule transition operations, termed STHGA, to address this problem. GA based approach termed STHGA has been proposed to find the maximum number of disjoint complete cover sets of sensors for maximizing the lifetime of a WSN. STHGA is applicable to both point-coverage and area-coverage problems in WSNs.

Jochen Furthmüller [8], Paper represents Management requests and responses create additional traffic in addition to the data issuing from the network's actual sensing application. Effective management therefore requires balancing the need for detailed oversight of the network against the energy consumption of the management system itself. Paper explores whether sending the management data and the sensing data together rather than separately can reduce the management system's energy footprint. We examined the trade-off between energy consumption for the purpose of network management

and the latency of management requests. We proposed the concept of cooperative requests, which allows the data sent by the actual sensor network application and the management agent to be clustered. In this way the number of packets as well as the number of sent bytes can be reduced considerably.

Vinay Kumar [9] In this paper to maximize network lifetime in Wireless Sensor Networks (WSNs) the paths for data transfer are selected in such a way that the total energy consumed along the path is minimized. To support high scalability and better data aggregation, sensor nodes are often grouped into disjoint, non overlapping subsets called clusters. We have found that the some energy efficient algorithms increases the network lifetime Although every effort has been made to provide complete and accurate state of the art survey on energy efficient clustering algorithms

#### 4. CONCLUSIONS

In this paper, we studied the different Research papers .Routing in wireless sensor networks has attracted a lot of attention to the researchers in the recent years. Routing in sensor networks is a new research area, with a limited but rapidly growing set of results. In last few years, energy conservation in wireless sensor networks has become one of the most important research areas. The main objective behind the routing protocol design is to keep sensors alive as much as possible, thus prolonging the lifetime of network. For heterogeneous wireless sensor networks, many energy efficient clustering protocols are proposed which are based on residual energy, density etc. we proposed a cluster-based multipath delivery scheme for WSNs, which integrates the advantages between hierarchical routing and multipath routing. Hierarchical routing maintains the energy consumption of sensor nodes and performs data aggregation which helps in decreasing the number of transmitted messages to base station. Single-path routing approach is unable to provide efficient high data rate transmission in wireless sensor networks due to the limited capacity of a multi-hop path and the high dynamics of wireless links.

#### REFERENCES

- [1] M. Aslam, T. Shah, N. Javaid, A. Rahim, Z. Rahman, Z. A. Khan, "CEEC: Centralized Energy Efficient

- Clustering A New Routing Protocol for WSNs”, 2012 9th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks.
- [2] Naveen Sharma<sup>1</sup> and Anand Nayyar<sup>2</sup>, “A Comprehensive Review of Cluster Based Energy Efficient Routing Protocols for Wireless Sensor Networks” International Journal of Application or Innovation in Engineering & Management (IJAIEEM) Volume 3, Issue 1, January 2014.
- [3] M.Sheik Dawood, N.Kaniamudham, M.Thalaimalaichamy ,G.Athisha, “Study of Energy Efficient Clustering Algorithm for Wireless Sensor Networks”, International Journal of Emerging Research in Management & Technology December 2012
- [4] Maotao Xie<sup>1</sup>, Xiaoli Wang<sup>2</sup>, “An Energy-Efficient TDMA Protocol for Clustered Wireless Sensor Networks”, 2008 ISECS International Colloquium on Computing, Communication, Control, and Management.
- [5] Danyan Luo, Decheng Zuo, Xiaozong Yang, “An Energy-Saving Routing Protocol for Wireless Sensor Networks”, 978-1-4244-2108-4/08/\$25.00 © 2008 IEEE.
- [6] Farhana Ashraf, Riccardo Crepaldi and Robin H. Kravets, “Synchronization vs. Signaling: Energy-Efficient Coordination in WSN”, 978-1-4244-7977-1/10/\$26.00 ©2010 IEEE.
- [7] Xiao-Min Hu, Student Member, IEEE, Jun Zhang, Senior Member, IEEE, Yan Yu, Henry Shu-Hung Chung, Senior Member, IEEE, Yuan-Long Li, Yu-Hui Shi, Senior Member, IEEE, and Xiao-Nan Luo, “Hybrid Genetic Algorithm Using a Forward Encoding Scheme for Lifetime Maximization of Wireless Sensor Networks”, IEEE TRANSACTIONS ON EVOLUTIONARY COMPUTATION, VOL. 14, NO. 5, OCTOBER 2010.
- [8] Jochen Furthmüller, Stephan Kessler, and Oliver P. Waldhorst, “Energy-efficient Management of Wireless Sensor Networks”, IEEE/IFIP WONS 2010 - The Seventh International Conference on Wireless On-demand Network Systems and Services.
- [9] Vinay Kumar<sup>1</sup>, Sanjeev Jain<sup>2</sup> and Sudarshan Tiwari, IEEE member<sup>3</sup>, “Energy Efficient Clustering Algorithms in Wireless Sensor Networks: A Survey”, IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 5, No 2, September 2011.