

Influence of High-Performance Routing Protocols in Wireless Sensor Networks

S.K.Susee, B.Chidambararajan

Abstract: *Wireless Sensor Network (WSN) can be termed as a group of tiny and cheap devices which are known as sensor nodes which can communicate information that has been monitored over the wireless links. The information is forwarded via multiple nodes to other networks associated with a gateway. The performance of the sensor networks greatly depends upon the routing protocols being used in the underlying network. Based upon the structure of the network, protocols used for routing in WSN have been classified as flat routing, hierarchical or cluster based and location based routing. Out of these three categories clustering methods gain the importance because it provides an efficient and scalable structure of the network. This paper aims at presenting the clustering based routing protocols and its types to improve the performance of the WSN.*

Keywords: *Wireless Sensor Networks (WSN), Cluster Based Routing, Heuristic Based Approach, Meta Heuristic Based Approach.*

INTRODUCTION

Wireless Communication is the medium for Information transfer or energy between two or more points that are not connected by an electric conductor. This Technology rapidly onwards into our day- today activities and modified the way of human and devices communicate. One Division of Wireless Communication is Wireless Sensor Network allows devices to connect to each other and coherence on sensing various physical Circumstances varying from small to high needs. Numerous number of nodes (also known as motes) are formed together to build the WSN Environment in which each sensor node [1, 4] is connected to another sensor nodes.

RELATED WORKS

This part deliberate about the different research finds with respect to the defect tolerance methods and power management of the sensor nodes [2]. Each and every node transmits the gathered information to different sensors present in the network through the base station node and the cluster mode [7, 8]. Based on the approach used by the sensor, will starts communication and calculation of information and it transfers to the sensor network. For transmission, every node leans over a communication or

casting methods had been discussed in [13]. This method should be able to handling heavy network congestion, rapid flow of data from the sender to the receiver and it must be capable of avoid network traffic. This enhances the inclusive performance of nodes in Wireless Sensor Network [10]. With a view to maximize the defect detection accuracy, a technique of consolidated cluster approach must be used in Wireless Sensor Network.

In [12] Vimalarani et al. discussed the methods to increase the network survival time using EPSO-CEO method in WSN. By utilizing the particle swarm optimization approach, the Enhanced PSO-Based Clustering Energy Optimization method accurately scans the network framework and the sensors will be determined that is grounded on the less energy consumption which is placed in the network. The chosen sensors are classified into the individual cluster along with the head which is used to communicate the data through the cluster which decrease the power parameters with controlled fashion. In the organized clusters, by using the Multihop Routing Protocol the information has been transferred which establishes the path by casting the one-hop communication and single path reply message to the adjacent sensors. This method helps to find the optimized path with low cost and less time when differentiated to the other existing routing techniques [9].

In [3] Buddha Singh et. al. proposed Particle Swarm Optimization (PSO) strategy for the creation of clusters that are power attentive by making ideal choice of CHs. The PSO in the end limit the cost of localizing an ideal area for the cluster hubs in a group. Also in this work, the actualization is performed inside the group rather than the base station, which produces it a semi-disseminated approach. A target work in term of choice criteria is done relies upon the remaining vitality, hub (nodes) degree, intra-cluster separation and head check of the likely CH. Furthermore, impact of the anticipated number of packet retransmissions with surveyed way to the CH is additionally replicated the energy utilization show. The consequences of this work consider regarding the recognizable cluster based sensor organize conventions, PSO-C and LEACH-C individually. In conclusion, this work lights up the viability of this work over its comparatives as far as normal packet transmissions, network lifetime, CH selection rounds maintained by average energy consumption and PSO.

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STUDY OF CLUSTER BASED ROUTING PROTOCOLS

The routing in WSN that is based on clustering is an energy proficient technique in which sensor nodes those having more battery power are non-sequentially picked for the selection and manipulation of the data, during which the other sensor nodes are observing and announcing information to cluster heads (CHs). Sensors that are involved in clustering normally acquire in a huge magnitude of sensor networks. Based on Liu statistics, it is proved the cluster based networks are more scalable, yield reliable, more desirable coverage, high resistance fault tolerance and are energy efficient. The routing issues in cluster based for Wireless Sensor Networks has been explored and developed various protocols. The heuristic and meta-heuristic based approaches are included in these protocols [5].

2.2.1 Heuristic Based Approaches

The Figure 2.2 shows the different types of heuristic approaches available in clustering routing protocols.

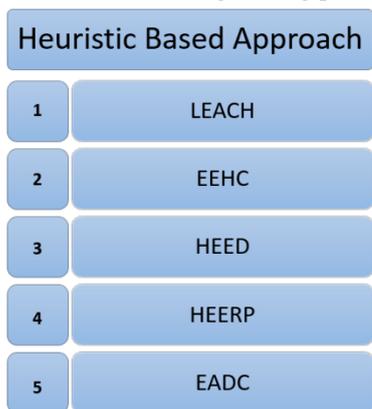


Figure 2.2 Heuristic Based Approach

Leach

It is a most popular and broadly accepted method for periodical data collecting cluster based algorithm. Low Energy Adaptive Clustering Hierarchy (LEACH) is a distributed technique for clustering which permits non-sequential creation of CH's in order to sustain the high network survival time. Based on the operation of the network, LEACH is classified into various sequences. In each sequence setup and steady are the two states being carried out.

In setup step, first cluster is formed and cluster head (CHs) are selected. In this the CH will be collecting the data from the various sensors and delivers it to the base station. In the steady state step, LEACH utilizes Time Division multiplexing Access (TDMA) which will eliminate the collisions that occurs in the intra and inter clusters.

EEHC

Distributed randomized technique for clustering is proposed to arrange sensor nodes into clusters named as Energy -Efficient Hierarchical clustering (EEHC).This protocol believe that communication setup is contention and fault free. There is no need of clock synchronization in the cluster among the sensor nodes. In this protocol, CHs collects the data being sensed from the sensing nodes and communicates it to the base station through Hierarchy of

CHs. This protocol permits the creation of a hierarchy of CHs to increase the battery life time by energy saving method.

HEED

It is an extended version of LEACH clustering mechanism aims to build an energy-efficient clustering protocol. The design objectives of HEED are high Network Survival time, threshold limit for iteration, minimizing the node overhead and fairly spread CHs and condensed clusters. To attain all those objectives, two attributes are used by the HEED protocol: one is energy residue and degree of the sensor. Residual energy is used to lift the efficacy of energy for prolonging the survival time of the network. The second attribute sensor degree deals with the value of the intra-cluster communications.

HEERP

Hierarchical Energy Efficient Routing Protocol (HEERP) utilizes the multipath and multihop routing algorithm based on hierarchy [6] that assures high network survival rate and energy efficient. This protocol enables the formation of hierarchical relations without the cluster head support. In this protocol, formation of the clusters and selection of the cluster heads are no longer needed. Major operations that are performed by this are creation of network hierarchy, managing neighbor tables, transmission of the sensed data and maintenance of the network.

EADC

Energy-Aware clustering algorithm (EADC) creates the cluster with equal sizes using contention span to balance the energy utilization between the members of cluster. This protocol eliminates the imbalance energy utilization by cluster heads due to the heterogeneous node dispensation in the cluster. This protocol also provides the transmission of cluster head in the form of single hop and multihop. The procedure of this protocol is categorized into four stages namely information collection stage, the cluster head competition stage, cluster formation stage and cluster based routing algorithm.

2.2.2 Meta Heuristic based Approaches

The Figure 2.3 shows the different types of Meta-Heuristic approaches available in clustering routing protocols.

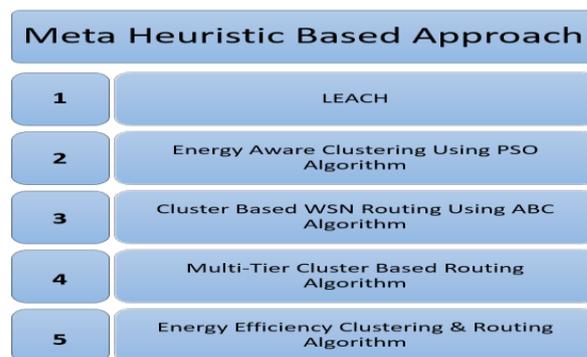


Figure 2.3 Meta- Heuristic Based Approach



LEACH-C

LEACH-C (Low energy adaptive clustering hierarchy-Centralized) method [14] which utilizes the centralized algorithm for the construction of clusters and selection of the CH. This protocol ensures an even distribution of work between the sensors in the network by collecting the energy information from each sensor node in the network. The threshold value based on the average power level is computed by the base station and whichever sensor node have energy below the threshold level is not eligible to become the Cluster head. Different clusters are formed to reduce the quantity of power being consumed by sensor node other than CH in transferring the data to the other CHs. LEACH-C approach have better results in energy utilization and data loss when compared to LEACH protocol.

ENERGY-AWARE CLUSTERING USING PSO ALGORITHM

Energy-Aware clustering uses the Particle Swarm Optimization algorithm to implement centralized clustering method. In this protocol, each sensor knows its exact location. Based on the power level and remoteness between the node and cluster, it allocates the CH to the appropriate sensor node. The Base station computes the average energy level (threshold value) and whichever sensor node have power above the threshold level is qualified to be a Cluster head. A defined cost task is used to reduce the intra-cluster distance in the network.

WSN ROUTING THROUGH ABC ALGORITHM

ABC technique utilizes Honey bee techniques to construct the clustering algorithm. This protocol is based on LEACH technique where CH is responsible for data aggregation. In the initialization phase, both routing strategy and clustering are performed. The Base station broadcasts the information message about configuration and cluster to every sensor nodes exist in the network. The information about the distance [11] between the sensors and energy levels of the sensors are gathered at the CH. Based on the received information, the Base station chooses the CH for the clusters. This protocol follows the semi-distributed approach to reduce the battery power cost of the sensor nodes.

MTC (MULTI-TIER CLUSTER) BASED ROUTING PROTOCOLS

This protocol inspired by Honey Bee Mating optimization (HBMO) which follows the reproductive nature of honeybees. The main objectives of this protocol are energy saving and optimized energy consumption. This protocol has different steps. Each step is classified into two stages namely cluster formation and data transfer.

EECR (ENERGY EFFICIENT CLUSTERING AND ROUTING) ALGORITHMS

This algorithm attempts to solve Non-linear Programming (NLP) as well as linear programming (LP) constructions of the clustering problem and routing problem. The routing approach is constructed as a trade-off among the transfer distance and number of forwarded data. All the sensors randomly deployed with some gateways. A sensor can

communicate with gateway, if it is inside the boundary of the gateway. This algorithm has three stages namely:

- Bootstrapping
- Route setup and
- Clustering.

This algorithm utilizes the energy conservation of sensor through load balancing.

ANALAYTICAL RESULTS &DISCUSSION:

This paper had given an overview of the clustering approach used for WSN. Performance of the wireless sensor network is improved with the help of clustering by keeping traffic load of the network in control, also reduces the energy being dissipated during the transmission over the long distance and the measure of the information about routing being deposited at every sensing node. Thus various approaches for clustering have been used widely to save energy and time.

CONCLUSION:

Wireless Sensor Networks (WSN) have found its applications in the field of military and civil applications magnanimously. Such kind of applications requires huge number of sensors to be deployed therefore requiring proper architecture with efficient network management. In order to increase the performance and scalability of the WSN, clustering technique is imparted by creating a group of sensor nodes in the form of clusters. This paper facilitates different techniques for clustering based routing. This paper aims at giving an overview of the clustering based routing with which the researchers will find beneficial in understanding the routing schemes in WSN and further optimizations can be performed to improve the performance of the WSN. Further in future the study of the parameters need for cluster head selection, position of BS, data aggregation mechanisms shall be carried out.

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