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A REVIWE ARTICLE OF COMPARITIVELY ANALYSIS OF DEEC PROTOCOL

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ABSTRACT

Energy Management can be improved by proficient clustering algorithms in heterogeneous wireless sensor networks. Coordination through cluster head selection provides efficient data aggregation that reduces communication overhead in the network. In this paper, we propose a fuzzy logic approach based DDEEC clustering algorithm which aims to prolong the lifetime of nodes in heterogeneous WSNs. We compare this algorithm with the PSO based DDEEC algorithm and original DDEEC algorithm according to the parameters of first node dies at different rounds and energy-efficiency metrics. The efficiency of proposed optimized fuzzy algorithm is proved by the Matlab experimental results. Simulation results exhibits that the proposed algorithm has higher energy efficiency and can improve life span of a node and data delivery at the base station over its comparatives.

KEYWORDS: Heterogeneous WSN; cluster head; fuzzy logic, DDEEC, Energy conservation, network lifetime.

INTRODUCTION

Wireless sensor network (WSN) consists of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations [1]. This network contains a large number of nodes which sense data from an impossibly inaccessible area and send their reports toward a processing center which is called ”sink”. Since, sensor nodes are power-constrained devices, frequent and long-distance transmissions should be kept to minimum in order to prolong the network lifetime [2], [3]. Thus, direct communications between nodes and the base station are not encouraged. One effective approach is to divide the network into several clusters, each electing one node as its cluster head [4].

The cluster head collects data from sensors in the cluster which will be fused and transmitted to the base station. Thus, only some nodes are required to transmit data over a long distance and the rest of the nodes will need to do only short-distance transmission. Then, more energy is saved and overall network lifetime can thus be prolonged. Many energy-efficient routing protocols are designed based on the clustering structure where cluster heads are elected periodically [5], [6]. These techniques can be extremely effective in broadcast and data query [7], [8]. DEEC is a distributed energy-efficient clustering algorithm for heterogeneous wireless sensor networks which is based on clustering, when the cluster-heads are elected by a probability based on the ratio between residual energy of each node and the average energy of the network. The round number of the rotating epoch for each node is different according to its initial and residual energy. DEEC adapt the rotating epoch of each node to its energy.

The nodes with high initial and residual energy will have more chances to be the cluster-heads than the low-energy nodes. Thus DEEC can prolong the network lifetime, especially the stability period, by heterogeneous aware clustering algorithm [9]. This choice penalizes always the advanced nodes, especially when their residual energy deplete and become in the range of the normal nodes. In this situation, the advanced nodes die quickly than the others.

The DDEEC, Developed Distributed Energy-Efficient Clustering, permits to balance the cluster head selection overall network nodes following their residual energy. So, the advanced nodes are largely solicited to be selected as cluster heads for the first transmission rounds, and when their energy decrease sensibly, these nodes will have the same cluster head election probability like the normal nodes.// An outline of this paper is as follows. Section II describes a review related work. In section III, a presentation of heterogeneous network is set. Additionally, in section IV, we present the details of DDEEC algorithm. Section V gives the simulation results. Finally, conclusion is presented.

Wireless sensor networks composed of hundreds of sensor nodes which sense the physical environment in terms of temperature, humidity, light, sound, vibration, etc. The main task of sensor node is to gather the data and information from the sensing field and send this to the end user via base station. These sensor nodes can be deployed on many applications. Current wireless sensor network is working on the problems of low-power communication, sensing, energy storage, and computation. Clustering technique enables the sensor network to work more efficiently. It increases the energy consumption of the sensor network and hence the lifetime [1]. The main role of cluster head is to provide data communication between sensor nodes and the base station efficiently. So the cluster head should have high energy as compared to other nodes, also, it performs the data aggregation. LEACH by Heinzelman, et. al. [2] is the first hierarchical or clustering-based protocol in which cluster heads are randomly selected. Others advancements proposed for LEACH are LEACHC [3], HEED [4], SEP [5], ALEACH [6].

DEEC [7] is cluster-based algorithm in which cluster heads are selected on the basis of probability of ratio of residual energy and average energy of the network. In this algorithm, node having more energy has more chances to be a cluster head. It prolongs the lifetime of the network. In this paper our proposed scheme is TDEEC (Threshold Distributed Energy Efficient Clustering) scheme which follows the thoughts of DEEC. This scheme selects the cluster heads from the high energy nodes improving energy efficiency and lifetime of the network.

THE DEVELOPED DISTRIBUTED ENERGY-EFFICIENT CLUSTERING PROTOCOL

DDEEC is based on DEEC scheme, where all nodes use the initial and residual energy level to define the cluster heads. To evade that each node needs to have the global knowledge of the networks, DEEC and DDEEC estimate the ideal value of network lifetime, which is use to compute the reference energy that each node should expend during each round. In this section, we consider a network with N nodes, which are uniformly dispersed within a M_M square region. The network is organized into a clustering hierarchy, and the cluster-heads collect measurements information from cluster nodes and transmit the aggregated data to the base station directly. Moreover, we suppose that the network topology is fixed and no-varying on time. We assume that the base station is located at the center. Furthermore, this last figure show a two-level heterogeneous network, where we have two categories of nodes, a m N advanced nodes with initial energy Eo(1+a) and a (1 □ m)N normal nodes, where the initial energy is equal to Eo. The total initial energy of the heterogeneous networks is given by: The network is organized into a clustering hierarchy, and the cluster-heads collect measurements information from cluster nodes and transmit the aggregated data to the base station directly. Moreover, we suppose that the network topology is fixed and no-varying on time. We assume that the base station is located at the center. Furthermore, this last figure show a two-level heterogeneous network, where we have two categories of nodes, a mN advanced nodes with initial energy Eo(1+a) and a (1 □ m)N normal nodes, where the initial energy is equal to Eo. The total initial energy of the heterogeneous networks is given by:

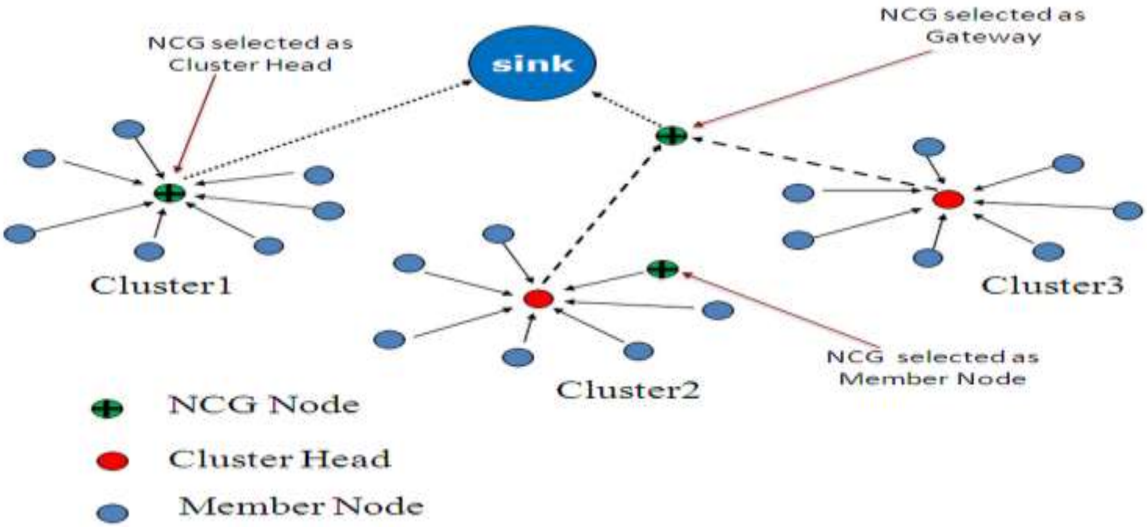
RADIO MODEL

On the first, for the purpose of this study we use similar energy model and analysis as proposed in [10]. According to the radio energy dissipation model illustrated in figure [10] and in order to achieve an acceptable Signal-to-Noise Ratio (SNR) in transmitting an L-bit message over a distance d, the energy expended by the radio is given by:

POWER EFFICIENT GATHERING IN SENSOR

The life span of the network is extended in terms of rounds which is the process of gathering all the data from sensor nodes to the base station regardless of how much time it makes. Low-Energy Adaptive Clustering Hierarchy (LEACH) , Power Efficient Gathering in Sensor Information Systems (PEGASIS) [3], Hybrid Energy-Efficient Distributed clustering (HEED) [4] are algorithms designed for homogenous WSN under consideration so these protocols do not work efficiently under heterogeneous scenarios because these algorithms are unable to treat nodes differently in terms of their energy. Whereas, Stable Election Protocol (SEP) [5], Distributed Energy-Efficient Clustering (DEEC) [6], Developed DEEC (DDEEC) [7], Enhanced DEEC (EDEEC) [8] are algorithms designed for heterogeneous WSN. SEP is designed for two level heterogeneous networks, so it cannot work efficiently in three or multilevel heterogeneous network. SEP considered only normal and advanced nodes where normal nodes have low energy level and advanced nodes have high energy. DEEC, DDEEC, EDEEC and TDEEC are designed for multilevel heterogeneous networks and can also perform efficiently in two level heterogeneous scenarios.

Proposed LEACH centralized (LEACH-C), a protocol that uses a centralized clustering algorithm and the same steady state protocol as LEACH. SEP (Stable Election Protocol) [5] is proposed in which every sensor node in a heterogeneous two-level hierarchical network independently elects itself as a cluster head based on its initial energy relative to that of other nodes. Li Qing et. al. proposed DEEC [6] (Distributed energy efficient Clustering) algorithm in which cluster head is selected on the basis of probability of ratio of residual energy and average energy of the network. Simulations show that its performance is better than other protocols. B. Elbhiri et al , proposed SBDEEC (Stochastic and Balanced Developed Distributed Energy-Efficient Clustering (SBDEEC) [10] SBDEEC introduces a balanced and dynamic method where the cluster head election probability is more efficient. Moreover, it uses a stochastic scheme detection to extend the network lifetime. Simulation results show that this protocol performs better than the Stable Election Protocol (SEP) and the Distributed Energy- Efficient Clustering DEEC) in terms of network lifetime.



CLUSTERING-BASED ALGORITHM

DEEC [6] is clustering-based algorithm in which cluster head is selected on the basis of probability of ratio of residual energy and average energy of the network. In this algorithm, node having more energy has more chances to be a cluster head. It prolongs the lifetime of the network. Ours E-DEEC follows the thoughts of DEEC and adds another type of node called super nodes to increase the heterogeneity. The rest of the paper is organized as follows: Section 2 contains the related work done. Section3 explains the radio energy dissipation model, Section 4 and 5 gives the network model and assumption used followed by section 6 which describes the cluster head selection method. Section 7 lists the performance metrics used for the simulation which gives the results. Traditionally as per LEACH, Cluster head algorithm is broken into rounds. At each round node decides whether to become a cluster head based on threshold calculated by the suggested percentage of cluster heads for the network (determined a priori) and the number of times the node has been a cluster-head so far. This decision is made by the nodes by choosing the random number between 0 and 1. If the number is less than a threshold T(s) the node becomes a cluster head for the current round.

ASSUMPTIONS AND PROPERTIES OF THE NETWORK:

In the network model described in previous section some assumptions have been made for the sensor nodes as well as for the network. Hence the assumptions and properties of the network and sensor nodes are:

- Sensor Nodes are uniformly randomly deployed in the network.
- There is one Base Station which is located at the centre of the sensing field.
- Nodes always have the data to send to the base station.
- Nodes are location-unaware, i.e. not equipped with GPS-capable antennae.

• All nodes have similar capabilities in terms of processing and communication and of equal significance. This motivates the need for extending the lifetime of every sensor. Sensor nodes have heterogeneity in terms of energy i.e., different energy levels. All nodes have different initial energy; some nodes are equipped with more energy than the normal nodes.

PERFORMANCE CRITERIA USED:
The performance metrics or parameters used to study and evaluate the clustering protocols are lifetime, number of nodes alive and number of data packets received at base station.
• Data Packets received at base station: It is total number of data packets or messages that are received by the base station. This measure varies linearly for all protocols.
• Number of alive nodes: This instantaneous measure reflects the total number of nodes and that of each type that has not yet expended all of their energy.
• Network remaining energy: It measures the total remaining energy of the network. It is calculated at each transmission round of the protocol. These metrics used allow us to conclude about the stability period of the network which is the time interval from the start of network operation until the death of the first sensor node, unstable period of the network which is the time interval from the death of the first node until the death of the last node, energy consumption, the data send that are received by the base station [5] and the lifetime of the network which is number of rounds until the first node die which is simply the stability period of the network (We have assume all the nodes having equal importance). More stable is the network; more is the lifetime of the network.

FUNDAMENTAL OUTPUT OR ALGORITHEMS
The comparison in terms of number of data packets received at the base station. The results show that for both the protocols it goes linearly for around 3000 rounds and after that the difference can be seen. It is clear E-DEEC has more numbers of data packets received at base station in comparison to SEP. Figure 5 show total remaining energy over time i.e., number of rounds. Here total initial energy is 102.5 hich decreases linearly up to around 2000 rounds for both E-DEEC and SEP. Energy per round is more in EDEEC as compared to SEP up to around 3000 rounds then graph changes for both E-DEEC and SEP from the round where first node dies in respect to them. Most of the energy is consumed in the first 3000 rounds.

The number of nodes alive during the lifetime of the network. It clearly shows that by introducing super nodes lifetime increases. Stability period and lifetime of EDEEC is longer as compared to SEP and unstable period of SEP is longer than EDEEC. EDEEC is better than SEP as it uses the residual energy. In SEP death of nodes starts after 1200 rounds while for EDEEC it starts after 1500 rounds. Last node for SEP and E-DEEC dies at 6000 and 4100 rounds.

These metrics used allow us to conclude about the stability period of the network which is the time interval from the start of network operation until the death of the first sensor node, unstable period of the network which is the time interval from the death of the first node until the death of the last node, energy consumption, the data send that are received by the base station [5] and the lifetime of the network which is number of rounds until the first node die which is simply the stability period of the network (We have assume all the nodes having equal importance). More stable is the network; more is the lifetime of the network.

CONCLUSION
Wireless sensor network is a combination of wireless communication and sensor nodes. The network should be energy efficient with stability and longer lifetime. In this paper, proposed E-DEEC adds heterogeneity in the network by introducing the super nodes having energy more than normal and advanced nodes and respective probabilities. Simulation results shows that E-DEEC has better performance as compared to SEP in terms of parameters used. It extends the lifetime and stability of the network

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