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Dynamic uneven clustering protocol for efficient energy management in EH-WSNs

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ABSTRACT

In recent days, the Energy Harvesting Wireless Sensor Networks (EH-WSNs) are designed to reduce the amount of energy used by sensors. In order to reduce the energy consumption of these components, the new algorithm namely Dynamic Uneven Clustering Protocol (DUCP) is proposed that will automatically cluster the harvested energy sources. The protocol aims to improve the energy management of a cluster head (CH) by selecting better performing nodes. Since rechargeable batteries have a limited capacity, a dynamic transmit power control strategy is devised for both CHs and cluster members during the data gathering process to improve collected energy consumption. A number of tests are conducted to verify the performance of the proposed DUCP algorithm, and the results demonstrate that the DUCP technique effectively utilizes energy and outperforms its rivals.

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1. Introduction

Wireless sensor networks (WSN) have a widespread acceptance due to their low cost and convenience [1]. However, their energy efficiency has become a concern due to their limited storage capacity. There has been a growing interest in designing energy-efficient routings for networks. A WSN is typically comprised of different kind of nodes which are typically linked together by a cluster head (CH) [10]. Since cluster-based routings require more energy to perform their intended function, it is usually better to have a CH instead of a CM.(See Fig. 1 and Table 1)

Energy harvesting is a technology that enables wireless sensor networks (WSNs) to obtain the energy they need from external sources. This method works by taking advantage of the various advantages of solar thermal energy [3]. Although they can work for a long time, EH-WSNs have unique characteristics that make them harder to control and less energy-harvesting efficient.

While compare with winter session the sensors can harvest more energy in the summer sessions. It can also be used to monitor the energy consumption in different regions. Due to different nature of cluster-based protocols, they are not suitable for EH-WNSs. For instance, the nodes in a tracked region include different characteristics, like their node population and distance to destination. While selecting the cluster-based protocols for propagation, the energy consumption of these components should not be ignored. Instead, it should be focused on optimizing the overall performance of these systems [2,3]. We introduce a new dynamic uneven cluster-based protocol known as DUCP to improve the energy efficiency of sensor nodes. It can reduce the consumption of power for CH election and adjust the energy consumption of the CMs.

The goal of this study was to find a novel method to select better performing CHs. This method is suggested to choose nodes based on their act. This paper proposes a method for balancing the energy requirement for transmission when the nodes using rechargeable batteries. This procedure can be reasonably adjusted to provide the required transmission power for data transfer.

2. Related works

Cluster-based routings have gained increasing attention due to their energy-efficient advantages. One of the low-energy adaptive clustering method is known as LEACH. This method works by selecting the right sensor nodes for a given head role in a cluster. The cluster with the most energy-efficient nodes is called the CH. It communicates with CMs in their cluster [4].

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