International Journal of Computer Networks and Applications (IJCNA)
DOI: 10.22247/ijcna/2021/208891 Volume 8, Issue 2, March – April (2021)

RESEARCH ARTICLE

Optimized Cluster Head Selection with Traffic-Aware Reliability Enhanced Routing Protocol for Heterogeneous Wireless Sensor Network (HWSN)

S. Tamilselvi
Department of Computer Science, Erode Arts and Science College, Erode, Tamil Nadu, India.
tamil3089@gmail.com

S. Rizwana
Department of Computer Science [SF], Erode Arts and Science College, Erode, Tamil Nadu, India.
rizureesh@gmail.com

Received: 16 February 2021 / Revised: 20 March 2021 / Accepted: 25 March 2021 / Published: 27 April 2021

Abstract – Clustering-based routing protocols are mainly used for extending the node's existence in Heterogeneous Wireless Sensor Networks (HWSNs). Several clustering protocols have been designed for splitting the network into different clusters and choosing the Cluster Heads (CHs) for each cluster effectively. Among those, a Traffic-Aware Reliability-based Enhanced Technique for Ordering of Preference by Similarity-Ideal-Solution (TARE-TOPSIS) protocol can determine the probability of every node is considered as CH by considering traffic load, initial and residual energy of each node in the multi-heterogeneity scenarios. It considers only coverage and energy for determining the amount of cluster and the corresponding probabilities. Nonetheless, noise and data transmission rates have a high effect on information or data packets transmitted between nodes and the Base Station (BS). The noise interference in the communication can let few nodes link to further far-away CHs and exploit the multipath amplification. The multipath diversion consumed additional energy than usual energy. Therefore in this article, an Optimized Clustering TARE-TOPSIS (OC-TARE-TOPSIS) protocol is presented for increasing the energy efficacy and the network lifespan by determining the optimal clusters. Initially, the network model is designed which characterizes the transmission environment noise. After, a multipath energy model incorporating the probability of data delivery is determined. Also, the optimum amount of clusters and optimal probability are derived to decide the amount of CHs in noise-prone multi-heterogeneity transmission scenarios. Energy-efficient data transfer from CHs to BS is achieved by the contribution of fewer nodes in the noisy networks. At last, the simulation results demonstrate the OC-TARE-TOPSIS realizes better efficiency compared to the conventional protocols in the aspect of different evaluation metrics.

Index Terms – HWSN, Clustering, Routing protocols, TARE-TOPSIS, Noise, Energy Conservation.

1. INTRODUCTION

WSNs is the network that connects a set of sensor nodes that interact with each other through a wireless medium for assembling, processing, and transmitting the required data to the nearest BS. These nodes are normally constructed for various purposes such as defense, agricultural monitoring, atmospheric conditions forecasting, healthcare, and home appliances. Typically, it has two categories: homogeneous and heterogeneous WSNs. In the homogeneous WSNs, every node is deployed with an equal functional capable hardware component. But in Heterogeneous WSNs (HWSNs), few high configurations or high capable nodes are deployed among other equal functional nodes for prolonging the lifetime of a network [1]. This type of network is popular in recent years and predominant in many real-time appliances for prolonging network lifetime. In contrast, effective routing is a vital challenge in these networks because of the energy, bandwidth, and storage constraints.

Routing is the development of methods for discovering the way between the source and destination nodes. Most of the routing protocols utilize clustering protocol which is a more energy-efficient method that splits the networks into clusters and selects the nodes with the highest remaining energy for data transfer [2-5]. As a result, the scalability and network lifetime are improved while utilization of energy is reduced. Among most clustering protocols, Low-Efficiency Adaptive Clustering Hierarchical (LEACH) protocol is widely used due to its unproblematic performance. The advanced routing protocols are designed by considering the basic principle of this protocol [6-8]. In this protocol, two main stages called setup and steady phases. Each node in the network checks them in the setup phase to become a CH or not in each round.