Adaptive energy efficient circular spinning protocol for dynamic cluster based UWSNs

ABSTRACT

Under Water Sensor Network (UWSN) is a novel paradigm for exploring marine environments such as offshore and mineral exploration, underwater surveillance, and sea habitat monitoring. However, a good quality underwater communication is difficult to achieve due to different constraints such as limited bandwidth, acoustic propagation issues, delays, battery replacement hitches, etc. In recent works, efficient energy-based designing and overall performance evaluation of the UWSN has become a major consideration. Cluster-based sensor networks have proven to be a successful way to increase the network's load congruency and scalability while lowering the system's total energy consumption. Usually, clustering algorithms work in three phases; cluster setup, data collection, and transmission to sink. In these types of dynamic cluster-based networks, energy consumed in cluster setup has been considered insignificant. Since these network energy consumptions are not part of data communication, we consider it extra energy consumption. In this paper, a new Energy Efficient Circular Spinning (EECS) dynamic clustering algorithm has been proposed to provide an improved cluster setup system and to minimize energy usage in re-clustering or cluster setup. Our proposed EECS mechanism suggests that system performance can improve by reducing the Cluster Head (CH) selection phase or cluster setup phase and can ultimately minimize the energy consumption of networks. It is demonstrated that by reducing the transmission of superfluous control messages during the cluster arrangement stage, approximately 21.5% to28.4% of the total network energy expended can be saved. This paper also compares the extra energy consumption, total network energy consumption, and life of the network in our proposed EECS mechanism to two different mechanisms, (1) Adaptive LEACH for UW, (2) UMOD-LEACH. The optimum value of cluster head has been calculated from energy consumption of different protocols and results show that our proposed EECS can prolong network lifetime by 21.5% and 28.4%from the above-mentioned algorithms consequently. In future, we will extend outwork for multi-hop dynamic cluster base mechanism for UW.