Metaheuristic Multi-Hop Clustering Optimization for Energy-Efficient Wireless Sensor Network

Abstract

Energy-efficient optimization algorithm in wireless sensor network (WSN) is often based on solely cluster routing or multi-hop routing. The cluster optimization algorithm will form a cluster network by dividing the sensor nodes into few clusters where each cluster has a cluster head (CH) for data collection. On the other hand, multi-hop optimization algorithm will form a multi-hop network by transmitting data to base station (BS) through data multi-hopping between sensor nodes. However, cluster optimization algorithm suffers from the overburdens of CH nodes, while multi-hop optimization algorithm suffers from the overburdens of nodes which are near to the BS. Therefore, Genetic Algorithm-Cuckoo Search (GACS) is proposed and developed based on the multi-hop clustering model in this paper. GACS optimizes both intra-cluster and inter-cluster communications to enhance energy efficiency in WSN, extending the network lifetime. Based on the performance evaluation, GACS outperforms both Genetic Algorithm (GA)-based cluster optimization algorithm and Cuckoo Search (CS)-based multi-hop optimization algorithm.