



Meta-heuristic Ant Colony Optimization Based Unequal Clustering for Wireless Sensor Network

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Abstract

Sensor nodes are randomly deployed to perform specific area monitoring in geographical region and temporal space. The network connectivity maintenance is a major requirement for accurate event detection with minimum energy consumption. To minimize the energy consumption, various clustering algorithms have been evolved in research studies. But, they failed to consider the other performance parameters such as quality of service constraints and the performance level. The initialization of nodes nearer to the base station (BS) as relay nodes reduces the number of relay node participation and increases the performance. This paper proposes the novel ant colony meta-heuristic based unequal clustering for the novel cluster head (CH) selection. The data fusion from the CH node to the intermediate node called Rendezvous node reduces the message transmissions and hence the energy consumed by the nodes is minimum. The neighbor finding phase and the link maintenance through the Meta-Heuristic Ant Colony Optimization approach selects the optimal path between the nodes which increases the packets delivered to the destination. The population initialization requires more time at this stage. Hence, the Haversine distance is estimated among the nodes which also reduces the dimensionality of the message transmission among the nodes. The prediction of optimal path and the CH selection using Ant Colony Optimization Meta-Heuristic and unequal clustering reduces the energy consumption effectively. The comparative analysis of proposed Meta-Heuristic Ant Colony Optimization based Unequal Clustering with the existing unequal clustering approaches on the basis of various performance parameters such as Packet Delivery Ratio, number of packets sent to the BS, energy consumption, residual energy and the percentage of dead nodes shows the effectiveness of proposed work in WSN applications.

Keywords Cluster head selection · Energy efficient · Energy consumption · Fruit fly optimization · Quality of service (QoS) · Unequal clustering · Meta-heuristic Ant Colony Optimization (MHACO)

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