Energy-Efficient Model for Recovery from Multiple Cluster Nodes Failure Using Moth Flame Optimization in Wireless Sensor Networks

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Abstract For transmission and collection of sensed data, it is essential that the connectivity among deployed sensor nodes in WSNs. The maintenance of network connectivity is a challenging task in harsh environmental conditions when participating nodes' failures lead to the network's disjoint partitions. To improve the connectivity and coverage with energy efficiency for the partitioned network, optimal positioning of sensor nodes has been performed based on the moth flame optimization algorithm (OPS-MFO). In the anchor node, the relay nodes have exploited in the proposed model—two phases involved in the proposed model, such as the inter-partition phase and intra-partition phase. For intra-partitioning and inter-partitioning, all sensor nodes and relay nodes' positions have been estimated using the moth flame optimization algorithm for better connectivity. The proposed

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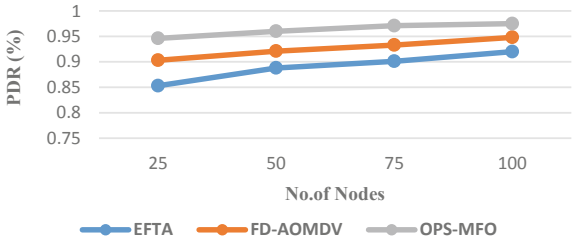

Fig. 5 Packet delivery ratio

The proposed algorithm outperforms all other existing protocols based on the assessment of simulation results. It consumes less energy, and less execution requires as the proposed protocol has the shortest itinerary length. The alternative CH will continue traveling among cluster nodes by the fault tolerance strategy-based alternative path in node failure.

5 Conclusion

In contrast to other existing strategies, a model for improving coverage and connectivity in partitioned networks is provided. The proposed model restricts both coverage loss and connectivity for partitioned wireless sensor networks with energy efficiency. For a given set of SN locations, the necessary minimum number of relay nodes is detected in order to achieve the optimal fault tolerance and a fully connected network.

The heuristic approach is ideal for network recovery since it obtains a minimum number of relay nodes. For better connectivity, the position of all sensor nodes is estimated in the phase of intra-partition. For relay nodes, all sensor nodes' position is computed in the phase of inter-partition. The proposed solution becomes energy efficient when average and residual energies are considered energy-centric. In the case of a dense network, one typical relay node between two partitions is assumed. In the case of a dense network, one typical relay node between two partitions is assumed.

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