5

Combination of improved Harris's hawk optimization with fuzzy to improve clustering in wireless sensor network

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Abstract: A Wireless Sensor Network (WSN) is divided into groups of sensor nodes for efficient transmission
of data from the point of measuring to sink. By performing clustering, the network remains energy-efficient
and stable. An intelligent mechanism is needed to cluster the sensors and find an organizer node, the
cluster head. The organizer node assembles data from its constituent nodes called member nodes, finds an
optimal route to the sink of the network, and transfers the same. The nomination of cluster head is crucial
since energy utilization is a major challenge of sensor nodes deployed over a hostile environment. In this
paper, a fuzzy-based Improved Harris's Hawk Optimization Algorithm (IHHO) is proposed to select an able
cluster head for data communication. The fuzzy inference model ponders balance energy, distance from
self to sink node, and vicinity of nodes from cluster head as input factors and decides if a candidate node is
eligible for becoming a cluster head. The IHHO tunes the logic into an energy-efficient network with less
complexity and more ease. The novelty of the paper lies in applying the hawk-pack technique based on
fuzzy rules. Simulations show that the combination of Fuzzy based IHHO reduces the death of nodes
through which network lifetime is enhanced.

Keywords: Harris's hawk optimization, fuzzification, cluster head election, energy efficient routing