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A two-step clustering to minimize redundant transmission in wireless sensor network using sleep-awake mechanism

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Abstract

This research addresses the problem of redundant data transmission and improves load-balance routing in wireless sensor network (WSN). Redundant data generates higher data transfer and additional traffic loads, which degrade the network performance. The sub-clustering approach is used to minimize redundant transmissions by grouping overlapped or closely located nodes in a cluster into several sub-clusters such that only one node is required to sense the surroundings and send data to the cluster head (CH). The remaining sub-cluster members turn off their radios to save energy. However, the grouping of nodes into non-overlapping clusters and sub-clusters as well as proper selection of nodes to be awaked within a sub-cluster remained a challenging issue. Moreover, using a single node in a cluster performing the role of CH and relay could lead to load-balancing issues as the position of the selected CH may not ensure balanced intra-cluster and inter-cluster transmissions at the same time. In this paper, we proposed a Two-Step-Clustering (TSC) to improve the performance of WSN. In TSC, in the first step, the sensor nodes of minimum distance from each other were grouped into balanced non-overlapping clusters and sub-clusters. Then, a sleep-awake mechanism was employed among the members of the sub-cluster such that the sub-cluster members take turns according to their remaining energy. This is done to minimize redundant transmission to achieve energy efficiency. Furthermore, two CHs were selected, i.e., primary, and secondary CHs. The primary CH is responsible for intra-cluster data collection and the secondary CH is responsible for inter-cluster data transmission. This improves load-balanced routing within the network. In addition, single-hop and multi-hop routing were used to send data to BS. The result shows that the TSC has 54% lifetime improvements against SEED and 60% against DHSCA.

Keywords

Author Keywords: Two-step; Clustering; Redundant transmission; Sleep-awake mechanism; And wireless sensor network

Keywords Plus: ENERGY-EFFICIENT; ROUTING PROTOCOL; AWARE; ALGORITHM; ARCHITECTURE; SCHEME; CRP

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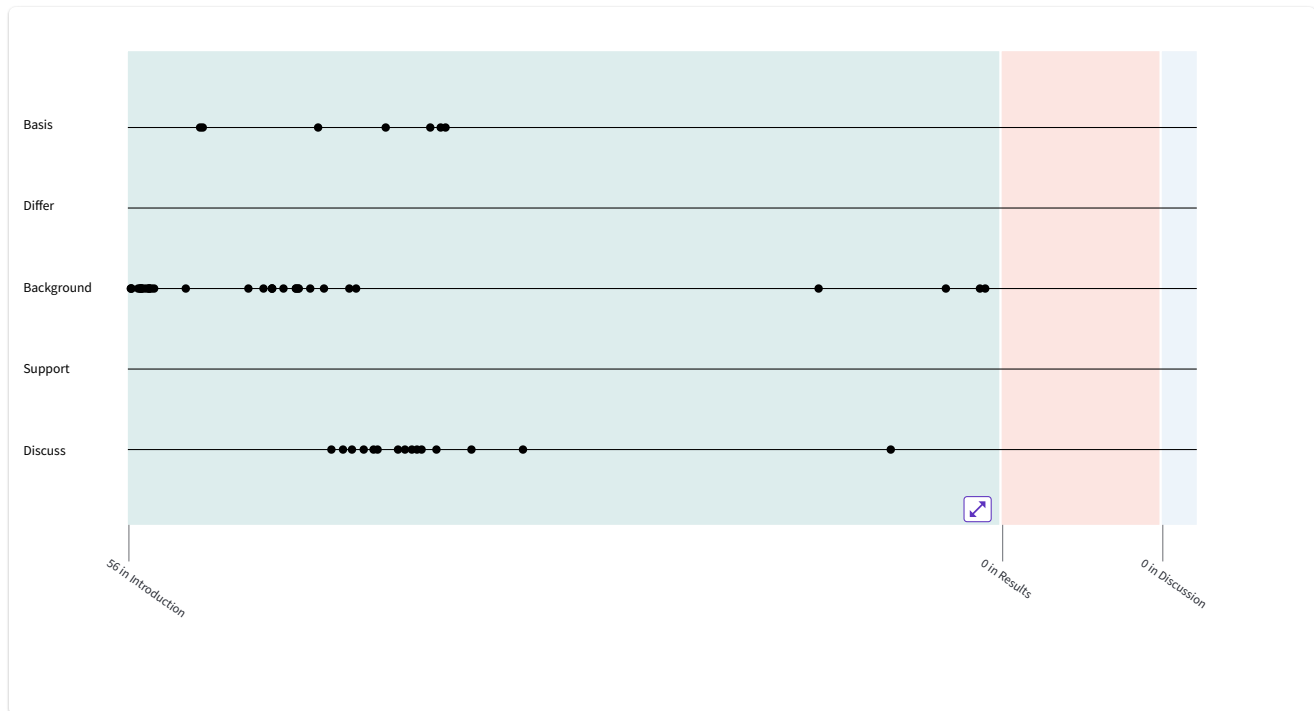
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