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Title : CLUSTER HEAD SELECTION ALGORITHM USING FUZZY LOGIC IN MULTI-TIER WIRELESS SENSOR NETWORK FOR ENERGY EFFICIENCY

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Energy deficiency is one of the most critical aspects of Wireless Sensor Network (WSN). The network performance can be affected when a small network grows larger, and this is related to the energy deficiency of WSN. Therefore, it is essential to manage sensor node energy efficiently, so as to ensure that it would be sufficient to complete WSN applications. Clustering is an established approach which emphasized on cluster head to prolong the lifetime of WSN. However, there is still a lack of effective techniques to determine and select the cluster head. Currently, the selection of cluster head is based on residual energy and several parameters. The data routing to the based station is solely relying on cluster head. These have resulted ineffective of energy usage of sensor node which causes restrict on a lifetime of the sensor network. Hence, this study proposes a new algorithm called Multi-Tier Protocol (MAP). MAP introduced clustering scheme to reduce the energy consumption of wireless sensor network in which, Fuzzy Logic used as tools to select the cluster head and multi-hop communication is used to route the data from the cluster head to the base station. Initially, the combinations of parameters which are residual energy, centrality and communication cost are determined for cluster head selection and utilized in MAP. Also, two types of principle nodes applied which called cluster head and primary node. The cluster head (CH) is responsible to gathered and compressed the data send by the sensor node, while primary node acts as a relay node for the respective cluster head at each tier to execute the routing process and sent the data to the base station. Two simulations based on 100 sensor nodes with 1 Joule and random energy are carried out. Simulation based on 200 sensor nodes with 1 Joule energy deployed for testing the reliability of MAP. The performances of MAP are evaluated through comparing its energy usage for data transmission against Low Energy Adaptive Clustering Hierarchy (LEACH) and Stable Election Protocol (SEP). It found that the three parameters' combination gave the most promising results in improving the lifetime of a network. The results indicated that MAP significantly extends the lifetime of wireless sensor network 48.25% longer than LEACH and SEP. This thesis concludes that the proposed protocol MAP with effective combinations of parameters for selecting cluster heads and cluster primary nodes as a relay node for data routing can effectively improve the efficiency of WSN network.