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Title: MAXIMIZING THE LIFETIME OF WIRELESS SENSOR NETWORK USING SOFT COMPUTING APPROACH

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ABSTRACT

A wireless sensor network is an autonomous network that can be dynamically formed without any existing infrastructure. The sensor nodes in these networks are energy constrained due to finite battery source. Wireless sensor networks have found applications in home automation, building automation, military applications, healthcare applications, environmental applications, and numerous other such real-time monitoring applications. Wireless sensor networks are also used in supervising of remote or inaccessible environment applications. In many situations, especially in hostile environment, replacing or even refilling the attached battery of the node is a very tedious job. The natural choice in such situations is to maximize network lifetime. Therefore, we need energy-efficient strategies to get longer lifetime of the network to achieve better performance.

A critical survey of the literature reveals that the researchers have proposed many techniques like duty cycling, data reduction, and topology management etc for enhancing the lifetime of the network. The nodes' energy can be saved with duty cycling strategy that permits sensor nodes to go in sleep when they are not in use. The data reduction method also reduces the energy consumption with the help of minimizing the quantity of information generated, processed, and transmitted. The topology management saves the energy consumption of nodes

by constructing and preserving a reduced set of nodes. The total energy consumption in the sensor network for extracting a signal frame at the base station includes three parts: sensing, computation and communication. Approximately, 80% of power consumed in each sensor node is used for information transmission. Therefore to enhance network's lifetime, the process of information transmission should be optimized. From the careful insight into the literature, we get motivated to move toward energy-efficient routing approach for enhancing the network's lifetime. Hierarchical or cluster-based routing methods seem to be the most appropriate for enhancing the lifetime of sensor networks. Initially, this approach was restricted to wired networks. Clustering was further suggested for wireless sensor networks. This has the advantages of high energy efficiency, enhanced network lifetime, network scalability, better fault tolerance, and network topology stability.

The aim of the thesis is to develop and test energy-efficient protocols for maximizing the lifetime of wireless sensor network using soft computing approach. In particular, the thesis emphasizes on hierarchal routing methods to enhance the network's lifetime. In this work, Energy-Aware Bee Colony Approach (EABCA) algorithm is presented that takes the benefit of honey bees. They are extremely organized organisms, proficient of individual cognitive abilities, and self-organization. They exhibit a combination of individual traits and social cooperation. We evaluate the performance of the proposed algorithm by comparing it with the state-of-the-art algorithms on a number of instances.

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