To Enhance the Energy Efficiency of WSN

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CERTIFICATE

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ABSTRACT

Wireless Sensor Networks (WSNs) are being widely used in various applications such as environmental monitoring, healthcare, and industrial automation. However, due to their limited power supply and communication range, energy efficiency is a critical factor that affects the performance and lifetime of WSNs. Therefore, enhancing the energy efficiency of WSNs has become an important research area.

This Thesis presents a comprehensive review of various techniques that have been proposed to enhance the energy efficiency of WSNs. The techniques can be broadly classified into three categories: hardware-based, protocol-based, and application-based. The hardware-based techniques include the use of energy-efficient hardware components such as low-power microprocessors, energy harvesting, and power management systems. The protocol-based techniques include the use of energy-efficient communication protocols, routing protocols, and data aggregation techniques. The application-based techniques include the use of energy-efficient data processing and application-specific optimizations.

The first part of this study delves into the hardware and communication protocols, highlighting advancements in low-power sensors, energy-efficient transceivers, and adaptive modulation techniques. These innovations significantly reduce the energy consumption of individual sensor nodes, ensuring that they can operate for extended periods without the need for frequent battery replacements.

The second section focuses on data aggregation and routing protocols. We discuss the importance of designing energy-efficient routing algorithms that minimize data transmission distances, employ multipath routing for load balancing, and exploit spatial and temporal correlations to reduce redundant data transmissions. These strategies collectively reduce the overall energy consumption during data transmission within the network.

In this Thesis, we discuss the advantages and disadvantages of each technique and provide a comparative analysis of their effectiveness in enhancing the energy efficiency of WSNs. We also highlight some of the challenges and future research directions in this field. The results of this study can help researchers and practitioners to design and implement energy-efficient WSNs for various applications.