



LOW-REDUNDANCY AND ENERGY-EFFICIENT NEW ROUTING APPROACH IN WIRELESS SENSOR NETWORKS

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ABSTRACT

Purpose: This study aimed to develop an enhanced routing approach for wireless sensor networks (WSNs) that primarily reduces end-to-end latency and improves energy efficiency while avoiding the overhead of incorporating multiple additional design factors.

Design/Methodology/Approach: The proposed approach was designed for WSNs composed of sensor nodes with constrained bandwidth and limited energy resources. The routing strategy prioritises energy efficiency and end-to-end latency to enable efficient data transmission and better utilisation of available energy across the network. By focusing on these key factors, the approach aims to reduce energy consumption, improve network performance, and extend the operational lifetime of sensor nodes.

Research Limitation: The proposed approach focuses primarily on energy efficiency and end-to-end latency and does not consider other routing factors that may influence WSN performance.

Findings: The proposed routing approach provides an energy-efficient mechanism for WSNs while minimising end-to-end latency. The approach distributes energy consumption more evenly across the network, which can extend network lifetime and reduce the need for frequent sensor node maintenance. Focusing on energy efficiency and latency also reduces the computational and communication overhead associated with considering multiple routing factors.

Practical Implication: It can support the development of WSN systems with improved energy utilisation, lower communication delay, and longer operational lifetime.

Social Implication: Improving energy utilisation and reducing communication latency can support the reliable operation of WSN applications for environmental monitoring, industrial monitoring, healthcare, and other sensing applications. More efficient use of sensor nodes can also reduce maintenance requirements and support sustainable WSN deployment.

Originality/Value: This study contributes a routing approach that prioritises energy efficiency and end-to-end latency as the primary design objectives for WSNs. By avoiding the overhead of incorporating multiple additional routing factors, the proposed approach provides a focused strategy to improve energy utilisation, reduce communication delay, and extend overall network lifetime.

Keywords: *Energy-efficient. node. routing, sink, wireless sensor network*