

Research on building an experimental system for wireless sensor networks

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Abstract: This study presents the design and implementation of an experimental system for wireless sensor networks (WSNs), addressing the critical need for flexible and cost-effective testbeds in WSN research. The proposed system integrates hardware and software components to support the development, deployment, and performance evaluation of sensor nodes and communication protocols. A modular architecture is adopted, enabling the configuration of various network topologies, including star, mesh, and hybrid structures. The system incorporates low-power microcontrollers and radio frequency transceivers, with a focus on energy efficiency and reliable data transmission. A custom graphical user interface facilitates real-time monitoring of network parameters such as packet delivery ratio, latency, and power consumption. Experimental results demonstrate the system's capability to simulate realistic WSN scenarios, validate routing algorithms, and assess node behavior under different environmental conditions. The platform provides a robust foundation for further research into WSN optimization, including energy harvesting and adaptive communication strategies.

Keywords: wireless sensor network, experimental system, construction, research