

Research on routing mechanisms and dynamic transmission power control of network nodes in ad hoc wireless networks.

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Abstract: This study investigates routing mechanisms and dynamic transmission energy control for network nodes in ad hoc wireless networks. The primary objective is to enhance energy efficiency and network longevity while maintaining reliable data transmission. A novel routing protocol is proposed that integrates adaptive energy-aware path selection with real-time transmission power adjustment based on node residual energy, link quality, and traffic load. The protocol dynamically balances energy consumption across nodes to prevent premature depletion of critical relays. Simulation results demonstrate that the proposed mechanism significantly reduces average energy consumption per packet, extends network lifetime by up to 30%, and maintains high packet delivery ratios compared to conventional routing protocols such as AODV and DSR. The findings highlight the importance of coupling routing decisions with dynamic power control to mitigate energy hotspots and improve overall network stability. This research contributes to the development of sustainable and self-organizing wireless networks for applications in disaster response, environmental monitoring, and military communications.

Keywords: routing, power control, ad hoc wireless network, network node