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An Energy-Efficient Routing Protocol for WSNs Combining Source Routing and Minimum Cost Forwarding

Source routing (SR) minimum cost forwarding (MCF) SRMCF is a reactive, energy-efficient routing protocol proposed to improve the existent MCF methods utilized in het- erogeneous wireless sensor networks (WSN). This paper presents an analytical analysis with ex- perimental support that demonstrates the effectiveness of the proposed protocol. SRMCF stems from SR concepts and MCF methods exploited in ad hoc WSNs, where all unicast communica- tions (between sensor nodes and the base station, or vice versa) use minimum cost paths. The protocol utilized in the present work was updated and now also handles link and node failures. Theoretical analysis and simulations show that the final protocol exhibits better throughput and energy consumption than MCF. Memory requirements for the routing table in the base station are also analyzed. Experimental results in a real scenario were obtained for implementations of both protocols, MCF and SRMCF, deployed in a small network of TelosB motes. Results show that SRMCF presents a 33 % higher throughput and 24 % less energy consumption than MCF. Exten- sive simulations for larger networks of MICAz and TelosB motes confirm the theoretical analysis. The impact of using SRMCF with two different MAC protocols, Berkeley-MAC and Contiki-Mac, is also evaluated by simulation, and the latter setup was also verified experimentally.

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