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Congestion avoidance in cognitive wireless sensor networks using TOPSIS and response surface methodology

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Abstract

Congestion in wireless sensor networks degrades the quality of the channel and network throughput. This leads to packet loss and energy dissipation. To cope with this problem, a two-stage cognitive network congestion control approach is presented in this paper. In the first stage of the proposed strategy, initially downstream nodes calculate their buffer occupancy ratio and estimate congestion degree in the MAC layer. Then, they send the estimated value to both network and transport layers of their upstream nodes. The network layer of the upstream node uses TOPSIS in order to rank all neighbors to select the best one as the next relay node. In the second stage, transport layer of the given node adjusts the transmission rate using an optimized regression analysis by RSM. Extensive simulations demonstrated that the proposed method not only decreases packet loss, but also significantly improves throughput and energy efficiency under different traffic conditions, especially in heavy traffic areas. Also, Tukey test is used to compare performance of algorithms as well as to demonstrate that the proposed method is significantly better than other methods.

Keywords

Congestion control Cognitive network Routing Transmission rate TOPSIS model Response surface methodology

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