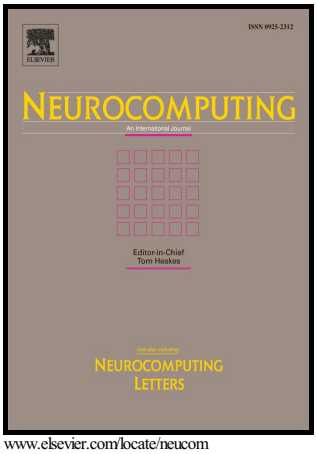

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A Game-Theoretic Power Control Mechanism Based on Hidden Markov Model in Cognitive Wireless Sensor Network with Imperfect Information

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Abstract

Wireless sensor networks are utilized in medical area to gather multimedia information from multiple sources, such as video streams, images, voice, heartbeat and blood pressure data, which call for higher bandwidth and more available spectrum. Whereas, today's radio spectrum is very crowded for rapid increasing popularities of various wireless applications. Hence, wireless sensor networks utilizing the advantages of cognitive radio technology, namely cognitive wireless sensor network (CWSN), is a promising solution for spectrum scarcity problem. A major challenge in CWSN is maximizing its network life-time by appropriate power control mechanism. To solve the distributed power control issues in CWSN with imperfect information, a game-theoretic power control mechanism based on Hidden Markov Model (HMM) is proposed according to the difference and independence of channel sensing results among users of cognitive wireless sensor network (UCWSNs). UCWSNs can use HMM to infer whether its competitors take part in the game, which improves the information accuracy of game and leads to an optimal transmission power. Moreover, to meet the QoS (Quality of Service) of UCWSNs for multimedia information, a utility function based on the tradeoff of signal to interference plus noise ratio and power efficiency is defined for the power control game. Simulation results indicate that the game-theoretic power control mechanism based on HMM can not only improve the power efficiency, but also meet the target SINR better compared with other methods.

Keywords

Imperfect Information; Hidden Markov; Game-Theoretic Power Control; Cognitive Wireless Sensor Networks