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Adaptive RSSI-based localization scheme for wireless sensor networks

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Abstract: Range of applications for Wireless Sensor Networks (WSNs) is increasing rapidly. One class of such applications is Energy-Aware Wireless Positioning Systems for situation awareness. Localization deals with determining a target node's position in WSN by analyzing signals exchanged between nodes. Received Signal Strength Indicator (RSSI) represents the ratio between received signal power and a reference power, and is typically used to estimate distances between nodes. RSSI distance estimations are affected by many factors. This paper aims to enhance the accuracy of RSSI-based localization techniques in ZigBee Networks through studying the communication channel status between two nodes. As the network nodes are exposed to high noise levels, position estimation accuracy deteriorates. A novel adaptive localization scheme is proposed; Two-State Markov model with moving average is employed to detect unpredictable RSSI readings that may reflect badly on the estimation. The proposed scheme achieves better estimation accuracy, for example, the estimation error was reduced from 11.7 m to just 3 m using the proposed scheme.