Abstract

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A framework for the power consumption and BER performance of ultra-low power wireless wearable healthcare and human locomotion tracking systems via UWB radios

In this paper, we propose a framework for the study of power consumption and bit error rate (BER) performance of non-coherent impulse radio ultra wideband (IR-UWB) correlation receivers in the IEEE 802.15.3a channel. Using this framework, transmitted reference (TR) and energy detection (ED) correlation receivers are studied and compared. The receivers are assumed to operate in the 3.1-5 GHz band targeting low-power consumption, where the correlation is performed in the analog domain. The BER performance is based on the channel averaged signal-to-noise ratio (SNR). Moreover, the framework addresses and compares different power consumption and performance parameters, namely the signal bandwidth, integration window, number of pulses per bit, and analog delay-lines. Then, we use the proposed framework for studying the fundamental design components of a wireless wearable human locomotion tracking and health-monitoring system based on UWB sensors. Ultimately, this system should provide high accuracy while consuming ultralow power. The study includes the link and power budgets of the system under investigation in addition to simulation results for the knee velocity. The accuracy provided by this system outperforms the accuracy of the current commercially available systems while preserving ultra-low power consumption.