

Abstract

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Toward a highly accurate ambulatory system for clinical gait analysis via UWB radios

In this paper, we propose and investigate a low-cost and low-complexity wireless ambulatory human locomotion tracking system that provides a high ranging accuracy (intersensor distance) suitable for the assessment of clinical gait analysis using wearable ultra wideband (UWB) transceivers. The system design and transceiver performance are presented in additive-white-Gaussian noise and realistic channels, using industry accepted channel models for body area networks. The proposed system is theoretically capable of providing a ranging accuracy of 0.11 cm error at distances equivalent to intermarker distances, at an 18 dB SNR in realistic on-body UWB channels. Based on real measurements, it provides the target ranging accuracy at an SNR = 20 dB. The achievable accuracy is ten times better than the accuracy reported in the literature for the intermarker-distance measurement. This makes it suitable for use in clinical gait analysis, and for the characterization and assessment of unstable mobility diseases, such as Parkinson's disease.