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Low-cost or compost? Using DecaWave UWB Transceivers for High-accuracy Multipath-assisted Indoor Positioning

Robust indoor positioning and location awareness at a sub-meter accuracy typically require highly accurate radio channel measurements to extract precise time-of-flight measurements. Emerging UWB transponders like the DecaWave DW1000 chip offer to estimate channel impulse responses with reasonably high bandwidth and excellent clock stability, yielding a ranging precision below 10cm. The competitive pricing of these chips allows scientists and engineers for the first time to exploit the benefits of UWB for indoor positioning without the need for a massive investment into experimental equipment. This work investigates the performance of the DW1000 chip concerning position related information that can be extracted from its channel impulse response measurements. We evaluate the signal-to-interference-plus-noise ratio of the line-of-sight and reflected multipath components which is a key parameter determining the Crame´r-Rao lower bound on the ranging error variance. We propose a novel and highly efficient positioning algorithm, which requires information from a single anchor only. Results demonstrate reliable and robust positioning at an accuracy below 0.5m.

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