

Performance Bounds for Multipath-assisted Indoor Localization on Backscatter Channels

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Abstract:

In this paper, we derive the Cramer-Rao lower bound (CRLB) on the position error for an RFID tag positioning system exploiting multipath. The channels constituting the backscatter radio system are modeled with a hybrid deterministic/stochastic channel model. In this way, both the geometry of the deterministic multipath components (MPCs) and the diffuse multipath are taken into account properly. Computational results show the influence of the room geometry on the bound and the importance of the diffuse multipath in dense indoor environments. Time reversal (TR) processing using the deterministic MPCs is analyzed as one possibility to overcome the degenerate nature of the backscatter channel. A derivation and evaluation of the corresponding CRLB shows the potential gain of TR processing as well as its strong dependence on the geometry.