Hybrid Cramer-Rao bound for near-field source localization using a spatially spread acoustic vector sensor

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ABSTRACT

This presentation characterizes the source-localization precision obtainable via "received signal strength indication" (RSSI) based on data from a tri-axial velocity sensor and a spatially separated pressure sensor. That scheme was proposed originally by Y. I. Wu and K. T. Wong in January 2012 in the IEEE Transactions on Aerospace and Electronic Systems. That source-localization scheme depends on the acoustic propagation path-loss exponent, which is typically not precisely known a priori but could be modeled stochastically. That exponent may also differ in value for the propagation path to the tri-axial velocity sensor and for the propagation path to the pressure sensor. This presentation accounts for these two practical considerations in characterizing the scheme's source-localization precision, through the metric of the "hybrid Cramer-Rao bound" (HCRB), the correctness of which is here validated by Monte Carlo simulations of the corresponding "maximum a posteriori" (MAP) estimator.