Abstract:

Classical target detection schemes are usually obtained by deriving the likelihood ratio under Gaussian hypothesis and replacing the unknown background parameters by their estimates. In most applications, interference signals are assumed to be Gaussian with zero mean [or with a known mean vector (MV)] and with an unknown covariance matrix (CM). When the MV is unknown, it has to be jointly estimated with the CM. In this paper, adaptive versions of the classical matched filter (MF) and the normalized MF, as well as two versions of the Kelly detector are first derived and then analyzed for the case where the MV of the background is unknown. More precisely, theoretical closed-form expressions for false alarm (FA) regulation are derived and the constant FA rate property is pursued to allow the detector to be independent of nuisance parameters. Finally, the theoretical contributions are validated through simulations.