

A Bayesian Approach to Detection of Small Low Emission Sources

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The article addresses the problem of detecting presence and location of a small low emission source inside of an object, when the background noise dominates. This problem arises, for instance, in some homeland security applications. The goal is to reach the signal-to-noise ratio (SNR) levels on the order of 10^{-3} . A Bayesian approach to this problem is implemented in 2D. The method allows inference not only about the existence of the source, but also about its location. We derive Bayes factors for model selection and estimation of location based on Markov Chain Monte Carlo (MCMC) simulation. A simulation study shows that with sufficiently high total emission level, our method can effectively locate the source.

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