



Asymptotic distribution of GLRT versus Fisher distribution for infrasonic detection

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Asymptotic distribution of GLRT versus Fisher distribution for infrasonic detection

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Abstract

The Fisher-like function of test (FoT) is a well-known and well-used detector of signal of interest (SOI) in background additive noise. This FoT is derived from a parametrical model of observation based on a Gaussianity assumption. To provide the final decision of test, the FoT is compared to some threshold or the p -value is performed. For both we need the distribution of the FoT under the null hypothesis i.e. in the absence of the SOI. If we omit the dependency on the wavenumber parameter in the parametrical model, it is straightforward to show that the FoT has a Fisher distribution under the null hypothesis. If you take into account the wavenumber dependency this result fails as we show in this paper. However, thanks to the asymptotic properties of the Generalized Likelihood Ratio Test (GLRT) the statistic of the ToF under H_0 is available. We show that this analytical expression is in good agreement with simulation results for currently sample length. Moreover the simulation shows that the GLRT outperforms, in terms of ROC curves, the FoT based on the cross-correlation maximization. Finally the GLRT is applied on real data.

Infrasound, maximum likelihood estimation, generalized likelihood ratio test, Fisher statistic, χ^2 statistic.

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