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On Generalized Tauberian and Abelian Theorems and Its Applications for Random Fields

Andrew Ya. Olenko, Kyiv University.

ABSTRACT

In many cases mathematical models for spatial phenomenon or images are obtained as particular instances of random fields. Models of this type are often characterized reasonably well by their correlation or spectral functions. For this reason it is important to obtain different estimates and to study asymptotic behavior of the spectral and correlation functions of random fields.

Let $\xi(x),\ x \in R^n$, be a real measurable square-mean continuous homogeneous isotropic Gaussian field with $E\xi(x) = 0,\ E\xi^2(x) = 1$.

Let $B(r)$ and $\Phi(\lambda)$ be correlation and spectral functions of this field respectively. Then

$$B(r) = 2^{\frac{n-2}{2}}\Gamma\Big(\frac{n}{2}\Big)\int_0^\infty \frac{J_{\frac{n-2}{2}}(\lambda r)}{(\lambda r)^{\frac{n-2}{2}}}d\Phi(\lambda).$$

Here $J_\nu(z)$ is a Bessel function of the first kind.

The relation between the asymptotic behavior of the function $\Phi(\lambda)$ as $\lambda \to +0$ and $B(r)$ as $r \to +\infty$ was studied. Tauberian and Abelian theorems for integral transforms of Hankel type were proved. Asymptotic with functions which generalize slowly varying functions was considered.

The limit theorems and estimates for different functionals of random fields were considered.

Keywords: *Tauberian Theorems, Abelian Theorems , Limit Theorems, Random Fields*

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Contact Address: olenk@ukma.kiev.ua