Nonparametric estimation of the characteristics of stationary 
Lévy random fields

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(joint work with Wolfgang Karcher, Ulm University)

Consider a stationary real-valued infinitely divisible random field
$X = \{X(t), t \in \mathbb{R}^d\}$ with spectral representation

$$X(t) = \int_{\mathbb{R}^d} f_t(x) M(dx), \quad t \in \mathbb{R}^d,$$

where $f_t$ is a kernel function which is integrable in a proper sense and $M$ is 
an infinitely divisible independently scattered random measure. We propose a 
amethod for the estimation of the characteristic Lévy triplet of $M$ (shift and scale 
parameters as well as Lévy density) out of the observations of $X$. For that, $f_t$ 
is assumed to be approximated by a piecewise constant function which can be 
estimated from the data together with the characteristic Lévy triplet of $X$. The 
consistency of the method is shown.

If $X$ has finite second moments then parametric minimum contrast and 
non–parametric Fourier–based methods can be applied to estimate $f_t$ via the 
covariance function of $X$. What happens if $X$ is not square integrable? We 
propose a non–parametric estimator for $f_t$ in the case where $X$ is an $\alpha$–stable 
moving average with $\alpha \in (1, 2]$, i.e., $f_t(x) = f(t - x)$ for all $t, x \in \mathbb{R}^d$ and $M$ 
is an $\alpha$–stable random measure with Lebesgue control measure. For that, we 
assume $f$ to be a symmetric kernel function with compact support. We prove 
consistency of the estimator and apply the method to a numerical example.