Some Path Properties of Lévy-Type Processes

Réne Schilling

We present sufficient conditions for the transience and the existence of local times of a Feller process, and the ultracontractivity of the associated Feller semigroup; these conditions are sharp for Lévy processes. The proof uses a local symmetrization technique and a uniform upper bound for the characteristic function of a Feller process. As a byproduct, we obtain for stable-like processes (in the sense of R. Bass) on $\mathbb{R}^d$ with smooth variable index $\alpha(x) \in (0,2)$ a transience criterion in terms of the exponent $\alpha(x)$; if $d = 1$ and $\inf_{x\in\mathbb{R}} \alpha(x) \in (1,2)$, then the stable-like process has local times.