Jump processes, L-harmonic functions, continuity estimates and the Feller property

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Abstract:

Given a family of Lévy measures $m(x, dh)$ we study the regularity of harmonic functions and the Feller property of corresponding jump processes.

We establish a-priori estimates for harmonic functions which ensure compactness in the space of continuous functions but are weaker than Hölder estimates. This approach allows us to work under quite weak assumptions on the jump kernels. Our assumptions imply cases where there is no uniform lower bound on the probability of hitting sets before leaving a ball as the radius of the ball tends to zero. Cases where the dependence of $m(x, dh)$ on the state variable x is only measurable and bounded are included as well.