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Perturbations of positive semigroups with applications to Dirichlet forms perturbed by jump parts

In [1] the authors proved the upper bound

$$p_t(x,y) \leq p_t^0(x,y) + t\|j\|_\infty \tag{1}$$

for the heat kernel for jump processes by means of splitting the jump density into a bounded part called j and the remaining part, whose heat kernel is $(p_t^0)_t$. This procedure is sometimes called Meyer decomposition. The talk will describe the functional analytic variant of the result, namely a perturbation result for positive C_0-semigroups on L_p-spaces, where the perturbation may act on a different L_q-space. In the special case of Dirichlet forms perturbed by jump parts with bounded jump density we thus recover (1), however the semigroup approach let us allow for more general jump densities. It turns out that the perturbation result is essentially a consequence of positivity, so the contractivity properties of the submarkovian semigroups associated with the Dirichlet forms do not play a role here.

The talk is based on joint works with H. Vogt, M. Waurick and D. Wingert [2, 3, 4].

References

[1] M.T. Barlow, A. Grigor'yan, and T. Kumagai, *Heat kernel upper bounds for jump processes and the first exit time*, J. Reine Angew. Math. **626** (2009), 135–157.

[2] C. Seifert, H. Vogt, and M. Waurick, *A note on perturbations of C_0-semigroups*, arXiv Preprint: 1802.00335, 2018.

[3] C. Seifert and M. Waurick, *Perturbations of positive semigroups on L_p-spaces*, Positivity **20** (2016), no. 2, 467–481.

[4] C. Seifert and D. Wingert, *On the perturbation of positive semigroups*, Semigroup Forum **91** (2015), no. 2, 495–501.