VECTOR VALUED POLYMEASURES AND PERTURBATIONS OF SEMIGROUPS OF OPERATORS

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Let X be a Banach space and $S : [0,\infty) \to L(X)$ a continuous semigroup of operators acting on X with infinitesimal generator A.

Let Λ be a locally compact Hausdorff space, $\mathcal{B}$ the σ-algebra of Baire sets in Λ and $P : \mathcal{B} \to L(X)$ a spectral measure. For a scalar valued P-integrable function W on Λ, we write

$$P(W) = \int_{\Lambda} W(\lambda)P(d\lambda) .$$

Assuming that such a scalar valued function W is given on Λ, let

$$T(t) = \exp(tP(W)) ,$$

for $t \geq 0$. So, $T : [0,\infty) \to L(X)$ is the semigroup with infinitesimal generator $P(W)$.

The aim is to describe the effects of the two semigroups S and T acting simultaneously.

For example, let us consider the diffusion in $\mathbb{R}^3$ of a substance reacting with the environment. In this case, $\Lambda = \mathbb{R}^3$ and X is the space of all finite real-valued measures on $\mathcal{B}$. The semigroup S describes the spontaneous diffusion of the substance disregarding the creation/destruction process due to the reaction with the environment. So, if the spacial distribution of the substance at time $t = 0$ is given by a