ON MULTIPLE POISSON STOCHASTIC INTEGRALS AND ASSOCIATED MARKOV SEMIGROUPS

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Abstract: Multiple stochastic integrals (m.s.i.)

\[ q^{(n)}(f) = \int_{X_n} f(x_1, \ldots, x_n) q(dx_1) \cdots q(dx_n), \quad n = 1, 2, \ldots \]

with respect to the centered Poisson random measure \( q(dx) \), \( E[q(dx)] = 0 \), \( E[(q(dx))] = m(dx) \), are discussed, where \( (X, m) \) is a measurable space. A ”diagram formula” for evaluation of products of (Poisson) m.s.i. as sums of m.s.i. is derived. With a given contraction semigroup \( A_t, t \geq 0 \), in \( L^2(X) \) we associate a semigroup \( \Gamma(A_t) \), \( t \geq 0 \), in \( L^2(\Omega) \) by the relation

\[ \Gamma(A_t)q^{(n)}(f_1 \hat{\otimes} \cdots \hat{\otimes} f_n) = q^{(n)}(A_t f_1 \hat{\otimes} \cdots \hat{\otimes} A_t f_n) \]

and prove that \( \Gamma(A_t), t \geq 0 \), is Markov if and only if \( A_t, t \geq 0 \), is doubly sub-Markov; the corresponding Markov process can be described as time evolution (with immigration) of the (infinite) system of particles, each moving independently according to \( A_t, t \geq 0 \).

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