Institution: Department of Mathematics

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Theme: The theory of the canonical representation of Gaussian processes

The theory of canonical representation of Gaussian processes has been presented for the first time by Lévy in 1954 and later developed by Hida and Cramer in 1960.

The history of my investigation is as follows:

For details, see my Home Page

http://www.ms.saga-u.ac.jp/%7Ehibino/index_e.htm

- For any linearly independent system in $L^2[0,1]$, we construct a Brownian motion which is noncanonical. Our example includes Lévy's one of noncanonical representations of a Brownian motion as a special case. For the construction, we use the theory of a partial isometry. A generalized Hardy inequality is derived and applied as an important lemma.

- We consider the Gaussian process X_λ defined by parameterizing a singular kernel of Volterra-type introduced as above.

- We construct a noncanonical representation of a d-dimensional Brownian motion by using a method similar to the above.

- We construct noncanonical representations of a Brownian motion which has an arbitrary finite-dimensional orthogonal complement by using a different method from the above.

- For a stationary centered Gaussian process, we construct a noncanonical representation which has an infinite-dimensional orthogonal complement that is nontrivial.

- We consider whether the noncanonical Volterra representation may have an infinite-dimensional orthogonal complement or not by the use of the method of the stationary processes.

Recently,

- Stimulated by the quantum generalization of the canonical representation theory for Gaussian processes, we first give the representations (not necessarily canonical) of two stationary Gaussian processes X and Y by means of the white noises q_t and p_t with no assumptions on their commutator. We then assume that $q_t + ip_t$ annihilates the vacuum state and prove that the representations are the joint Boson Fock ones if and only if X and Y have a scalar commutator.