Abstract of Main Thesis

Title of Thesis

A Study on Fermionic Wiener Functionals via Stochastic Areas and its Applications

Phonetically in Japanese Hiragana あいはらひでみ（てい　ひでみ）
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Abstract on the Content of the Applicant's Thesis

This thesis is organized into four sections.

In the first section, a probabilistic representation of the tau functions of KP (Kadomtsev-Petviashvili) solitons in terms of stochastic areas will be presented.

The second section is composed of a remark that Quadratic Gaussian term structures under suitable scale change are of multi-soliton type, (a collection of) solitary waves that are related to KdV solitons. In the real market, the term structure of forward rates exhibits some humps. The quadratic Gaussian term structure models or affine term structure models well explain this phenomena.

The third section presents a probabilistic ``Bosonization" using stochastic areas. With the Bosonization, the ``Fermions", which are anti-symmetric stochastic integrals generated by a representation of a Clifford algebra in Wiener space, are sent to the character polynomials. This Bosonization enables us to construct a probabilistic representation of tau functions of integrable systems.

In the last section, we present two equivalences in law among stochastic areas. The first one states that the law of a stochastic area at a fix time of a Gaussian process (stochastic integral of a deterministic L^2 function) is only dependent on its L^2-norm. The second one is on the pair of (generalized) stochastic areas. It says that the law of a pair related to Walsh system is again independent of the choice of the Walsh function.