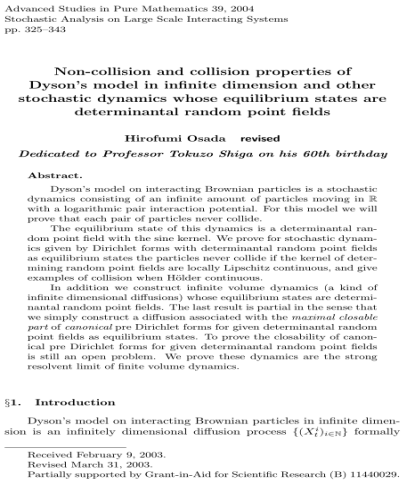
Introduction To Infinite Dimensional Stochastic Analysis



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Non-collision and collision properties of Dyson's model in infinite dimension and other stochastic dynamics whose equilibrium states are determinantal random point fields

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Dedicated to Professor Tokuzo Shiga on his 60th birthday

Abstract.

Dyson's model on interacting Brownian particles is a stochastic dynamics consisting of an infinite amount of particles moving in $\mathbb{R}$ with a logarithmic pair interaction potential. For this model we will prove that each pair of particles never collide.

The equilibrium state of this dynamics is a determinantal random point field with the sine kernel. We prove for stochastic dynamics given by Dirichlet forms with determinantal random point fields as equilibrium states the particles never collide if the kernel of determining random point fields are locally Lipschitz continuous, and give examples of collision when Hölder continuous.

In addition we construct infinite volume dynamics (a kind of infinite dimensional diffusions) whose equilibrium states are determinantal random point fields. The last result is partial in the sense that we simply construct a diffusion associated with the *maximal closable part* of *canonical* pre Dirichlet forms for given determinantal random point fields as equilibrium states. To prove the closability of canonical pre Dirichlet forms for given determinantal random point fields is still an open problem. We prove these dynamics are the strong resolvent limit of finite volume dynamics.

§1. Introduction

Dyson's model on interacting Brownian particles in infinite dimension is an infinitely dimensional diffusion process $\{(X_t^i)_{i\in\mathbb{N}}\}$ formally

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