Mathematical Science and Nonlinear Partial Differential Equations

J617
Graduate School of Engineering Science
Osaka University
http://www.sigmath.es.osaka-u.ac.jp/suzuki/title_e.html
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Program

February 14 (Sat.) 2009

Chair: Futoshi Takahashi (Osaka City University)

9:00-9:50
Shinya Okabe (Iwate University)
The variational problem for a certain action functional defined on closed curves

9:50-10:40
Kwangseok Choe (Pohang University of Science and Technology)
Elliptic problems arising in the self-dual Chern-Simons theories

10:50-11:40
Ken Sawada (Osaka University)
Mean field equations for point vortex and vortex filament systems

Chair: Yuki Naito (Kobe University)

13:10-14:00
Sohei Tasaki (Osaka University)
Nonlocal eigenvalue problems in phase transition

14:00-14:50
Ryo Takahashi (Osaka University)
Degenerate parabolic equation derived from the kinetic theory

15:00-15:50
Hyung Ju Hwang (Pohang University of Science and Technology)
Boundary value problems in the Vlasov-Poisson system

Coffee Break

Chair: Michinori Ishiwata (Muroran Institute of Technology)

16:10-17:00
Takashi Suzuki (Osaka University)
Einstein's formula and reaction diffusion equations

17:00-17:50
Jaeyoung Byeon (Pohang University of Science and Technology)
Asymptotic profile of least energy solutions for Henon equation

Abstracts

Jaeyoung Byeon, Asymptotic profile of least energy solutions for Henon equation:
We consider the following nonlinear elliptic problem:
$ ¥Delta u + |x|^{¥alpha}u^{p} = 0, u > 0 in ¥Omega, u = 0 on ¥partial¥Omega$. Here $¥alpha> 0, p ¥in (1,(n+2)/((n-2))$ and $¥Omega$ is a bounded domain in $¥mathbb{R}^n>$. We charaterize an asymptotic behavior of the least energy solutions as $¥alpha ¥to ¥infty.$

Kwangseok Choe, Elliptic problems arising in the self-dual Chern-Simons theories:
We introduce the Chern-Simons vortex equation derived from the self-dual Chern-Simons theories which is believed relevant to superconductivity of type II. We briefly review the existence, uniqueness and qualitative properties of solutions to the Chern-Simons vortex equation.

Hyung Ju Hwang, Boundary value problems in the Vlasov-Poisson system:
We concern boundary value problems arising in the Vlasov-Poisson system. The Vlasov-Poisson system models a collisionless plasma. When a boundary condition is included in the problem it is known that singularities can occur but that weak solutions exist globally in time. However, existence of a strong solution and

uniqueness of a weak solution for such a BVP have been open so far. Firstly, we study global existence for strong solutions of the Vlasov-Poisson system in convex bounded domains with specular boundary conditions and with a prescribed outward electrical field at the boundary. Secondly, we discuss the uniqueness of the weak solution for a problem in one dimension with specular reflection at the boundary.

Shinya Okabe, The variational problem for a certain action functional defined on closed curves:
We consider a variational problem for a certain time space functional defined on planar closed curves. The functional is appeared in the action minimization problem for stochastic Allen-Cahn equation. The variational problem is stated as follows: ``Let $¥Gamma_0$ and $¥Gamma_1$ denote planar closed curves and T be a positive constant. Minimize the time space functional over families of planar closed curves, which change from $¥Gamma_0$ at time $t=0$ into $¥Gamma_1$ at time $t=T$". In this talk, we focus on an existence of non-radial symmetry critical point of the problem.

Ken Sawada, Mean field equations for point vortex and vortex filament systems:
We consider the mean field equations for point vortex and vortex filament systems. These equations depend on circulation constraints, a generalization of the constraint is concerned. We derive the mean field equations for generalized point vortex systems in two-dimensional bounded domains. Then we investigate the equation for the neutral opposite-valued system. Finally, we discuss the generalized vortex filament system, as an extension to a three-dimensional case.

Takashi Suzuki, Einstein's formula and reaction diffusion equations:
We derive the diffusion equation as a mean field equation of a master equation describing the existence probability of particles continuous in space and time, whereby the diffusion coefficient is the one prescribed by Einstein. Then the Debye term under the presence of potential is reformulated by the reinforced random walk, and finally, a reaction diffusion equation with non-local term is obtained using a new concept, the reaction radius. This is a joint work with K. Ichikawa.

Souhei Tasaki, Nonlocal eigenvalue problems in phase transition:
We study some mathematical models arising in phase transition. First, we formulate the physically closed stationary state as a nonlinear eigenvalue problem with a non-local term. Then, some results on existence, non-existence, stability, and

bifurcation of the solution are proven. In particular, we prove the existence of dynamically stable non-constant stationary states.

Ryo Takahashi, Degenerate parabolic equation derived from the kinetic theory:
We address a degenerate parabolic equation derived from the kinetic theory using R¥'{e}nyi-Tsallis entropy. This talk is devoted to the critical case $m=2-2/n$, $n¥geq 3$. Firstly, we construct the weak solution in the space considered the lack of decay of the Newton potential. Secondly, the threshold mass for the blowup is considered in terms of the relation between the free energy and the second moment, the scale invariance and the Trudinger-Moser inequality. Finally, we study the structure of the blowup set, say the finiteness of type II blowup points and so on.

Participants (tentative)

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From Kansai Airport

1. You can take a Limousine bus at #8 stop. The destination is Hankyu Hotarugaike. Then take Osaka mono-rail. The next station Shibahara is the place to get off. It takes aroud 1minute to the campus.
2. You can take JR line to go to Osaka station. Then get on Hankyu at Umeda station and come to Hotarugaike.