Mathematics and Physics Unit "Multiscale Analysis, Modelling and Simulation"
Top Global University Project, Waseda University

Waseda Workshop on Partial Differential Equations

Date: December 20, 2018
Venue: Meeting Room, Bldg. 62, Nishi-waseda Campus, Waseda University
早稲田大学 西早稲田キャンパス 62 号館 W 棟 1 階 大会議室

Shih-Hsien Yu (National University of Singapore)
10:00 – 11:20

Green's functions and Well-posedness of Compressible Navier-Stokes equation

A class of decomposition of Green's functions for the compressilbe Navier-Stokes linearized around a constant state is introduced. The singular structures of the Green's functions are developed as essential devices to use the nonlinearity directly to covert the 2nd order quasi-linear PDE into a system of zero-th order integral equation with regular integral kernels. The system of integrable equations allows a wider class of functions such as BV solutions. We have shown global existence and well-posedness of the compressible Navier-Stokes equation for isentropic gas with the gas constant $\gamma \in (0, e)$ in the Lagrangian coordinate for the class of the BV functions and point wise L^∞ around a constant state; and the underline pointwise structure of the solutions is constructed. It is also shown that for the class of BV solution the solution is at most piecewise C^2-solution even though the initial data is piecewise C^∞.

Shinya Nishibata (Tokyo Institute of Technology)
11:30 – 12:30

Stationary waves for symmetric hyperbolic systems in half space

In the present talk, we discuss an existence and asymptotic stability of a stationary solution to general system of hyperbolic equations. Assuming the existence of an entropy function, we can rewrite it to the symmetric form. We prove the existence of the stationary solution for this system symmetric. It immediately implies the existence for the original hyperbolic system. Moreover, we show the asymptotic stability of the stationary solution, thus obtained, assuming the stability condition. These results are proved for general hyperbolic system. We, then, discuss the application to the physical models such as the discrete Boltzmann equations and the model system of thermal non-equilibrium flow.

Yoshihiro Ueda (Kobe University)
14:20 – 15:20

Analysis of the dissipative structure for the symmetric hyperbolic system with non-symmetric relaxation

In this talk, we discuss the dissipative structure for a hyperbolic system with relaxation. If the relaxation term of the system has symmetric property, Umeda-Kawashima-Shizuta 1984 and Shizuta-Kawashima 1985 introduced a stability condition which induces the decay estimate for the solution of Cauchy problem. However, there are some complicated physical models which possess a non-symmetric relaxation term and we can not apply this stability condition to these models. Under this situation, our purpose of this talk is to extend the stability condition for complicated models and get the quantitative decay estimate. Furthermore, we shall explain the new dissipative structure by using the several concrete examples.

Keiichi Kato (Tokyo University of Science)
15:50 – 16:50

Wave packet transform and existence of solutions to Schrödinger equations

In this talk, we consider linear Schrödinger equations with quadratic or sub-quadratic potentials, which can be transformed by the wave packet transform with time dependent wave packet to a PDE of first order with inhomogeneous terms including unknown function and second derivative of the potential. If the second derivatives of the potentials are bounded, the transformed first order equation gives a simple proof of the existence of solutions to Schrödinger equations with quadratic or sub-quadratic potentials on L^2. We will comment on the existence of solutions on more or less regular spaces.

Tatsuo Iguchi (Keio University)
17:00 – 18:00

Initial value problem to a shallow water model with a floating solid body

In this talk we are concerned with the well-posedness of the initial value problem to a shallow water model for two-dimensional water waves with a floating solid body. We consider three cases: the body is fixed, the motion of the body is prescribed, and the body moves freely according to Newton's laws. The difficulty of the analysis comes from the fact that we have to treat the contact points, where the water, the air, and the solid body meet. This model yields a new type of free boundary problems for a quasilinear hyperbolic system. We will report that the initial value problem to this model is in fact well-posed. This result is based on the joint research with David Lannes at University of Bordeaux.

Organized by Yoshihiro Shibata, Shuichi Kawashima, Hideo Kozono, Tohru Ozawa

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