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Membership of academic societies:

The mathematical society of Japan

Research Interest:

- partial differential equations
- nonlinear dispersive equations
- harmonic analysis

Research Summary:

My research area is in the nonlinear partial differential equations. I am particularly interested in nonlinear dispersive equations such as the Korteweg de-Vries equation, nonlinear Schrödinger equations and the Zakharov system. These equations appear in the study of nonlinear optics, fluid dynamics, plasma physics, quantum mechanics and so forth. The properties of the linear equations are well understood. However, the nonlinear terms make these equations difficult. I am studying the well-posedness (the existence, the uniqueness, the continuous dependence on initial data), the regularity of the solutions and the asymptotic behaviors of the solutions, using the techniques from the harmonic analysis. These are the most fundamental problems in the study of the Cauchy problem.

Major Publications:

- [1] K. Tsugawa: Local well-posedness of the KdV Equation with quasi-periodic initial data, *SIAM J. Math. Anal.* **44** (2012), no. 5, 3412–3428.
- [2] N. Kishimoto, K. Tsugawa: Local well-posedness for quadratic nonlinear Schrödinger equations and the “good” Boussinesq equation, *Differential Integral Equations* **23** (2010), no. 5-6, 463–493.
- [3] K. Tsugawa: Well-posedness and weak rotation limit for the Ostrovsky equation, *J. Differential Equations* **247** (2009), no. 12, 3163–3180.
- [4] K. Tsugawa: Global well-posedness for the KdV equations on the real line with low regularity forcing terms, *Commun. Contemp. Math.* **8** (2006), no. 5, 681–713.
- [5] H. Kubo, K. Tsugawa: Global solutions and self-similar solutions of the coupled system of semilinear wave equations in three space dimensions, *Discrete Contin. Dyn. Syst.* **9** (2003), no. 2, 471–482.

Education and Appointments:

- 4/1991 – 3/1996 Department of mathematics, University of Tokyo
- 4/1996 – 3/1998 Graduate School of Mathematical Sciences, University of Tokyo(Master course)
- 4/1998 – 3/2001 Graduate School of Mathematical Sciences, University of Tokyo(Doctor course)
- 4/2001 – 8/2003 Graduate research student Mathematical institute, Tohoku University, Japan
- 9/2003 – 8/2004 Post doctor Institut des Hautes Études Scientifiques, France
- 9/2004 – 2/2005 Post doctor Forschungsinstitut fur Mathematik (ETH), Switzerland
- 3/2005 – 3/2005 Post doctor Max-Planck-Institut fur Mathematik
in den Naturwissenschaften Leipzig, Germany
- 4/2005 – present Associate Professor Graduate School of Mathematics, Nagoya University, Japan

Message to Prospective Students:

This area has been intensively studied for the last 30 years. However, there are many open problems. If you are interested in this area, please look at the following books:

- [1] T. Cazenave, Semilinear Schrodinger Equations (Courant Lecture Notes 10), Amer. Math. Soc.
- [2] F. Linares and G. Ponce, Introduction to Nonlinear Dispersive Equations, Springer
- [3] Terence Tao, Nonlinear Dispersive Equations: Local And Global Analysis (Cbms Regional Conference Series in Mathematics), Amer. Math. Soc.