博士課程学生 (Doctoral Course Students)

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(FMSP コース生)

A. 研究概要

Pertial differntial equations

1. **Stand wave solutions of nonlinear Schrödinger-Poisson systems [5]**
   This is a joint work with Hiroyuki Miyahara (UTokyo). We worked on stand wave solutions of the following nonhomogeneous nonlinear Schrödinger-Poisson systems:

2. **Generalized Joseph-Lundgren exponent [1]**
   This is a joint work with Prof. Yasuhito Miyamoto (UTokyo).

3. **Semilinear elliptic equations involving critical Sobolev exponent [3] [4]**
   I worked on the following nonhomogeneous semilinear elliptic equation involving the critical Sobolev exponent: $-\Delta u + au = bu^p + \lambda f$. I proved that provided b achieves its maximum at an inner point of the domain and a has a growth of the exponent q in some neighborhood of that point, then if the dimension of the domain is less than $6 + 2q$, there exist at least two positive solutions. It seems to be new that the coefficient of a linear term affects the dimension of the domain on which solutions exist.

Mathematical informatics

4. **Zero-dimentional fold and cut [2] [6]**
   This is a joint work with Yasuhiko Asao (UTokyo), Prof. Erik D. Demaine (MIT), Prof. Martin L. Demaine (MIT), Hideaki Hosaka (Azabu High School), Prof. Akitoshi Kawamura (UTokyo) and Prof. Tomohiro Tachi (UTokyo).

5. **Application of SAT-solver for AI [7]**
   It is known that n-satisfiability problems are NP-hard to solve for $n \geq 3$ but are solved quickly by SAT-solver in recent years. I applied it for AI in the international programming contest "SamurAI Coding 2016–17", which is held by Information Processing Society of Japan. I made an algorithm on SAT-solver to decide the hidden enemy logically by observing which place is conquested. It worked faster than a rudimentary algorithm by brute force. The latter exceeds the time limit but the formar does not.

Social mathematics in FMSP

6. **Control model for traffic lights**
   This is a joint work with

B. 発表論文

Papers [Refereed]

1. Yasuhito Miyamoto and Kazune Takahashi: "Generalized Joseph-Lundgren exponent and intersection properties for supercritical quasilinear elliptic equations", Archiv der Mathematik **108** (2017) 71–83.

2. Yasuhiko Asao, Erik Demaine, Martin Demaine, Hideaki Hosaka, Akitoshi Kawamura, Tomohiro Tachi and Kazune Takahashi: "Folding and Punching Paper", Abstracts from the 19th Japan Conference on Discrete and Computational Geometry, Graphs and Games (2016) 40–41.

3. Kazune Takahashi: "Semilinear elliptic equations with critical Sobolev exponent and non-homogeneous term", Master Thesis, The University of Tokyo (2015).

Papers [Not-Refereed]

4. Kazune Takahashi: "Semilinear elliptic equations with critical Sobolev exponent and non-homogeneous term", to appear in RIMS Kôkyûroku.

Preprints

5. Hiroyuki Miyahara and Kazune Takahashi: "Existence and Nonexistence of Standing Wave Solutions of Nonlinear Schrödinger-Poisson System", preprint.

6. Yasuhiko Asao, Erik Demaine, Martin Demaine, Hideaki Hosaka, Akitoshi Kawamura, Tomohiro Tachi and Kazune Takahashi: "Folding and Punching Paper", submitted.

Miscs

7. Kazune Takahashi: "Application of SAT-solver for AI on SamurAI Coding 2016–17", (2017), `https://github.com/kazunetakahashi-thesis/SAT-solver-AI-project`.

C. 口頭発表

International Conference [Invited]

1. Semilinear elliptic equations with critical Sobolev exponent and non-homogeneous term, RIMS Workshop: Shapes and other properties of solutions of PDEs, RIMS, Kyoto University, Japan, Nov 2015.

International Conference [Not-invited]

2. (With Yasuhiko Asao, Erik Demaine, Martin Demaine, Hideaki Hosaka, Akitoshi Kawamura, and Tomohiro Tachi) Folding and Punching Paper, The 19th Japan Conference on Discrete and Computational Geometry, Graphs, and Games, Tokyo University of Science, Japan, Sep 2016.

Domestic Conference [Invited]

3. Existence and Nonexistence of Standing Wave Solutions of Nonlinear Schrödinger-Poisson System, The 39th Differential Equation Seminar at Yokohama National University, Yokohama National University, Japan, Aug 2016.

D. 講義

Teaching Assistant

1. Computational Mathematics I (Prof. Shingo Ichii): I made new teaching materials for the script language Ruby. I updated the fast-moved attendance management system *Quiz Magic Attendance 3* by Ruby on Rails. (For third-year students in School of Sciences)

2. Computational Mathematics II (Prof. Shingo Ichii): I helped a third-year student to learn Ruby and to develop an introductory network application. (For third-year students in School of Sciences)

G. 受賞

International Programming Contests

1. SamurAI Coding 2014–15, World Final: 6th place, 77th Information Processing Society of Japan National Convention, Kyoto University, Japan, Mar 2015.

Domestic Programming Contests

2. Code Runner 2015, Final Round: 1st place, Recruit Career, Tokyo, Dec 2015.

3. Code Runner 2014, Final Round: 7th place, Recruit Career, Tokyo, Nov 2014.

4. Code Festival 2014 AI Challenge, Final Round: 3rd place, Recruit Holdings, Tokyo, Nov 2014.