

数理解析研究所講究録 2087

RIMS 共同研究 (公開型)

第14回生物数学の理論とその応用
—— 構造化個体群ダイナミクスとその応用 ——

京都大学数理解析研究所

2018年8月

数理解析研究所講究録は、京都大学数理解析研究所の共同利用研究集会および共同研究の記録として1964年に刊行が開始されました。現在の共同利用・共同研究拠点（2010年発足）の前身である、全国共同利用研究所として当研究所が発足した翌年のことでしたが、以来半世紀、毎年数十巻を刊行し、2016年には第2000巻が刊行されるに至りました。第1巻から第2000巻までに収録された論文数は29,265編、総頁数は342,960頁という膨大なものであり、最先端の数学・数理科学分野の研究状況を伝えるのみならず、我が国の数学・数理科学の発展の歴史を留める文献として、他に類例を見ない論文集となっています。

講究録の内容は当研究所のウェブサイトおよび京都大学の学術情報リポジトリにおいても公開され、年間の総アクセス数は1,380,032回（2017年度）を数えるなど、多数の方にご利用いただいています。

講究録の使用言語は論文著者の判断に任されていますが、結果的に日本語が多用されていることが特徴の一つとなっています。その結果、講究録は、数学・数理科学の広い領域における最先端の専門知識に母国語でアクセスできるものとして、近年の英語化の流れの中で、重要な文献となりつつあります。

当研究所の共同利用事業に参加し講究録の論文を執筆していただいた多数の方々に対し、講究録を大きく成長させていただいたことを深く感謝いたしますとともに、これからも、当研究所の共同利用・共同研究拠点としての活動にご参加いただき、講究録の発展にご協力いただけますよう心よりお願い申し上げます。

RIMS Kôkyûroku 2087

*Theory of Biomathematics and
Its Applications XIV
-Modelling and Analysis for Structured
Population Dynamics and its Applications-*

November 8 ~10, 2017

edited by Hiroto Shoji

August, 2018

Research Institute for Mathematical Sciences

Kyoto University, Kyoto, Japan

This is a report of research done at the Research Institute for Mathematical Sciences,
a Joint Usage/Research Center located in Kyoto University.
The papers contained herein are in final form and will not be submitted for publication elsewhere.

講究録

Kôkyûroku

RIMS Kôkyûroku was started in 1964 as the proceedings of symposia, colloquia and workshops supported by RIMS, the Research Institute for Mathematical Sciences, Kyoto University. It was the next year of the establishment of RIMS as one of the nationwide Cooperative Research Centers, the preceding system of the current Joint Usage/Research Centers that started in 2010. For half a century since then, about 50 to 60 volumes have been issued each year, and the 2,000th volume was issued in 2016. The volumes of Kôkyûroku from the 1st through the 2,000th, containing enormous 29,265 articles and 342,960 pages, not only deliver the latest research activities in mathematics and mathematical sciences but also constitute valuable and incomparable collections of articles that pass down history of progress of mathematics and mathematical science in Japan.

Articles in Kôkyûroku are available on the websites of RIMS and Kyoto University Research Information Repository. They are very frequently accessed on the internet, with a total of as many as 1,380,032 accesses in 2017.

The authors choose the languages to write articles, and many are written in Japanese, which is one of the characteristics of Kôkyûroku. As a result, Kôkyûroku is regarded as a significant and important literature which allows easy access to the latest specialized knowledge in the large fields of mathematics and mathematical sciences written in native language for Japanese readers, while more and more research papers are being written in English in recent years.

We are deeply grateful to many of those who have participated in cooperative research activities of RIMS and greatly developed Kôkyûroku. We heartily ask for your continuous participation in research activities at RIMS as a Joint Usage/Research Center and your warm support and cooperation for the fruitful development of Kôkyûroku.

**RIMS Workshop : Theory of Biomathematics and Its Applications XIV - Modelling and Analysis
for Structured Population Dynamics and its Applications**

Date : Nov. 8 - 10, 2017

Venue : Maskawa Hall, North Comprehensive Education and Research Bldg., Kyoto University

Organizing committee : Hiroto Shoji (School of Science and Technology, Kwasei Gakuin University)

Toshikazu Kuniya (Graduate School of System Informatics, Kobe University)

Endorsement The Japanese Society for Mathematical Biology

Program

Nov. 8 th (Wed)

13:30~13:35 Opening Address

Mini-Lecture

13:35~14:10 Gen Kurosawa (Theoretical Biology Laboratory, RIKEN and iTHEMS, RIKEN)

Toward the simplest theoretical model for circadian rhythms

14:10~14:15 Short break

Contributed Talk

14:15~14:35 Kazuhisa Nishi (School of Engineering, University of Hyogo)

Theory of genes network in reprogramming of iPS cells

14:35~14:55 Machika Higashibeppu (Faculty of Science, Kyushu University)

Predicting bone mass dynamics under various gravity conditions

14:55~15:00 Short Break

15:00~15:20 Mitsuo Takase (LINFOPS Inc.)

Tumor-immune system analysis code situation, relationship with real states and its automatic control

15:20~15:40 Tsuyoshi Hirashima, Naoya Hino, Michiyuki Matsuda (Graduate School of Medicine, Kyoto University)

Cellular Potts Modeling for Mechanical Wave Propagation in Multicellular Movement

15:40~16:00 Nariyuki Nakagiri (School of Human Science and Environment, University of Hyogo)

Simulation and pattern formation for *Bacillus subtilis* natto on the lattice model : effects of environmental conditions

16:00~16:10 Short Break

Mini-Lecture

16:10~16:45 Sohei Tasaki (Frontier Research Institute for Interdisciplinary Sciences, Tohoku University)

Morphologies of *Bacillus subtilis* communities responding to environmental variation

Nov. 9 th (Thu)

Contributed Talk

9:00~9:20 Shinji Nakaoka (JST PRESTO, The University of Tokyo)

Analysis for composition change of the gut microbiota induced by viral infection

9:20~9:40 Kai Mizuta, Hisashi Inaba (Graduate School of Mathematical Sciences, the University of Tokyo)

Homogeneous eigenvalue problem and its applications

9:40~10:00 Kazunori Sato (Faculty of Engineering, Shizuoka University)

Basic reproduction numbers for epidemic models on lattice space

10:00~10:10 Short Break

Mini-Symposium "Mathematical models in epidemiology – the current of young research in Japan"

Organizer Toshikazu Kuniya (Graduate School of System Informatics, Kobe University)

10:10~10:15 Opening Address

10:15~10:55 Ryosuke Omori (Research Center for Zoonosis Control, Hokkaido University)

Lessons from multi-strain SIR model and their application for prediction of Influenza epidemics

10:55~11:00 Short Break

11:00~11:40 Yukihiro Nakata (Shimane University)

Infection and reinfection dynamics in a heterogeneous susceptible population

11:40~11:45 Short Break

11:45~12:25 Youich Enatsu (Department of Applied Mathematics, Tokyo University of Science)

Transmission dynamics of mathematical models for vector-borne diseases

12:25~13:30 Break for Lunch

Invited Talk

13:30~14:30 Viggo Andreasen (Roskilde University, Denmark)

The dynamics of repeated epidemics

14:30~14:40 Short Break

Invited Talk

14:40~15:40 David Greenhalgh (University of Strathclyde, UK)

Backward bifurcation, equilibrium and stability phenomena in a three-stage extended BRSV epidemic model

15:40~15:50 Short Break

Invited Talk

15:50~16:50 Hisashi Inaba (Graduate School of Mathematical Sciences, the University of Tokyo)

An Age-Structured Epidemic Model for Demographic Transition

Nov 10 th (Fri)

Contributed Talk

- 9:50~10:10 Yusuke Ito (Department of Biology, Kyushu University), Fabrizio Mammano (INSERM, France), Shingo Iwami (Department of Biology, Kyushu University, PRESTO JST, CREST JST)
Identifying the number of target cell subpopulation in HIV-1 co-infection
- 10:10~10:30 Shingo Iwami (Kyushu University & JST PRESTO,)
Mathematical modeling of virus dynamics and its application to data analysis
- 10:30~10:50 Yusuke Kakizoe (Graduate School of Systems Life Sciences, Kyushu University)
Quantification of Hepatitis B Virus infection dynamics in cell culture model
- 10:50~11:00 Short Break
- 11:00~11:20 Kosaku Kitagawa (Graduate School of Systems Life Sciences, Kyushu University)
Analyzing clinical data of Direct-Acting-Antivirals treatment for Hepatitis C Virus patients
- 11:20~11:40 Tatsuya Kuruo (Department of Biology, Faculty of Sciences, Kyushu University)
Quantitative analysis of APOBEC to HIV-1 infection in vivo with linear mixed effects model
- 11:40~12:00 Shoya Iwanami (Graduate School of Systems Life Sciences, Kyushu University)
Data analysis of single-cell transplantation using mathematical model of hematopoietic system with myeloid bypass
- 12:00~13:00 Break for Lunch
- 13:00~13:20 Akane Hara (Graduate School of Systems Life Sciences, Kyushu University) , Yoh Iwasa (Department of Biology, Faculty of Sciences, Kyushu University)
Theoretical study of relationship between allergy and intestinal microbiome
- 13:20~13:40 Mitsuaki Takaki (Faculty of Science, Kyushu University)
Mathematical modeling of cancer recurrence caused by premalignant lesions formed before the first treatment
- 13:40~14:00 Hiroataka Kanazawa (Kyoto Prefectural University of Medicine, International Institute of Advanced Studies)
A relationship between differential energy and algebra in Morphogenesis
- 14:00~14:10 Short Break
- 14:10~14:30 Ryo Iwamoto (School of Science and Technology, Kwansai Gakuin Univ.)
Turing Patterns by Anisotropic Diffusions
- 14:30~14:50 Sho Shimbaba (School of Fundamental Science and Technology, Waseda University)
Insurance developed by Social Wasps
- 14:50~15:00 Short Break

15:00~15:20 Kanako Noda, Kenta Uemichi (Kwansei Gakuin University), Etsushi Nakaguchi (Tokyo Medical and Dental University), Koichi Osaki (Kwansei Gakuin University)

A Lyapunov Function for Constant Equilibria to the Deneubourg Chemotaxis System

15:20~15:40 Takaaki Aoki, Koichi Osaki (School of Science and Technology, Kwansei Gakuin Univ.,)

Codimension-two and -three bifurcations from uniform equilibria in a chemotaxis-growth system

15:40~16:00 Ryusuke Kon (Faculty of Engineering, University of Miyazaki)

Dynamic dichotomy in high-dimensional semelparous Leslie matrix models

16:00~16:05 Closing Address

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 Theory of Biomathematics and Its Applications XIV
 - Modelling and Analysis for Structured Population Dynamics and its Applications -
 RIMS 共同研究 (公開型) 報告集

2017年11月8日～11月10日
 研究代表者 昌子 浩登 (Hiroto Shoji)

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