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数理解析研究所講究録 2174

RIMS共同研究（公開型）

偏微分方程式による逆問題解析とその周辺

京都大学数理解析研究所

２０２１年２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．当研究所が全国共同利用研究所として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，当研究所の国際共同利用・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．

*数理解析研究所は2018年11月13日，共同利用・共同研究拠点の認定が廃止され，新しく国際共同利用・共同研究拠点に認定されました．

RIMS Kôkyûroku 2174

Analysis of inverse problems through partial differential equations and related topics

January 8～10, 2020

edited by Kazumi Tanuma

February, 2021

Research Institute for Mathematical Sciences

Kyoto University, Kyoto, Japan

Preface

The open symposium “Analysis of inverse problems through partial differential equations and related topics” was held on January 8th to 10th, 2020, at the Research Institute for Mathematical Sciences (RIMS), Kyoto University, Japan. The papers at the present proceedings are the outgrowth of this symposium. The symposium addressed both theoretical and numerical aspects on inverse problems, where we were encouraged to express and exchange mathematical ideas on the basis of partial differential equations etc.

We would like to express our gratitude to all the speakers and all the participants, which include young scientists and foreign researchers, for their interesting talks and stimulating discussions. We also thank the staff of the Research Institute for their kind help and support offered to us.

Soon after the symposium, the Covid-19 pandemic spread all over the world. We wish everyone to be safe and hope that we could proceed with activities in the inverse-problem community once the situation has been under control.

October 2020
Kazumi Tanuma
Gunma University, Kiryu, Japan
On behalf of the Organizing Committee

Program of the symposium

January 8th, 2020 (Wed)

10:00〜10:45 Daisuke Kawagoe (Kyoto University)
Spectral analysis on the elastic Neumann-Poincaré operator

11:00〜11:45 Hitoshi Yoshikawa (Kyoto University)
A determination of scatterers using topology optimization with time domain BIEM for scalar wave problems

13:30〜14:15 Hiroya Ito (The University of Electro-Communications)
On polynomial solutions of the Lamé and Stokes systems

14:25〜15:15 Guanghui Hu (Beijing Computational Science Research Center, China)
Corner scattering and data-driven shape identification problems

15:30〜16:15 Yikan Liu (Hokkaido University)
Inverse moving source problems for (time-fractional) diffusion(-wave) equations

16:25～16:55 Hiroshi Takase (The University of Tokyo)
Inverse source problem for Klein-Gordon equation in de Sitter space-time

January 9th, 2020 (Thu)

9:20～10:05 Ibtissem Ben Aïcha (Beijing Computational Science Research Center, China)
Stability estimate in recovering a first order coefficient in a non-self-adjoint wave equation from Dirichlet-to-Neumann map

10:20～11:05 Manmohan Vashisth (Beijing Computational Science Research Center, China)
Reconstruction for the coefficients of a quasilinear elliptic partial differential equation

11:20～12:10 Xiang Xu（Zhejiang University, China）
Inversion trace formulas for a Sturm-Liouville operator

12:15～12:30 Xiaohua Jing（Xi'an Jiaotong University, China, The University of Tokyo）
Uniqueness of the potential for one-dimensional time-fractional diffusion problem (short communication)

14:00～14:50 Cheng Hua (Fudan University, China)
The uniqueness problem of Rayleigh wave in Kelvin viscoelastic half-space and possible method to solve the problem

15:10～15:55 Hiromichi Itou (Tokyo University of Science)
On unilateral contact problems with friction for an elastic body with cracks

16:10～16:55 Shiro Hirano (Ritsumeikan University)
A nonlinear integro-differential equation of earthquake faulting

18:00～ Banquet

January 10th, 2020 (Fri)

9:30～10:15 Kazuki Niino (Kyoto University)
A fundamental study of a numerical analysis based on the point source method for the Helmholtz equation in 2D

10:30～11:15 Takahiro Saitoh (Gunma University)
Application of various forward and inverse scattering techniques to non-destructive testing

11:30～12:15 Takaaki Nara (The University of Tokyo)

Identification of coefficients in time-harmonic Maxwell's equations and its application to biomagnetic inverse problems

13:50～14:35 Manabu Machida (Hamamatsu University School of Medicine)

A numerical method for inverse transport problems

14:50～15:35 Hiroshi Fujiwara (Kyoto University)

Numerical realizations of X-ray computerized tomography by Cauchy-type boundary integration

15:50～16:20 Takashi Furuya (Nagoya University)

Direct and inverse scattering problems for the local perturbation of an open periodic waveguide in the half plane

16:30～16:45 Ruixue Gu (Harbin Institute of Technology, China, The University of Tokyo)

Fast subspace optimization method for nonlinear inverse problems in Banach spaces with uniformly convex penalty terms (short communication)

The home page of the conference:
http://www.xmath.ous.ac.jp/~ohe/RIMS_Jan2020/index_en.html

This conference is supported partly by Grant-in-Aid for Scientific Research (C) 19K03559 and partly by JSPS and RFBR under the Japan - Russia Research Cooperative Program (project No. J19-721).

Organizers:

Professor Hiroshi Fujiwara (Kyoto University)

Professor Hiromichi Itou (Tokyo University of Science)

Professor Mishio Kawashita (Hiroshima University)

Professor Takashi Ohe (Okayama University of Science)

Professor Takashi Takiguchi (National Defense Academy of Japan)

Professor Kazumi Tanuma (Chair: Gunma University)

Professor Michiyuki Watanabe (Niigata University)

偏微分方程式による逆問題解析とその周辺

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RIMS 共同研究（公開型）報告集

2020 年 1 月 8 日〜1 月 10 日

研究代表者　田沼　一実 （Kazumi Tanuma)

目次

The articles are put in alphabetical order of the presenters at the symposium.

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. For half a century since then, several dozen 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 an International Joint Usage/Research Center(*) and your warm support and cooperation for the fruitful development of Kôkyûroku.

* RIMS was certified as an International Joint Usage/Research Center on Nov. 13, 2018.