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数理解析研究所講究録1889

RIMS共同研究

デザイン、符号、グラフおよびその周辺

京都大学数理解析研究所

2014年4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，2012年には第1800巻が刊行されるに至りました．第1巻から第1840巻までに収録された論文数は26,808編，総頁数は317,199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 1,254,383回（2012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 1889

Designs, Codes, Graphs and Related Areas

July 1～3, 2013

edited by Hiroshi Nozaki

April, 2014

Research Institute for Mathematical Sciences

Kyoto University, Kyoto, Japan

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

PREFACE

The second international joint research "Designs, Codes, Graphs and Related Areas" was held as a part of the joint research service of Research Institute for Mathematical Sciences (RIMS) in Kyoto during 1-3 July, 2013. Part of this research is also supported by Grant-in-Aid for Scientific Research B, No. 22340016 (JSPS) whose representative is Professor Masakazu Jimbo. This research is primarily concerned with theoretical and applied aspects of discrete structures in all branches of combinatorics, with special emphasis on design theory, coding theory and graph theory, as well as their linkage with other related areas such as discrete geometry, probability theory, statistics and so on. It is our hope that this joint research will create new good relationships among those people and trigger further new joint research.

We invited 16 great speakers from domestic and overseas, and there were a lot of lively discussions on new problems in the related areas. In particular we are very grateful to the guests from overseas, Professor Oleg Musin, Professor Alexander Barg, Professor Yuan Xu, and Professor Bruce Reed who essentially contributed to the excellent level of the conference. We would like to thank all the participants who helped make this conference a success. We hope the joint research series are continued for the interaction with different areas of discrete structures in combinatorics. The third conference is to be held in RIMS by the chair Masatake Hirao in 2014.

Organizers: Hiroshi Nozaki (Chair)
Jun Fujisawa
Masatake Hirao
Masanori Sawa

February 2014

Designs, Codes, Graphs and Related Areas

This is a RIMS joint research which will take place as a part of the joint research service of Research Institute for Mathematical Sciences (RIMS) in the 2013 fiscal year.

Dates: Monday 1st July to Wednesday 3rd July 2013.
Venue: RIMS, Kyoto University, Room 111
Kyoto 606-8502 Japan[1]

Program

1st July

13:00 – 13:50 Oleg Musin (Univ. of Texas at Brownsville and Yaroslavl State University)
Optimal packings of congruent circles on spheres and flat tori

14:00 – 14:50 Alexey Glazyrin (Univ. of Texas at Brownsville and Yaroslavl State University)
The price of SDP relaxations for spherical codes

15 : 10 – 16 : 00 Keisuke Shiromoto (Kumamoto University)
On critical exponents of matroids and linear codes

16 : 10 – 17 : 00 Michiaki Onodera (Kyushu University)
Evolution equations for quadrature identities

2nd July

9 : 00 – 9 : 50 Ryoh Fuji-Hara (University of Tsukuba)
Descendent sets and codes

10 : 00 – 10 : 50 Yuichiro Fujiwara (California Institute of Technology)
Codes and designs for quantum error correction

11 : 00 – 11 : 50 Ken-ichi Kawarabayashi (National Institute of Informatics)
Combinatorial coloring of 3-colorable graphs

[1]RIMS is easily accessible by a number of public transportation services provided conveniently throughout Kyoto City. Details can be found in http://www.kurims.kyoto-u.ac.jp/en/access-01.html

14 : 00 − 14 : 50 Yuan Xu (University of Oregon)
Cubature rules and orthogonal polynomial

15 : 00 − 15 : 50 Bruce Reed (McGill University)
The structure of a typical H-free graph

16 : 00 − 16 : 50 Satoshi Aoki (Kagoshima University)
Markov chain Monte Carlo methods for regular two-level fractional factorial designs and cut ideals

3rd July

9 : 00 − 9 : 50 Alexander Barg (University of Maryland)
On the theory of association schemes

10 : 00 − 10 : 50 Hiroto Sekido (Kyoto University)
An approximate approach to E-optimal designs for weighted polynomial regression by using Tchebycheff systems and orthogonal polynomials

11 : 00 − 11 : 50 Mikio Kano (Ibaraki University)
Discrete geometry on 3 colored point sets in the plane

14 : 00 − 14 : 50 Ferenc Szöllősi (Tohoku University)
Equiangular lines with angle 1/5 and Seidel matrices with 3 distinct eigenvalues

15 : 00 − 15 : 50 Akihiro Higashitani (Osaka University)
Ehrhart polynomials of polytopes and orthogonal polynomial systems

16 : 00 − 16 : 50 Takayuki Okuda (Tohoku University)
Relation among designs on compact homogeneous spaces

POSTER EXHIBITION:

Shoko Chisaki (Tokyo University of Science)
Difference System of Sets from Lines in $PG(4, 2)$
Hirotake Kurihara (Kitakyushu National College of Technology)
Relations between great antipodal sets and designs with the smallest cardinalities on the complex Grassmannian manifolds and the unitary groups
Sho Suda (Aichi University of Education)
Weighing matrices and related combinatorial objects

デザイン、符号、グラフおよびその周辺
Designs, Codes, Graphs and Related Areas
RIMS 共同研究報告集

２０１３年７月１日～７月３日

研究代表者　野崎　寛 (Hiroshi Nozaki)
副代表者　藤沢　潤 (Jun Fujisawa)
〃　平尾　将剛 (Masatake Hirao)
〃　澤　正憲 (Masanori Sawa)

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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 1,800th volume was issued in 2012. The volumes of Kôkyûroku from the 1st through the 1,840th, containing enormous 26,808 articles and 317,199 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 1,254,383 accesses in 2012.

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.