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Title: Workshop on Algebraic Design Theory and Hadamard Matrices

Event Type: Conference-Workshop

Location:

University of Lethbridge, Lethbridge Alberta

Dates:

July 8 - 11, 2014

Topic:

Algebraic Design Theory and Hadamard Matrices

Methodology:

Approximately 44 talks in length from 20 to 50 minutes were given in a lecture room at the University of Lethbridge over a period of 4 days.

Objectives Achieved:

ADTHM 2014 brought together researchers and students interested in algebraic design theory, especially as it relates to Hadamard matrices and their applications, as well as in related areas. // We learned about the latest developments in these areas, discussed the latest findings, took stock of what remains to be done on classical problems and explored avenues for future research. //

Scientific Highlights:

Karol Zyczkowski, a physicist with an excellent reputation, gave a wonderful talk on the connection between Quantum Information and Hadamard matrices. // This is especially notable as it gave mathematicians useful insights into parallel important research being done in physics and broke down the barriers between the two fields which often use divergent notation impeding communication. //

Many researchers noted how much momentum there is in the study of mutually unbiased matrices, which is intimately connected with Quantum Information Theory. //

Bernhard Schmidt ruled out around 95% of the known cases in the Barker sequence conjecture, one of several important conjectures in the workshop's area. //

Several talks presented material that would be very difficult to glean from reading the literature. // For example, Bill Martin's talk emphasizing tools over results, showing us his accumulated insights. // Mate Matolcsi courageously shared new ideas that could go nowhere but might be key to solving a famous old conjecture. //

Jonathan Jedwab presented a talk which was a pleasure to listen to, which showed the difficulties and subtleties of attempting to solve Zauner's conjecture, but at the same time was encouraging. //

Jonathan Jedwab and Mate Matolcsi agreed to collaborate in studying further the Fourier analytic approach of Matolcsi to the famous circulant Hadamard conjecture. //

Dokovic and Kotsireas presented a new method for constructing new Golay pairs, and in turned learned from S. Georgiou about his method for generating more pairs using 'seeding' pairs. // There will likely be collaboration to use their new Golay pairs to generate many more pairs. //

Problem of constructing symmetric conference matrices (talks by Armario, Seberry, Szollosi) was of interest and will likely lead to a collaboration between Szollosi, Dokovic and Kotsireas to solve the lowest open order of 66. //

Ilya Zhdanovskiy found a new method with algebraic geometry to tackle a conjecture of Mate Matolcsi regarding complex Hadamard matrices of order 6. // It is possible that this approach will lead to the proof of the conjecture which, in turn, is likely to play a key role in the solution of the famous mutually unbiased matrix problem in dimension 6. //

Organizers:

Akbary, Amir; Dept. of Mathematics & Computer Science, University of Lethbridge, Lethbridge, Alberta //

K. T. Arasu, Dept. of Mathematics and Statistics, Wright State University, Fairborn, Ohio //

Yuqing Chen, Dept. of Mathematics and Statistics, Wright State University, Fairborn, Ohio //

Charlie Colbourn, School of Computing, Informatics and Decision Systems Engineering, Arizona State University, Tempe, Arizona //

Robert Craigen, Dept. of Mathematics, University of Manitoba, Winnipeg, Manitoba //

Wolf Holzmann, Dept. of Mathematics and Computer Science, University of Lethbridge, Lethbridge, Alberta //

Vladimir Tonchev, Dept. of Mathematical Sciences, Michigan Technological University, Houghton, Michigan //

Speakers:

See attached file of abstracts which lists speakers in alphabetic order.

Links:

<http://www.cs.uleth.ca/ADTHM>

Comments / Miscellaneous:

We have attached the abstracts and schedule for the workshop. // These are also available at the link <http://www.cs.uleth.ca/ADTHM>

There you will also find the group photo. //

File Uploads:

Additional Upload 1: http://www.pims.math.ca/files/final_report/abstracts_4.pdf

Additional Upload 2: http://www.pims.math.ca/files/final_report/schedule_0.pdf

Additional Upload 3: http://www.pims.math.ca/files/final_report/titlepage.pdf
