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Hakata Workshop 2013[1]

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: 2013 1 26 ( ) 9:30–18:00
:Seminar Room I (2F) in Reference Eki Higashi Building (1-16-14 Hakata-Eki-Higashi, Hakata-Ku, Fukuoka City, 812-0013)
URL: http://comb.math.kyushu-u.ac.jp/

9:25–9:30 Opening Tetsuji Taniguchi

9:30–10:05 Akihiro Munemasa (Tohoku University)
Complex Hadamard matrices contained in a Bose-Mesner algebra.

10:20–10:55 Michael Dobbins (GAIA, Postech)
Reducing combinatorial to projective equivalence in realizability problems for polytopes.

11:10–11:45 Aleksandar Jurisic (University of Ljubljana)
TOWER GRAPHS AND EXTENDED GENERALIZED QUADRANGLES

13:00–15:00 Poster Session
Introduction to Mathematical Software

15:15–16:15 Xiao-Dong Zhang (Shanghai Jiao Tong University)
The algebraic connectivity of graphs

16:30–17:05 Katsuhiro Ota (Keio University)
Clique minors, chromatic numbers for degree sequences

17:10–17:45 Yota Otachi (JAIST)
The path-distance-width of hypercubes

17:45–18:00 Closing Yoshihiro Mizoguchi

18:00 − Post-meeting party

Poster Session

Theme: Introduction to Mathematical Software
Speakers:

1.   (   ),   : GraphiCalPad

2.   (   ),   :

3.   (   ),   :

4.   (   ),   : Magma   2   (Classification of maximal 2-distance sets by Magma)

5.   (   ),   :
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6.   (   ),   :

7.   (   ),   : Q-det

8.   (   ),   : PARI/GP E_8 lattice

9.   (   ),   :

10.   (GCOE-MI),   : MAGMA   Ramanujan graph

11.   (   ),   : SSD Problem

12.   (   ),   : Truffe

13. (   ),   :

Abstract

Akihiro Munemasa (Tohoku University)

Title : Complex Hadamard matrices contained in a Bose-Mesner algebra

Abstract : A complex Hadamard matrix H is an n by n matrix with complex entries with absolute value 1, such that rows are pairwise orthogonal with respect to the hermitian inner product. Recently, Ada Chan constructed a 15 by 15 complex Hadamard matrix using the adjacency matrix of the line graph of the Petersen graph. We found another such matrix, and then generalized it to an infinite family. In this talk, we focus on how to set up a system of polynomial equations for solving this kind of problem more efficiently than the naive approach. This is achieved by determining the ideal of the 3-dimensional algebraic variety consisting of the points of the form (x+1/x,y+1/y,z+1/z,x/y+y/x,y/z+z/y,z/x+x/z) in the 6-dimensional space. This is a joint work with Takuya Ikuta.

Michael Dobbins (GAIA, Postech)

Title: Reducing combinatorial to projective equivalence in realizability problems for polytopes.

Abstract: Determining if there is a polytope of any combinatorial type that satisfies some given property is made difficult by the fact that there are polytopes with realization spaces that are homotopic to any primary semialgebraic set. I will show how, for certain properties, this can be reduced to finding such realizations among projective equivalence classes of polytopes, which are much nicer spaces. An application of this answers a question posed by Bernt Lindstrom in 1971, that there does exist a polytope without an antiprism.

Aleksandar Jurisic (University of Ljubljana)

Title: TOWER GRAPHS AND EXTENDED GENERALIZED QUADRANGLES

Abstract: Let Γ be a complete multipartite graph with at least two parts and each part of size at least 2. For example, $K_{t \times n}$, i.e., the complement of t copies of K_n, and $t, n \geq 2$. Then the local graphs and the μ-graphs (that is the graphs induced on the common neighbours of two vertices at distance 2) are again complete multipartite. They are actually the same graphs, in our example $K_{(t-1) \times n}$. If $t \geq 3$, then the geodesic closure of any μ-graph is the graph we started with.

Let now Γ be the point graph of a generalized quadrangle $GQ(s, t)$. Then Γ is strongly regular like the complete multipartite graph (its valency is $s(t + 1)$, while the number of triangles on an edge in (a) Γ is $s - 1$, and (b) the complement of Γ is $t + 1$). Its μ-graphs are $K_{1 \times (t+1)}$ and when the generalized quadrangle is regular, the convex closures of μ-graphs are $K_{2 \times (t+1)}$.

We study a family of graphs, denoted by $\mathcal{F}$, with the following properties

  (i) their μ-graphs are complete multipartite,

(ii) there exist adjacent vertices x, y and a vertex z at distance 2 from both x, y in Γ, and the number $\alpha_\Gamma = \alpha(x, y, z)$ of common neighbours of these vertices does not depend on a choice of such a triple.

This is a generalization of the study of extended generalized quadrangles in it is intimately connected with even more general study of locally strongly regular graphs. We report on our progress of the classification of the family $\mathcal{F}$.

Xiao-Dong Zhang (Shanghai Jiao Tong University)

Title: The algebraic connectivity of graphs

Abstract : Let G be a simple graph of order n and $L(G) = D(G) - A(G)$ be its Laplacian matrix, where $D(G)$ and $A(G)$ are the degree diagonal and adjacency matrices, respectively. The the second smallest eigenvalue of $L(G)$ is called the algebraic connectivity of G. In this talk, we survey some new results and progress on the algebraic connectivity. In particular, we present some relationships between the algebraic connectivity and the graph parameters, such as the clique number, the matching number, the independence number, the isoperimetric number, etc.

Katsuhiro Ota (Keio University)

Title: Clique minors, chromatic numbers for degree sequences

Abstract : For a given graph G, let $\chi(G)$ and $h(G)$ denote the chromatic number, and the maximum size of clique minors of G, respectively. The well-known Hadwiger's conjecture (1943) states that $\chi(G) \leq h(G)$ holds for every graph G, which is wide open for the graphs with $\chi(G) \geq 7$. In 2005, Robertson posed the "Hadwiger's conjecture for degree sequences." For a graphical degree sequence D, let $\chi(D)$ and $h(D)$ denote the maximum $\chi(G)$ and $h(G)$, respectively, among the graphs G having degree sequence D. Robertson's conjecture states that $\chi(D) \leq h(D)$ for any degree sequence D. This conjecture was recently confirmed by Dvořák and Mohar by showing strongly that $\chi(D) \leq h'(D)$, where $h'(D)$ is the maximum size of topological clique minors of graphs having degree sequence D. In this talk, we give an alternative and very short proof of Robertson's conjecture. Also, we shall discuss the values of $\chi(D)$, $h(D)$ and $h'(D)$ for some D. These results are based on a joint work with Guantao Chen and Ryo Hazama.

Yota Otachi (JAIST)

Title : The path-distance-width of hypercubes

Abstract : The path-distance-width of a connected graph G is the minimum integer w satisfying that there is a nonempty subset of $S \subseteq V(G)$ such that the number of the vertices with distance i from S is at most w for any nonnegative integer i. We present a general lower bound on the path-distance-width of graph, and determine the path-distance-width of hypercubes by using the lower bound. We also discuss the applicability of the lower bound to other graphs.