Symmetries of Discrete Objects

Rotorua, New Zealand, 10-14 February 2020

Abstracts

Abstracts for SODO–2020 (Rotorua, 9–14 February 2020)

Keynote Lectures

Anneleen De Schepper (University of Ghent, Belgium)
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Moufang meets Severi

Abstract: I will consider a class of projective planes defined over composition algebras A (over an arbitrary field k). If A is division, this yields Moufang projective planes; if not, their Veronese representations are the four Severi varieties over k. What connects these two types of planes, and makes them rather special, is that their Veronese representations can be characterised neatly, by means of three combinatorial axioms, among a huge family of potentially similar objects. Those objects consist of points in a projective space over k, equipped with a family of non-degenerate quadrics, each member of which spans a $(d+1)$-space, where d is an arbitrary but fixed finite number. I will give a description of these Veronese varieties and the groups acting on them, connect them with the Freudenthal-Tits magic square, give a brief historic overview of the characterisation results and, if time permits, explain why non-degeneracy is a necessary condition.

This is joint work with Jeroen Schillewaert and Hendrik Van Maldeghem.

Dimitri Leemans (Université Libre de Bruxelles, Belgium)
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String C-group representations of finite groups

Abstract: We will give a survey of the latest developments in the study of string C-group representations of finite groups. These representations are in one-to-one correspondence with abstract regular polytopes, and they also give nice independent generating sets for the groups they generate.

Joy Morris (University of Lethbridge, Alberta, Canada)
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Regular representations of groups

Abstract: A natural way to understand groups visually is by examining objects on which the group has a natural permutation action. In fact, this is often the way we first show groups to undergraduate students: introducing the cyclic and dihedral groups as the groups of symmetries of polygons, logos, or designs. For example, the dihedral group D_8 of order 8

is the group of symmetries of a square. However, there are some challenges with this particular example of visualisation, as many people struggle to understand how reflections and rotations interact as symmetries of a square.

Every group G admits a natural permutation action on the set of elements of G (in fact, two): acting by right- (or left-) multiplication. (The action by right-multiplication is given by $\{\tau_g : g \in G\}$, where $\tau_g(h) = hg$ for every $h \in G$.) This action is called the *right- (or left-) regular representation* of G. It is straightforward to observe that this action is regular (that is, for any two elements of the underlying set, there is precisely one group element that maps one to the other). If it is possible to find an object that can be labelled with the elements of G in such a way that the symmetries of the object are precisely the right-regular representation of G, then we call this object a *regular representation* of G.

A Cayley (di)graph $\mathrm{Cay}(G, S)$ on the group G (with connection set $S \subset G$) is defined to have the set G as its vertices, with an arc from g to sg for every $s \in S$. It is straightforward to see that the right-regular representation of G is a subset of the automorphism group of this (di)graph. However, it is often not at all obvious whether or not $\mathrm{Cay}(G, S)$ admits additional automorphisms. For example, $\mathrm{Cay}(\mathbb{Z}_4, \{1, 3\})$ is a square, and therefore has D_8 rather than $\mathbb{Z}_4$ as its full automorphism group, so is not a regular representation of $\mathbb{Z}_4$. Nonetheless, since a regular representation that is a (di)graph must always be a Cayley (di)graph, we study these to determine when regular representations of groups are possible.

I will present results about which groups admit graphs, digraphs, and oriented graphs as regular representations, and how common it is for an arbitrary Cayley digraph to be a regular representation.

Primož Potočnik (University of Ljubljana, Slovenia)
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Fixity of vertex-transitive graphs

Abstract: Given a connected finite graph Γ on n vertices, one can ask what is the maximum number of vertices that a nontrivial automorphism of Γ can fix. This parameter will be called the *fixity* of the graph Γ. The notion of *fixity* (or rather its "opposite" notion, the minimum number of points moved by an element of the group, called called *minimal degree*) has been studied extensively in the context of permutation groups. For example, a classical result of Jordan states that the symmetric group S_n is the only primitive permutation groups of degree n and fixity $n - 2$. On the other hand, not much is known about the graph theoretical version of the problem.

Clearly the fixity of Γ is maximal possible (that is, $n-2$) if and only if there exists two vertices that, after removing an edge between them if they are adjacent, have the same neighbourhood, and it is minimum possible (that is, 0), if the automorphism group acts semiregularly on the vertices. However, I will focus on the question what can be said about connected vertex-transitive graphs of small valence (3 and 4, in particular) whose fixity is

large. In particular, I will present a solution of a problem that was raised a few years ago, asking for the classification of connected cubic vertex-transitive graphs with fixity larger than 1/3. This solution is a result of joint work with Pablo Spiga.

Jozef Širáň (Slovak University of Technology, Slovakia, and Open University, UK)
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Avoiding the Gorenstein-Walter theorem in the classification of regular maps of negative prime Euler characteristic

Abstract: In 2005, Breda, Nedela and the presenter published a classification of regular maps on surfaces of negative prime Euler characteristic, the first result of this kind for an infinite family of surfaces. A substantial part of the argument, however, depended on a highly non-trivial theorem by Gorenstein and Walter (1965) on factoring out the maximal odd-order normal subgroup of a group with dihedral Sylow 2-subgroups. In this talk (reporting results of a joint work with Marston Conder) we will outline ways to avoid the Gorenstein-Walter result in the above classification. The new methods may also be useful to bypass the Gorenstein-Walter theorem in subsequent classifications of regular maps on surfaces of Euler characteristic $-2p$, $-3p$, $-p^2$ for any prime p, as well as in future classification projects of a similar nature.

(The presenter acknowledges support by the APVV Research Grants 15-0220 and 17-0428.)

Contributed talks

Adrián Bacelo (Universidad Rey Juan Carlos, Spain)

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The symmetric crosscap spectrum of abelian groups

Abstract: The non-orientable non-bordered Klein surfaces, also named non-orientable Riemann surfaces, are compact, non-bordered, non-orientable surfaces endowed with a dianalytic structure. Every finite group G acts as an automorphism group of some of these surfaces. The minimal topological genus of them is called the *symmetric crosscap number* of G. In recent years, a great improvement in this parameter has been made, although it is the least well known of some similar parameters. In this oral communication we will talk about the symmetric crosscap spectrum of abelian groups, that is, we study which natural numbers are the symmetric crosscap number of some abelian group. We will give some interesting results and fill some gaps in the symmetric crosscap spectrum.

Ramon Barral Lijo (Ritsumeikan University, Japan, and University of Santiago de Compostela, Spain)

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Colorings and symmetries in limit graphs

Abstract: Albertson and Collins introduced the notion of *distinguishing number* for a graph G: this is the least number of colors needed to produce a vertex-coloring ϕ such that the only a utomorphism of the colored graph (G, ϕ) is the identity. On the other hand, the Gromov space of pointed, colored, connected graphs of finite vertex degrees provides us with the notion of *limit colored graph* – that is, (X, ϕ) is a limit of (Y, ψ) if for every finite pattern in (X, ϕ) we can find a pointed-isomorphic copy inside (Y, ψ). The author and Álvarez López have introduced the notion of *limit distinguishing number*: the least number of colors needed to produce a coloring such that every limit colored graph has trivial automorphism group. In this talk we will present the motivation for this problem, an intuitive idea of the proof, and an application to foliation theory.

This is joint work with Jesus Antonio Alvarez Lopez.

Marston Conder (University of Auckland, New Zealand)
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Bi-Cayley graphs

Abstract: Cayley graphs form an important class of vertex-transitive graphs, which have been the object of study for many decades. These graphs admit a group of automorphisms that acts regularly on vertices. On the other hand, there are many important vertex-, edge- or arc-transitive graphs that are not Cayley graphs, such as the Petersen graph, the Gray graph, and the Hoffman-Singleton graph.

In this talk, I will describe some recent developments in the theory of *bi-Cayley graphs*, which are graphs that admit a group H of automorphisms acting semi-regularly on the vertices, with two orbits (of the same length). We focus mainly on the case where the group H is normal in the full automorphism group of the graph, and have produced infinite families of examples in each of three sub-classes of bi-Cayley graphs, namely those that are arc-transitive, half-arc-transitive, and semisymmetric, respectively. In doing this, we found the answer to a number of open questions about these and related classes of graphs, posed by Li (in *Proc. American Math. Soc.* 133 (2005)), Marušič and Potočnik (in *European J. Combinatorics* 22 (2001)) and Marušič and Šparl (in *J. Algebraic Combinatorics* 28 (2008)). Also we found and corrected an error in a recent paper by Li, Song and Wang (in *J. Combinatorial Theory, Series A* 120 (2013)).

This is joint work with Yan-Quan Feng, Mi-Mi Zhang and Jin-Xin Zhou (Beijing).

Ted Dobson (University of Primorska, Slovenia)
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On automorphisms of Haar graphs

Abstract: Let G be a group and $S \subseteq G$. A Haar graph of G with connection set S has vertex set $\mathbb{Z}_2 \times G$ and edge set $\{\,(0,g)\,(1,gs) : g \in G \text{ and } s \in S\,\}$. Haar graphs are then natural bipartite analogues of Cayley digraphs. We report on progress to generalize an earlier result characterizing the automorphism groups of Haar graphs of abelian groups to Haar graphs of any group. We mainly discuss the case for Haar graphs of any group G corresponding to the case of Haar graphs of abelian groups where the graph is connected and can be written as a nontrivial wreath product. It turns out that for general Haar graphs the corresponding operation is not the wreath product, but a generalization of the wreath product called an X-join of a family of graphs. We refine a result of Hemminger which gives necessary and sufficient conditions for the automorphism group of the X-join to the "complete set of natural automorphisms", in the special case when X is bipartite and the family of graphs are all empty graphs. This allows us to finish this case, which should allow us to finish the characterization. All of these results hold in the more general setting of bi-coset graphs.

This is joint work with Rachel Barber of Mississippi State University.

Olivia Jeans (Open University, UK)
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Symmetric maps with two edge orbits

Abstract: We consider a class of maps whose automorphism group H acts transitively on corners with two edge orbits. We study the possible structure of the group H on surfaces of negative prime Euler characteristic.

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Structural properties of Toeplitz graphs

Abstract: Title : Structural properties of Toeplitz graphs

Abstract : An $n \times n$ matrix $T = (t_{ij})_{1 \leq i,j \leq n}$ is called a *Toeplitz matrix* if $t_{i,j} = t_{i+1,j+1}$ for each $\{i,j\} \subset [n-1]$ where $[m]$ denotes the set $\{1, 2, \ldots, m\}$ for a positive integer m. Toeplitz matrices are precisely those matrices that are constant along all diagonals parallel to the main diagonal, and thus a Toeplitz matrix is determined by its first row and column. A simple graph is called a *Toeplitz graph* if its adjacency matrix is a $(0, 1)$-symmetric Toeplitz matrix. In this talk, we study structural properties of Toeplitz graphs. We characterize K_q-free Toeplitz graphs for an integer $q \geq 3$, and give equivalent conditions for a Toeplitz graph $G_n\langle t_1, t_2, \ldots, t_k\rangle$ with $t_1 < \cdots < t_k$ and $n > t_{k-1} + t_k$ being chordal, and equivalent conditions for a Toeplitz graph $G_n\langle t_1, t_2\rangle$ being perfect. Then we compute the edge clique cover number and vertex clique cover number of a chordal Toeplitz graph.

Rafał Kalinowski (AGH University, Krakow, Poland)
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On asymmetric colourings of claw-free graphs

Abstract: A vertex colouring of a graph is called *asymmetric* if the only automorphism which preserves it is the identity. The minimum number of colours needed for an asymmetric colouring of a graph G is called its *distinguishing number* $D(G)$. It has been observed that, roughly, large motion $m(G)$ causes small distinguishing number $D(G)$. In 2018, László Babai posed the question whether there exists a function $f(d)$ such that every connected, countable graph G with maximum degree $\Delta(G) \leq d$ and motion $m(G) > f(d)$ satisfies $D(G) = 2$, with at most finitely many exceptions for every degree d. This question has been already answered in some special cases by several authors. We prove the following result: if G is a connected, countable graph of maximum degree at most 4, without an induced claw $K_{1,3}$, then $D(G) = 2$ whenever $m(G) > 2$, with three exceptional small graphs.

This answers the question of Babai for $d = 4$ in the class of claw-free graphs.

This is joint work with Wilfried Imrich, Monika Pilśniak and Mariusz Woźniak.

Ruth Kellerhals (University of Fribourg, Switzerland)
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Regular simplices and higher dimensional modular groups

Abstract: Higher dimensional analogues of the classical modular group PSL(2,$\mathbb{Z}$) are closely related to hyperbolic reflection groups and Coxeter polyhedra with big symmetry groups. In this context, I present a theory and dissection properties of ideal hyperbolic k-rectified regular polyhedra. As an application, the covolumes of the quaternionic modular groups can be identified with certain explicit rational multiples of Riemann's $\zeta(3)$.

Martin Knor (Slovak University of Technology, Bratislava, Slovakia)
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On a graph invariant based on distances and symmetries

Abstract: A topological index is a graph invariant which is correlated with some chemical properties of the corresponding molecule. The Wiener index of a graph G is given by $W(G) = \sum_{u,v \in V(G)} \mathrm{dist}(u, v)$, while the Graovac-Pisanski index is given by

$$\mathrm{GP}(G) = \frac{|V(G)|}{2|\mathrm{Aut}(G)|} \sum_{u \in V(G)} \sum_{\alpha \in \mathrm{Aut}(G)} \mathrm{dist}(u, \alpha(u)).$$

We show that $\mathrm{GP}(G) \leq W(G)$ if G is a tree, but this does not hold in general. For trees, we find all Δ such that there is a tree T with $W(T) - \mathrm{GP}(T) = \Delta$. Moreover, we find all trees (unicyclic graphs) on n vertices with the maximum value of Graovac-Pisanski index.

This is joint work with Riste Škrekovski and Aleksandra Tepeh. It was partially supported by Slovak research grants VEGA 1/0238/19, APVV-15-0220 and APVV-17-0428, and also by Slovenian research agency ARRS, program no. P1-00383, project no. L1-4292.

Young Soo Kwon (Yeungnam University, South Korea)
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Classification of skew-morphisms of dihedral groups and applications

Abstract: Recently, Kovacs and Kwon classified skew-morphisms of dihedral groups related to regular Cayley maps, namely Cayley skew-morphisms, and Hu, Wang, Yuan and Zhang classified smooth skew-morphisms of dihedral groups. We show that every skew-morphism of a dihedral group is either a Cayley skew-morphism or a smooth skew-morphism. In two

applications of this classification, we consider reflexible and nonorientable regular Cayley maps on cyclic groups.

This is joint work with Kan Hu and Istvan Kovacs.

Gee-Choon Lau (Universiti Teknologi MARA, Malaysia)
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On local anti-magic chromatic number of symmetric graphs

Abstract: An edge labeling of a connected graph $G = (V, E)$ is said to be local antimagic if it is a bijection $f : E \to \{1, \ldots, |E|\}$ such that $f^+(x) \neq f^+(y)$ or any pair of adjacent vertices x and y, where $f^+(x)$ is the induced vertex label given by $f^+(x) = \sum f(e)$, with e ranging over all the edges incident to x. The local antimagic chromatic number of G, denoted by $\chi_{la}(G)$, is the minimum number of distinct induced vertex labels over all local antimagic labelings of G. In this talk, we study the local antimagic chromatic number of some symmetric regular bipartite graphs. We show that there are infinitely many symmetric r-regular graphs with $\chi_{la} = 3$ for each $r \geq 2$. Moreover, we can transform some of these graphs to obtain infinitely many bipartite (or tripartite) graphs with $\chi_{la} = 3$.

This is joint work with Wai-Chee Shiu and Ho-Kuen Ng.

Martin Mačaj (Comenius University, Bratislava, Slovakia)
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On packings of the Hoffman Singleton graph with a non-trivial automorphism

Abstract: In 1983, A.J. Schwenk asked whether it is possible to decompose K_{10} into three copies of the Petersen graph. In an analogous way, we may ask whether there exists a decomposition of K_{50} into seven copies of the Hoffman-Singleton graph (HoSi). In 2003, J. Šiagiová and M. Meszka constructed a packing of 5 copies of HoSi in which all graphs share an automorphism group of order 25. Using exhaustive computer search based on methods of J. Šiagiová and M. Meszka, we have shown that there is no packing of 7 copies of HoSi in which all graphs share a non-trivial automorphism. We also present a complete list of largest packings of HoSi which share an automorphism group of order 7 or 25.

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Representation theory of dessins d'enfants

Abstract: We associate to a dessin d'enfant a finite-dimensional associative algebra, called a Brauer configuration algebra. This is an algebra given by a certain quiver, with relations induced by the monodromy of the dessin d'enfant. Certain properties of this algebra are encoded completely combinatorially, and therefore are good candidates for new Galois invariants, identification of which is still a major open problem in the theory of dessins d'enfants. In particular, we can show that the dimension and the center of a Brauer configuration algebra are Galois invariants. Furthermore, when a dessin is a map, the dimension of the first Hochschild cohomology space and the stable Auslander-Reiten quiver of the Brauer graph algebra are Galois invariant, and any two genus 0 Galois-conjugate dessins have derived equivalent Brauer configuration algebras. This is presentation is a result of joint work with Sibylle Schroll.

Elías Mochan (National Autonomous University of Mexico (UNAM), Mexico)
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Intersection properties for k-orbit polytopes

Abstract: We will define the flag graph of a polytope and describe how to recover the polytope from its flag graph. We will also define the symmetry type graph of a polytope with respect to a group of automorphisms and use voltage assignments to recover the flag graph from the symmetry type graph and the corresponding group. We will use this construction to characterize the groups that act on some polytope with a given symmetry type graph. This groups are characterized by certain intersection properties on some distinguished subgroups and some of their cosets.

Roman Nedela (Slovak Academy of Sciences, Slovakia)
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The Jacobian and the automorphism group of a graph

Abstract: We investigate the relationship between the group of symmetries of a finite graph X and its Jacobian, which is a finite abelian group associated with X, denoted by $\mathrm{Jac}(X)$ and known also as the sandpile group, Piccard group or critical group of X. We show that any regular group of symmetries of X embeds in the automorphism group of $\mathrm{Jac}(X)$. As a consequence, we prove that if X admits a non-abelian semiregular group of automorphisms, then $\mathrm{Jac}(X)$ cannot be cyclic. While the size of the Jacobian of X is well-understood (for example, its order is equal to the number of spanning trees of X), a combinatorial interpretation of the rank of the Jacobian of a graph is not known in general.

This is joint work with A. Mednykh and I. Estelyi.

Robert Nicolaides (University of Manchester, UK)
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Some families of abstract regular polytopes with no non-trivial regular quotients

Abstract: If G is a string C-group with respect to the generators $\{\rho_0, \ldots, \rho_{n-1}\} \subseteq G$ then we will call this set a C-string for G. We say that a C-string for G *unravels* if for every non-trivial normal subgroup $N \triangleleft G$, the quotient G/N with respect to $\{\rho_0 N, \ldots, \rho_{n-1} N\}$ is not a rank n string C-group. We will present some families of unraveled C-strings, and show that this property may sometimes serve as an interesting filter.

Soňa Pavlíková (Slovak University of Technology, Slovakia)
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Spectra and eigenspaces of graph covers

Abstract: We describe an explicit method for determining the spectrum, as well as generators of the corresponding eigenspaces, of an arbitrary cover (regular or not) of a graph.

This is a joint work with C. Dalfó, M.-A. Fiol and J. Širáň: the last author and the presenter acknowledge support by the APVV Research Grants 15-0220 and 17-0428.

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Asymmetric colourings of regular graphs

Abstract: A colouring of a graph G is called *asymmetric* if the identity is the only automorphism preserving the colouring. The *distinguishing index* of a graph G is the least number of colours in an asymmetric edge colouring of G. It was first investigated by Kalinowski and Pilśniak. In this talk, we survey results on asymmetric edge colourings offinite and infinite graphs. We give known general upper bounds in terms of maximum degree. We focus mainly on several classes of graphs which need only two or three colours to admit an asymmetric edge colouring. In particular, we prove a very recent result for regular graphs, obtained together with Lehner and Stawiski.

Jeroen Schillewaert (University of Auckland, New Zealand)
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On exceptional Lie geometries

Abstract: Parapolar spaces are point-line geometries introduced as a geometric approach to (exceptional) algebraic groups. We provide a characterization of a wide class of Lie

geometries as parapolar spaces satisfying a simple intersection property. Many of the exceptional Lie geometries occur. In fact, our approach unifies and extends several earlier characterizations of (exceptional) Lie geometries arising from spherical Tits-buildings.

[Joint work with Anneleen De Schepper, Hendrik Van Maldeghem and Magali Victoor]

Martin Škoviera (Comenius University, Bratislava, Slovakia)
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Binary snarks with rotation symmetry

Abstract: A binary snark is a cubic graph which cannot be properly 3-edge-coloured and is spanned by the balanced cubic tree T_d of depth d. Removing the root r of T_d (which is its unique central vertex) produces three copies of the complete binary tree of depth $d-1$. A binary snark G is called a rotation snark if an automorphism of T_d that cyclically permutes the three edges incident with r extends to an automorphism of the entire snark G. One of the motivations for the study of rotation snarks was the intention to obtain small snarks of girth 7 and even cyclically 7-edge-connected snarks. So far, only very few rotation snarks have been found (one of them being the Petersen graph), mostly as a result of an extensive computer search. All of them have cyclic connectivity at most 5 and order at most 46. We present a construction of infinitely many rotation snarks with cyclic connectivity 5 and prove that they are indeed not 3-edge-colourable.

This is joint work with Edita Máčajová.

Riste Škrekovski (FIŠ and University of Ljubljana, Slovenia)
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Some results on unique-maximum coloring of plane graphs

Abstract: A unique-maximum coloring of a plane graph G is a proper vertex coloring by natural numbers such that each face α of G satisfies the propety: the maximal color that appears on α, appears precisely on one vertex of α (or shortly, the maximal color on a face is unique on that face). Fabrici and Göring proved that six colors are enough for any plane graph and conjectured that four colors suffice. Thus, this conjecture is a strengthening of the Four Color Theorem. Wendland later decreased the upper bound from six to five. We first show that the conjecture holds for various subclasses of planar graphs but then we disprove it for planar graphs in general. Thus, the facial unique-maximum chromatic number of the sphere is not four but five. In the second part of the talk, we will consider various new directions and open problems.

(Joint work with Vesna Andova, Bernard Lidický, Borut Lužar and Kacy Messerschmidt)

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On a conjecture of Dembowski for finite inversive planes

Abstract: Inversive (or Möbius) planes are incidence geometries with points and blocks, normally called circles, satisfying two basic geometric axioms of joining and touching. Finite inversive planes of order n are precisely the $3-(n^2+1, n+1, 1)$ designs. All known finite inversive planes have order a prime power q, and are obtained as the geometry of non-trivial plane sections of an ovoid in 3-dimensional projective space over the Galois field $\mathrm{GF}(q)$. If the ovoid is a an elliptic quadric the inversive plane is called miquelian because these planes are configurationally characterized by the Theorem of Miquel. As usual in incidence geometry, an automorphism of an inversive plane is a permutation of the point set such that circles are mapped onto circles.

Peter Dembowski announced at the *Second Chapel Hill Conference on Combinatorial Mathematics and its Applications* at the University of North Carolina in 1970 a result by his student Olaf Prohaska that a finite inversive plane of prime power order q is miquelian if and only if its automorphism group contains a subgroup isomorphic to $\mathrm{PSL}(2, q)$ which leaves a circle invariant and acts faithfully on it. He commented that such a group can act in only one way on the plane, that the plane can be reconstructed within the group, and that this reconstruction is the same as that for the miqelian inversive plane of the same order q. Unfortunately, no proof was subsequently published, by either Prohaska nor Dembowski.

In this talk we prove Dembowski's conjecture in the case of inversive planes of even order. We further comment on the difficulties arising in the case of odd order.

Micael Toledo (IMFM and University of Primorska, Slovenia)
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Generalised voltage graphs

Abstract: Given a graph X and a group G, we may construct a covering graph $\mathrm{Cov}(X, Z)$ by means of a voltage assignment Z, which maps edges of X into elements of G. The graph $\mathrm{Cov}(X, Z)$ is called the regular cover of X arising from the voltage graph (X, Z) and admits a semiregular (fixed point free) group of automorphisms isomorphic to G. Every graph X with a semiregular group of automorphism G can be regarded as the regular cover of the quotient graph X/G with an appropriate voltage assignment. The theory of voltage graphs and their associated regular covers has become an important tool in the study of symmetries of graphs. We present a generalised theory of voltage graphs where G is allowed to be an arbitrary group (not necesarily semiregular).

Steve Wilson (University of Northern Arizona, USA)
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Colorings for BGCG constructions

Abstract: This talk will touch on edge-colorings of graphs, particularly tetravalent graphs. We can think of these colorings as equivalence relations on the set of edges, or as functions from the set of edges to some fixed color set. We are particularly interested in ones whose symmetry group is large enough to be transitive on darts (that is, directed edges) in the graph. We will show some of the variety of possibilities, motivated by their uses in BGCG constructions.

Peter Zeman (Charles University, Prague, Czech Republic)
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Testing isomorphism of circular-arc graphs in polynomial time

Abstract: A graph is said to be circular-arc if the vertices can be associated with arcs of a circle so that two vertices are adjacent if and only if the corresponding arcs overlap. It is proved that the isomorphism of circular-arc graphs can be tested by the Weisfeiler-Leman algorithm after individualization of two vertices.
