'Perspectives on Artin groups' ICMS workshop

Titles and abstracts

Matthieu Calvez: Strongly contracting elements in Garside groups. The additional length graph associated to a Garside group G is a graph whose relation to G is intended to be analogous to the curve graph's relation to the Mapping Class Group. In the case of braid groups, this graph is conjectured to be quasi-isometric to the curve graph of the punctured disk. We show that the loxodromics are the same for both actions, namely pseudo-Anosov braids. This fact appears as a consequence of the following more general theorem. The axis of every Morse element of a Garside group G (of finite type) is strongly contracting in the Cayley graph of G/ZG w.r.t. the Garside generating set.

Ruth Charney: What can we learn from Artin monoids? While infinite type Artin groups are generally very challenging, the corresponding Artin monoids are easier to understand. I will talk about some joint work with Rachael Boyd and Rose Morris-Wright on geometric relations between Artin monoids and Artin groups. The talk will focus more on questions than on answers!

María Cumplido: Garside structure on Artin groups. The first aim of this talk is to define Garside groups and see how we can use their algebraic structure to solve the word problem and the conjugacy problem. After that, we will discuss the Garside structure of some Artin groups, namely braid groups, spherical Artin groups and euclidean Artin groups.

Thomas Haettel: Helly graphs, injective metrics and Artin groups. We will focus on the relationship between Artin groups and injective metric spaces. These

are geodesic spaces where pairwise intersecting balls have a non-empty global intersection, and their graph analogues are called Helly graphs. They are a fascinating category of nonpositively curved metric spaces. We will present a simple criterion to construct such injective metric spaces from lattices, and present applications to spherical type Artin groups and Deligne complexes.

Jon McCammond: Dual braids in the complex braid arrangement complement. The braid groups have two well known Garside presentations. The elegant minimal standard presentation is closely related to the Salvetti complex, a cell complex derived from the complement of the complexification of the real braid arrangement. The dual presentation, introduced by Birman, Ko and Lee, leads to a second Garside structure and a second classifying space, but it has been less clear how the dual braid complex is related to the (quotient of the) complexified hyperplane complement, other than abstractly knowing that they are homotopy equivalent. In this talk, I will discuss recent progress on this issue. Following a suggestion by Daan Krammer, Michael Dougherty and I have been able to embed the dual braid complex into the complement of the complex braid arrangement. This leads in turn to a whole host of interesting complexes, combinatorics, and connections to other parts of the field. This is joint work with Michael Dougherty.

Damian Osajda: Helly groups. A graph is Helly if each family of pairwise intersecting (combinatorial) balls has a non-empty intersection. Groups acting geometrically on such graphs are themselves called Helly. The family of such groups is vast, it contains: Gromov hyperbolic groups, CAT(0) cubical groups, Garside groups, FC type Artin groups, and others. On the other hand being Helly implies many important algorithmic and geometric features of the group. In particular, such groups act geometrically on spaces with convex geodesic bicombing, equipping them with a kind of CAT(0)-like structure. I will present basic properties and examples of Helly groups, focusing on relations with Artin groups. The talk is based on joint work with Jérémie Chalopin, Victor Chepoi, Anthony Genevois, Hiroshi Hirai and, independently, with Jingyin Huang and, independently, with Motiejus Valiunas.

Luis Paris: Isomorphism problem for even Artin groups. This talk concerns a work in collaboration with Rubén Blasco-García. By a Coxeter diagram we mean a simplicial graph Γ endowed with a labeling of the edge set, $E(\Gamma) \to \mathbb{N}_{\geq 2}$, $e \mapsto m_e$.

Then the Artin group associated with Γ is the group $A[\Gamma]$ generated by the set S of vertices subject to the relations $\underbrace{sts\cdots}_{m_e} = \underbrace{tst\cdots}_{m_e}$ for all $e = \{s,t\} \in E(\Gamma)$. We say that Γ is even if m_e is even for all $e \in E(\Gamma)$ and we say that Γ is right-angled if $m_e = 2$ for all $e \in E(\Gamma)$. Obviously, any right-angled Coxeter diagram is even. We are going to show an invariant for even Artin groups, derived from the lower central series, which can be easily calculated and which distinguishes between them some of these groups up to isomorphism, but not all of them. For example, it distinguishes between them all right-angled Artin groups. More generally, for each integer $d \geq 2$, it distinguishes between them all the Artin groups defined by Coxeter diagrams satisfying $m_e \in \{2d^k \mid k \in \mathbb{N}\}$. On the other hand, it does not distinguish between them the Artin groups defined by Coxeter diagrams satisfying $m_e \in \{2, 6, 10, 30\}$ for all $e \in E(\Gamma)$.

Sarah Rees: Rewriting and decision problems in Artin groups. I'll survey what is known about rewrite systems and decision problems for Artin groups, and discuss evidence for the possibility of a general approach to rewriting in these groups. I'll start at work of Artin, then Garside, Deligne, Brieskorn&Saito, then move on, via Appel&Schupp, to more recent work, by myself and Derek Holt (and sometimes Laura Ciobanu), by Eddy Godelle and Patrick Dehornoy, also by Blasco, Huang&Osajda.

Nicolas Vaskou: Parabolic subgroups of large-type Artin groups. We show that the geometric realisation of the poset of strict parabolic subgroups of a large-type Artin group has a systolic geometry. We use this geometry to show that the set of parabolic subgroups of a large-type Artin group is stable under arbitrary intersections and forms a lattice for the inclusion. As one of several applications, we show that parabolic subgroups of large-type Artin groups are stable under taking roots.