TS16: Thematic Session: Conjugacy and Induced actions in groups, semigroups, and automata

Thursday 3 July, 11:00–12:28 • Room 110

Michael Kinyon (University of Denver)

Time: 11:00–11:22

The inverse monoid of partial inner automorphisms of a semigroup

A partial automorphism of an algebra is an isomorphism between subalgebras. Under composition of partial maps, the set of all partial automorphisms of an algebra generates an inverse monoid.

In groups, there is an intrinsic notion of automorphism induced by conjugacy, namely inner automorphisms. The group conjugacy relation has several different generalizations to semigroups. One of these, natural conjugacy introduced by Konieczny, turns out to induce an intrinsic notion of partial automorphism on any semigroup. We call these inner partial automorphisms.

In this talk, after a quick review of natural conjugacy, I will introduce partial inner automorphisms, show that they have particularly good properties, and then describe the resulting monoid for some examples.

This is joint work with João Araújo (U. Nova de Lisboa, NOVAMath), Wolfram Bentz (U. Aberta, NOVAMath), Janusz Konieczny (U. of Mary Washington), António Malheiro (U. Nova de Lisboa, NOVAMath), and Valentin Mercier (U. Nova de Lisboa, NOVAMath).

Ana Catarina Monteiro (NOVA University of Lisbon)

Time: 11:22–11:44

Product of Formations of Congruences on Groups

In this talk, we focus on formations of groups and formations of congruences on groups. A formation of groups is a class of groups closed under quotients and subdirect products of finite families. A formation of congruences on groups is a correspondence that assigns to each group G, a set of congruences on G satisfying certain closure properties.

Various definitions for the product of classes of groups have been proposed and studied, particularly with regard to the preservation of structural properties such as being a formation [1].

Recent developments have extended these ideas to the level of congruences and languages on groups, leading to the introduction and study of formations of congruences and formations of languages [2, 3, 4].

These developments naturally raise the question: How should we define the product of formations of congruences and languages in a way that preserves desirable algebraic properties?

In this talk, we explore this question in the context of groups and discuss potential generalizations to other algebraic structures, such as Clifford semigroups and inverse semigroups.

This is joint work with Gracinda Gomes.

References [1] K. Doerk and T. Hawkes (1992), Finite Soluble Groups, Walter de Gruyter. [2] G. Gomes and A.-C. Monteiro (2024), "Formations and i-Fitting classes of inverse semigroups, congruences and languages", Semigroup Forum 109, 87–115. [3] M. Ballester-Bolinches, J.-E. Pin, and X. Soler-Escrivà (2015), "Languages associated with saturated formations of groups," Forum Mathematicum, 27(3):1471–1505. [4] A. Ballester-Bolinches, E. Cosme Llópez, R. Esteban-Romero, and J. Rutten (2015), "Formations of monoids, congruences, and formal languages," Scientific Annals of Computer Science, 25:171–209.

Jacques Sakarovitch (LTCI, Télécom Paris, Institut Polytechnique de Paris)

Time: 11:44–12:06

The computational aspect of equivalence of weighted automata

The theoretical framework for the decidability of equivalence of finite automata with weights in a semiring K is based on the notion of conjugacy of weighted automata, a concept borrowed to symbolic dynamics. Two conjugate automata are obviously equivalent, but the remarkable fact is that the converse almost holds: two equivalent automata are conjugate to a third one in all known cases where the equivalence is decidable. The decision algorithm for the equivalence of the automata A and B amounts indeed to the computation of that third automaton C that is conjugate to A and B. We'll briefly sketch the general structure of the algorithm and the distinctive features in the cases where the weight semiring is a division

ring, a principal ideal domain, a commutative ring, and a bounded distributive lattice. Joint work with Marie-Pierre Béal and Sylvain Lombardy.

André Carvalho (University of Porto)

Time: 12:06–12:28

Geodesic languages for rational subsets and conjugates in virtually free groups

In this talk, we will consider rational subsets of virtually free groups and languages of geodesics related to the subset and its set of conjugates. We will sketch the ideas that show that the language of geodesic words representing an element in a rational subset of a virtually free group is regular and that the language of geodesic words representing a conjugate to an element in the subset is context-free. We will also discuss generalizations to the hyperbolic setting. This is joint work with Pedro V. Silva (University of Porto)
