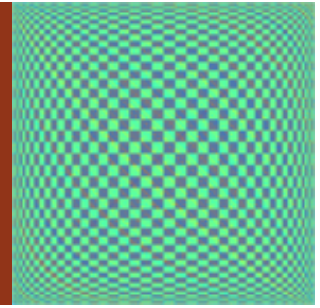




Centro de Matemática
Universidade do Porto



Seminar on Semigroups, Automata and Languages

From A to B

Marcel Jackson

La Trobe University, Melbourne Australia

Abstract: The five-element semigroups A_2 and B_2 are amongst the most well-known critical examples in finite semigroup theory. Their six element monoid counterparts A_2^1 and B_2^1 are similarly ubiquitous, with B_2^1 sometimes known in the universal algebraic community as Perkin's Semigroup. The semigroup variety $\mathbb{V}(B_2)$ generated by B_2 is defined within $\mathbb{V}(A_2)$ by the law $xyyy = yyxx$ and since $\mathbb{V}(B_2^1)$ also satisfies $xyyy$, it is a natural question as to whether $xyyy = yyxx$ defines $\mathbb{V}(B_2^1)$ within $\mathbb{V}(A_2^1)$ as well. We present an encoding of hypergraph homomorphism problems into semigroups built around B_2 to show that there is a continuum of counterexamples to this conjecture, which moreover shows that $\mathbb{V}(B_2^1)$ is not finitely axiomatized within the intersection of $\mathbb{V}(A_2^1)$ with the variety $[[xyyy = yyxx]]$. With significant care, the proof remains true even in the monoid signature.

This represents the first part of a longer alphabetical journey “From A to B to Z ” that is joint work with Wenting Zhang (Lanzhou University). In the latter stage of the journey, the Z represents the Zimin words, whose syntactic monoid lies continuum many subvarieties below $\mathbb{V}(B_2^1)$.

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