

# TWO EXAMPLES OF GEOMETRIC METHODS IN INVERSE SEMIGROUP THEORY

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In the talk, we show how two techniques of geometric group theory can be modified to work for inverse semigroups and inverse monoids. By the results of Stephen, to solve the word problem of an inverse monoid  $M = \text{Inv}\langle X \mid R \rangle$ , one only needs to understand strongly connected components of its Cayley graph called Schützenberger graphs. An inverse monoid is called  $\delta$ -*polyhyperbolic* if all geodesic polygons of its Schützenberger graphs are  $\delta$ -thin. We show that finitely presented  $\delta$ -*polyhyperbolic* inverse monoids have a rational set of geodesics.

Secondly, we study the membership problem for so-called closed inverse submonoids of  $M$  — these are precisely the inverse submonoids which arise as stabilizers. The membership problem of a closed inverse submonoid  $S$  of  $M$  is solvable if bounded subgraphs of its  $\omega$ -coset graph  $\Gamma_S$  are constructable. We show that  $\Gamma_S$  can be obtained from the bouquet of generators by successively applying expansions and foldings, which generalizes the Todd–Coxeter process.

The work presented is joint with John Meakin and Pedro V. Silva.