

Modern Developments in Algebraic Dynamics: Challenges and Opportunities

20 – 24 August 2018 @Snellius

The workshop brought together leading researchers in the broad field of algebraic dynamics. This is an active research field with both internal and external problems of interest. Internally, there are active problems concerning structure and classification: examples including the so-called Pisot conjecture, attempting to relate arithmetic properties of parameters associated with dynamical systems related to tilings and symbolic substitutions to their dynamical properties), and the many problems involved in extending a highly developed theory of systems generated by commuting automorphisms to algebraic actions of more general groups. Externally, there is a long history of striking applications of results in algebraic dynamics to number theory, with important examples including the Littlewood Conjecture. More broadly still, the methods of algebraic and symbolic dynamics have found applications in other parts of science, and one of the talks presented described how symbolic models could be used to model viral growth in the body.

The presentations, brainstorm sessions, and informal breakouts facilitated many conversations and progress in several areas. Examples include:

- Arzhakova presented results on renormalization of principal actions and showed interesting properties of ‘decimated’ polynomials
- Dimitrov presented novel striking results on Diophantine issues related to the growth in periodic orbits of algebraic dynamical systems.
- All the participants were able to learn the state of the art in abelian measure rigidity from Lindenstrauss and Einsiedler.
- Links between symbolic systems and spectral theory were discussed by Baake and others.
- Deninger and others explained an arithmetic geometry perspective on algebraic dynamical systems, giving new points of view to existing problems and structures.

It is early to form views on the beginnings of scientific breakthroughs resulting from these interactions, but the seeds to several possible connections have been sown. Among new ideas or surprises, the link between symbolic dynamics and viral modelling, the arithmetic-geometric viewpoint on algebraic dynamics, and the rich links between tiling systems and spectral theory stand out.

The format of the workshop worked well. The brainstorm format perhaps worked less well than the informal breakouts, in part because of the extreme specialization of mathematical research. Involving current doctoral students directly as speakers seemed to be particularly successful – these talks were excellent and both speakers received positive feedback and some new ideas as a result, as well as the other participants learning about very novel results.

The friendly and self-contained nature of the Lorentz Centre worked very well for the group of participants, and the organisational aspects of the workshop were exemplary. All the organisers would want to thank the staff of the Lorentz Centre for this.

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