

Hamiltonian and Reeb dynamics: new methods and applications

17-21 July 2017 Lorentz Center@ Oort

Symplectic and contact topology has been very successfully applied to central questions in dynamical systems, and conversely the problems from dynamics greatly influenced the development of these fields. Our plan for this workshop was to focus on some high potential, exciting new applications of symplectic and contact geometry to dynamics.

We look back to a very exciting and fruitful week. All the themes we were planning to focus on were addressed during the workshop.

On the subject of Reeb dynamics, an interesting application of embedded contact homology was discussed by Cristofaro-Gardiner: he reported on very recent results (joint work with Hutchings), extending work of Hutchings and Taubes, on the number of distinct periodic Reeb orbits on closed contact manifolds. A very concrete outcome we would like to mention is the preprint by Gutt and Hutchings (arXiv:1707.06514), which was completed during the workshop. Also Ginzburg and Gurel completed a major step in their work on pseudo-rotations of projective spaces.

On the theme of C^0 -topology and barcodes, Seyfaddini explained to us how one can apply the theory of barcodes (and in particular the notion of Bottleneck distance) to study the group of Hamiltonian homeomorphisms (via Floer homology). This is a promising new direction bringing together several areas of mathematics and there is no doubt that this link between Floer theory and persistent homology can be further developed to generate new results. Also, in a similar spirit, Fabert (VU) gave a very interesting talk focusing on intriguing new connections between Hamiltonian PDEs, symplectic topology and model theory.

We believe that the short presentations by the Ph.D. students were a very successful part of the workshop: the talks by Alboresi (UU) on holomorphic curves in log-symplectic manifolds and Bakker (VU) on Hamiltonian dynamics of non-local equations were of very high level and demonstrated that symplectic geometry has the potential to connect to the research of several groups within the Dutch mathematical community.

Last but not least, we feel that a special mention is deserved by Polterovich's contribution: his work, which provides a link between symplectic displacement energy (a fundamental notion in symplectic topology) and the quantum speed energy (a bound on the maximal number of distinct states a physical system can pass through in given time), is absolutely groundbreaking and opens up new possibilities of interaction between symplectic topology and the fundamentals of quantum computation.

The workshop lasted 5 days, with every day 3 or 4 talks of 45 minutes. Thanks to the limited number of talks and their length (45 minutes), the workshop program left ample time for discussion. Tuesday afternoon was reserved for short presentations (20 minutes) by PhD students: these were attended by all participants with great interest. The talks were organized each day around a theme: this worked very well and created discussions that would often continue throughout the whole day!

The Lorentz Center provided excellent facilities and support. Lunch on Friday in the common room was very much appreciated by the participants, as it gave everyone the opportunity of a last discussion and of saying farewell to everybody. It was an excellent way of closing the workshop.

Hansjörg Geiges (Universität zu Köln)

Viktor Ginzburg (UC Santa Cruz)

Federica Pasquotto (VU University Amsterdam)