New connections between dynamical systems and PDE's

organized by
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Workshop Summary

Our goal in organizing this meeting was to bring together researchers from both, dynamical systems and PDE, as well as the related areas of geometry and probability, to discuss the central issues of Aubry - Mather theory and its PDE and probabilistic analogs, the Hamiltonian structure of certain PDEs and Arnold diffusion. Our primary aims were to:

61607; make researchers aware of progress on common problems from different directions, 61607; explore whether methods from one field could shed light on the other, 61607; encourage collaborations, and 61607; identify major open questions

To establish a common playing field, we began the meeting with two days of tutorial and survey talks. The following three days consisted of more specialized talks on the main topics.

Thus the first day (Sunday, July 6) began with a tutorial lecture by Lawrence Evans on viscosity solutions, followed by Vadim Kaloshin on Mather sets. After lunch, Albert Fahti gave a talk on the connections between these notions. A discussion followed in which the dynamical systems and PDE people were able to pose questions to one another.

Monday's sessions consisted of survey talks on Arnold diffusion (Zhihong Xia), Aubry-Mather theory (Victor Bangert), and KAM theory (Walter Craig). We scheduled as well a shorter talk by Konstantin Khanin.

The morning of Tuesday was devoted to talks on recent progress on Arnold diffusion by John Mather, Patrick Bernard, and Luca Biasco. The afternoon consisted of talks on PDE analogues of Aubry Mather theory by Paul Rabinowitz and Enrico Valdinoci. A discussion session in which many open problems were formulated followed.

On Wednesday, the morning session comprised talks on stochastic analogs by Panagiotis Souganidis, Elena Kosygina, and Nalini Anantharaman. In the afternoon session, Franz Auer spoke on geometrical questions related to Bangert's survey and Massimiliano Berti spoke on small amplitude periodic solutions of nonlinear wave equations and related topics.

On Thursday, the final day of the meeting, Gonzalo Contreras, Diogo Gomes, and Renato Iturriaga gave lectures on recent work concerning viscosity solutions and Mather sets.

We felt that overall our program was successful. First of all, the mathematicians in dynamical systems and in PDEs were able to meet each other socially and professionally: this will make future contacts much easier. More importantly, we made some good progress in teaching each other our respective languages and viewpoints.

It is indeed obvious that there is a substantial overlap of mathematical concerns between our subjects, although much more needs to be done to draw out further these connections. In retrospect, we should probably have scheduled even more, and longer, tutorial

lectures. It is clearer now, for example, that A. Fathi is particularly well placed to communicate between the fields: we should have encouraged him to give some more talks.

The feedback we got from various participants indicated that the meeting went well and that the members of the two main groups at least got some idea of what the others could do. We hope future interactions will result.

Sergey Bolotin worked very hard both during and after the meeting, to assemble an excellent list of open questions.