

Математички институт САНУ
Кнеза Михаила 36
11001 Београд, п.п. 367
Србија



Тел. +381-11-2630170
office@mi.sanu.ac.rs

Matematički institut SANU
Kneza Mihaila 36
11001 Beograd, p.p. 367
Serbia

Fax: +381-11-2186105
office@mi.sanu.ac.rs

Scientific Report (grant no. 7373)

Rade Živaljević

Mathematical Institute SASA, Belgrade

1. Purpose of the visit

ESF network “Applied and Computational Algebraic Topology” (ACAT) had a final meeting (conference) <http://ist.ac.at/acat/> at the Institute of Science and Technology in Vienna (IST-Austria). The grant 7373 was used for the following activities:

- (a) Lecture and participation in ACAT Final Project Meeting (conference), July 6-10, 2015
IST Austria, Klosterneuburg, Austria.
- (b) Research contact with Herbert Edelsbrunner (the leader of the ‘Algorithms, Geometry and Topology’ group) and Uli Wagner (the leader of ‘Discrete and Computational Geometry and Topology’ group).
- (c) Participation in the meeting of ACAT project steering committee.

2. Description of the work carried out during the visit

- (a) I had a privilege and honor to be the second speaker on the first day of the conference (after Janos Pach). In a 40 minutes lecture with the title,

“Tverberg theorem and its relatives – recent developments”

http://ist.ac.at/fileadmin/user_upload/events_pages/acat/ACAT2015_Program.pdf

I covered some of the exciting recent developments in topological combinatorics related to the advances of Uli Wagner and Issac Mabillard on one side and Florian Frick on the other (based on the previous work with Pavle Blagojevic and Guenter Ziegler). This was opportunity to present the latest work of the Belgrade ACAT-team (Dusko Jojic, Sinisa Vrecica, Rade Zivaljevic), in particular the analysis of new complexes of ‘chessboard type’ which had as a consequence our affirmative answer to a conjecture of Blagojevic, Frick, and Ziegler. My lecture was based on two preprints in the arXiv.org (*Multiple chessboard complexes and the colored Tverberg problem*, arXiv:1412.0386v2 [math.CO], and *Symmetric multiple chessboard complexes and a new theorem of Tverberg type*, arXiv:1502.05290v2 [math.CO]), as well as on some ongoing work.

The conference itself was very interesting, covering many aspects of applied and computational topology, with some emphasis on topological data analysis, stochastic topology, and topology of concurrency and distributed computing.

- (b) The conference was very intensive, however there was still time left for intensive exchange of ideas in smaller groups. My long term research contact with Herbert Edelsbrunner (started more than 20 years ago) is planned to continue and we agreed to plan his visit of Belgrade in near future. Prof. Edelsbrunner has been for years a principal figure in disseminating ACAT ideas and a leader of several projects so the research contact with him was one of the principal goals of the visit.

I had a very intensive (on two occasions for several hours) meetings with Uli Wagner and his PhD degree student Issac Mabillard. These meetings had the form of a small seminar where we informed each other about both the central ideas and the technical details in our most recent work related to Tverberg theorem. Aside from the pure scientific content, these meetings provided an opportunity to discuss future plans, especially participation in the forthcoming trimester “Topology in Motion” at Brown University (ICERM, Institute for Computational and Experimental Research in Mathematics). <https://icerm.brown.edu/programs/sp-f16/>

Both Uli Wagner and Issac Mabillard are invited by the “Topology in Motion” program committee to participate in this project and I had opportunity (as a member of the organizing committee) to provide some information about the project and its participants.

Aside from this there were other very interesting contacts initiating possible future research projects. A particularly interesting were discussions with Tamal Day (Ohio State Univ.) and Iskander Taimanov (Novosibirsk) about possibilities of defining the intersection product for the persistence homology.

- (c) The third aspect of the visit was participation in the work of the ACAT project steering committee. The ACAT network has 13 members (12 in Europe and 1 in Israel) and each node has a representative in the committee. (The chair of the committee is Prof. Martin Raussen from Aalborg University.) Since the ACAT project is now at its conclusion, one of the ideas of the final committee meeting was to discuss future plans and ideas for continuation of joint projects. Since the Belgrade team has been already recognized as an unofficial ACAT network node, the idea of my participation in the committee meeting was to play even more active role in ACAT networking. Among other things I had opportunity to inform about the preparation of the special program “Topology in Motion” at ICERM as well as our proposed bilateral projects with Ljubljana (Slovenia). One of the conclusions of the meeting was that ACAT network should be preserved and continued in every form available, as a basis for future collaboration and for organization of future ACAT-related events.

3. Description of the main results obtained

Considering the nature of the visit (a short conference) the main achievement of the visit included a strong exchange of insight, information, and ideas about some of the most recent developments in the area, including the recent breakthrough related to Tverberg’s theorem and

its relatives. Equally important (in the long run) is the participation in planning of future ACAT related activities (bilateral projects, networking etc.).

4. Future collaboration with host institution (if applicable)

Institute of Science and Technology (IST - Austria) is envisaged as one of the leading European scientific institutions. The proximity of this center (relative to Belgrade) and especially the presence of two powerful scientific groups (Edelsbrunner and Wagner teams) in the area of ACAT make IST our natural first choice for future long term collaboration. This is of highest importance for Mathematical Institute SASA in Belgrade as a yet another step in the direction of integrating of Serbian scientists into European research area. I have a strong feeling that my visit was very useful for our future collaboration.

5. Projected publications / articles resulting or to result from the grant (ESF must be acknowledged in publications resulting from the grantee's work in relation with the grant);

The paper "Tverberg unavoidable and r -unavoidable complexes", which is under preparation, was discussed with Uli Wagner and Isaac Mabillard during the course of the conference. The preprint will be soon posted in the arXiv and the support of the ESF grant 7373 will be acknowledged.

6. Other comments

This was my first opportunity to use ESF personal grant. It is kindly appreciated since it enabled me to continue my research on a high level and to contribute in other ways to the collaboration of scientists in the area of ACAT.