

Prof. Dr. Andrea Scharnhorst

Chair of the Action

COST Action TD1210 KNOWeSCAPE

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SUBJECT: MSc. Miroslav Andjelkovic's report about Short Term Scientific Mission at Jozef Stefan Institute in Ljubljana

From 21.03.2014. to 02.04.2014. I was working at Jozef Stefan Institute, Department of theoretical physics, under supervision Prof. Dr. Bosiljka Tadic.

During the time I spent here

- I have studied topological layers on prototype networks we obtained from simulations of online chats using the agent-based models developed in previous work of Prof. Dr. Tadic.
- In consultation with Prof. Dr. Tadic, I have developed new methods for better description of every vertex from network giving them new dimensions. Most significance measure we joined to vertex is environmental vector which represent number of simplices that are built by vertex by all dimensions. There are several more global measures for network. We manage to do that by using mathematical concept of simplicial complexes and the related methodology for studying topology of networks.
- Using new dimensions that describe every vertex in networks, we found the way to separate networks to communities and study in depth their topologic structures. That network was part of Myspace network full with communities in it. Study of communities gave us so called topological layers by dimension of simplicial complexes they built. From that study we could recognize most significance vertices of each community, and by that of whole network as multiplex.
- We applied same study, by using clique complexes and neighborhood complexes we separated layers by its polarization of emotional messages that was spread from bot in chat networks and study them separately and their coexistence on each other as whole network. Same methodology we used to study communities, we used on this type of network to study its core which contains bot and moderators which are more active than regular users.

This whole study will continue after my return to Vinca Institute as mutual collaboration of our two groups.

- As we obtained new tool for this studies, we will try to assemble three structure vectors with other global components we got.
- Using different topological approach as combinatorial Laplacian of the simplicial complex we will study vertices that corresponding on different topological layers separately and its multiplexity. We will attempt to manage new topological measures based on properties of various topological quantities and the combinatorial Laplacian on separated layers by polarized emotion messages.

I have to thank to my supervisor Prof. Dr. Bosiljka Tadic who was involved in my research actively as supervisor and professor and gave me excellent knowledge and guidelines about whole study. Also, I have to thank Department of theoretical physics for being such a wonderful host, where I spent wonderful time. I am sure that we will continue this research on our mutual pleasure. This whole scientific mission was wonderful opener for my Phd studies and gave me positive afflatus for continue.

In Ljubljana,

02.04.2014.

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