

Report on the outcomes of a Short-Term Scientific Mission¹

Action number: CA18232

Grantee name: Aladin Crnkic

Details of the STSM

Title: Statistical examination of networks through identification of collective behaviour in complex systems

Start and end date: 03/07/2022 to 10/07/2022

Description of the work carried out during the STSM

Description of the activities carried out during the STSM. Any deviations from the initial working plan shall also be described in this section.

(max. 500 words)

The purpose of this STSM was the scientific collaboration with prof. Vladimir Jaćimović and several other scientists from the University of Montenegro. This STSM was devoted to applications of the classical Kuramoto model of coupled oscillators in a statistical characterization of various complex systems. We have characterized complex networks by detecting the collective behavior of oscillators in them, which was observed through the statistics of Möbius transformations (Mirolo-Marvel-Strogatz principle). During this visit, we introduced new statistical measures on coupled oscillator networks that quantify the extent to which the network deviates from the Mirolo-Marvel-Strogatz principle. Using these new concepts, we have got some important information about the topological and structural properties of complex networks and their subnetworks. Our approach was verified with a broad class of networks including those with repulsive, time-dependent, noisy, time-delayed, and mixed interactions.

Description of the STSM main achievements and planned follow-up activities

Description and assessment of whether the STSM achieved its planned goals and expected outcomes, including specific contribution to Action objective and deliverables, or publications resulting from the STSM. Agreed plans for future follow-up collaborations shall also be described in this section.

(max. 500 words)

1. We have established the new characterization of complex network topologies and structures.

¹ This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

2. We have proposed new methods for the identification of vital nodes or important subgroups and the classification of network topologies.
3. We have started developing a general approach for this set of problems.

We plan to continue this collaboration and write one paper that will consist of many numerical results that have been obtained during and after this STSM. We hope to submit this paper in several months.

The support of the COST Action will be clearly acknowledged in the paper.