

Report on the outcomes of a Short-Term Scientific Mission¹

Action number: CA22145

Grantee name: Miloš Stojaković

Details of the STSM

Title: **Client-Waiter games on graphs**

Start and end date: **03/03/2024 to 09/03/2024**

Description of the work carried out during the STSM

The goal of the STSM was for the grantee to visit the Discrete Mathematics Department at Faculty of Mathematics and Computer Sciences in Poznan, Poland, for a week, and engage in a scientific collaboration with Małgorzata Bednarska-Bzdęga, an experienced researcher in the field of Positional Games with more than 25 years of experience. We attacked several exciting open problems dealing with positional games on edge sets of graphs. The discussions attracted another two scholars based in the same institution – Sylwia Antoniuk, who has a previous experience working in positional games, and Tomasz Łuczak, one of the pioneers of the field and author of many seminal papers in the area of positional games.

Our primary focus was on standard well-studied games played on edge sets of the complete graph, like the Connectivity game, the Perfect matching game, the Hamiltonicity game as well as the H-game, with notable special cases like the triangle game, and more generally the cycle game. These were also observed on the boards of small density. A suggestion that came from Prof. Łuczak was to look at the variant of the games with limited token supply, which was not initially planned but proved out to be a great success as a substantial progress was made in that direction.

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

We are happy to report that the STSM achieved its expected outcomes, as we have made a considerable progress in several of the questions that we addressed. A particular advance was achieved with estimating the token supply needed for either of the players to win the well-studied games of Box, Connectivity, Perfect matching, Hamiltonicity, H-game and several others, in situations when we already know that the player can win.

The plan of the four researchers involved is to organize a number of follow up online meetings in order to coordinate the work on the details as well as the write-up of the results, which will eventually lead to

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.

a complete publication ready for submission for possible publication in a renowned journal. On top of that, several new promising directions of research are presenting themselves, opening up a possibility for further collaboration on related follow up questions, equally for scientists that are already involved in this project and the others interested in studying games on graphs.