

COST Action IC1205 on Computational Social Choice: STSM Report

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Host country: Iceland

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I was hosted for 11 days by Ágnes Cseh at Reykjavik University, Iceland. During this period, we worked on a major open question belonging to the framework matching mechanisms (WG4).

Popular matchings in general graphs. The main focus of the research stay was to exploit fixed-point approaches in the evolving area of popular matchings. A matching M in a stable marriage instance is popular if there is no matching M' such that the vertices that prefer M' to M outnumber those that prefer M to M' . Popular matchings provide a useful, community-optimal and large size alternative to stable matchings. Probably the most important open question in the field of popular matchings is the complexity of the popular matching problem in not necessarily bipartite graphs. Despite the increasing number of recent papers in the bipartite setting, the problems seems to be extremely challenging to solve in general graphs.

We have worked with several ideas to tackle the problem, such as

- generalizing the graph transformation in [1];
- orienting the edges of the graph;
- converting the problem into a set of weighted matching problems;
- studying the set of vertices covered in popular matchings (similarly as in [2]).

We managed to work out methods with which the set of vertices and edges that can or must occur in a popular matching can be restricted. This is a promising start towards restricting the set of matchings to the point where only popular matchings remain.

Besides this, I served as the main speaker and delivered a talk 'Pareto optimality in many-to-many matching problems' at the annual Theory Day of the Icelandic Centre of Excellence in Theoretical Computer Science (ICE-TCS). At this occasion, I also had the chance to meet Eyjólfur Ingi Ásgeirsson, who is likely to become the representative of Iceland in COST Action CA15210, 'European Network for Collaboration on Kidney Exchange Programmes', in which I myself am also involved.

I sincerely thank the COST Action for their support which made this visit possible.

References

- [1] Á. Cseh and T. Kavitha. Popular edges and dominant matchings. In *Integer Programming and Combinatorial Optimization - 18th International Conference, IPCO 2016, Liège, Belgium, June 1-3, 2016, Proceedings*, pages 138–151, 2016.
- [2] M. Hirakawa, Y. Yamauchi, S. Kijima, and M. Yamashita. Any max-cardinality popular matching in a stable marriage problem consists of the same people. In *8th Japanese-Hungarian Symposium on Discrete Mathematics and Its Applications June 4-7, 2013, Veszprém, Hungary*, page 225.