COST Action IC1205 on Computational Social Choice: STSM Report

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During this short-but-productive STSM, we continued work on some threads that we started to explore in a previous STSM in Summer 2015, and considered new topics.

A major focus was on the problem of *randomised assignment*, a probabilistic version of the house allocation problem. Here we tried to obtain a strong impossibility result (an incompatibility of an efficiency axiom and a weak strategy-proofness axiom) using computer-aided techniques that have recently been successfully used to produce sophisticated (but human-readable) proofs in a variety of fields within social choice. Our work as applied to the assignment problem is ongoing; it seems particularly challenging. In our probabilistic setting, because the search space has a more complicated structure than in a deterministic setting, solver performance is significantly worse, and so sophisticated problem-reduction techniques need to be used. We've only had the time to try out a few of the possible avenues to a solution, but plan to continue to work on this, and are optimistic that progress is possible using these techniques.

We also had in-depth discussions on how computer-aided techniques can be applied in social choice in the future, and identified multiple promising directions in fair division, committee selection, and auction theory.

Other work performed in this STSM concerns extensions to prior work in Munich which showed that winner-determination problems for various (weighted) tournament solutions remain hard even for preference profiles that only consist of a constant number of voters. As an exciting new direction, we have started to apply the techniques used in that work to also better understand the precise complexity of calculating winners of voting rules *that are polynomial-time computable*. More precisely, some voting rules that can be solved by linear programming are in fact *P-complete*. We started looking into whether this result continues to hold for profiles with few voters. If this turns out to be the case, there is essentially no better method for evaluating these voting rules than solving a linear program, even on 'small' profiles.

We are grateful to the COST Action for fostering such fruitful collaboration across European borders.