COST Action IC1205: Report from an STSM

Piotr Faliszewski

September 2, 2015

Applicant:	dr Piotr Faliszewski
Home institution:	AGH University
Home country:	Poland
Host:	Prof Rolf Niedermeier
Host institution:	Technische Universitaet Berlin
Host country:	Germany
Dates:	09/08/2015 to 24/08/2015

The objective of this STSM was to study means of manipulating multiwinner elections. A multiwinner voting rule is given an election $E = (C, V)$, where C is the set of candidates and V is the set of voters, and committee size k. It outputs a (set of) size-k subsets of C, the winning committees. There is a number of multiwinner rules and we have focused on those based on the Borda and t-Approval scoring rules. In particular, we have studied the single non-transferrable vote rule (the SNTV rule), the Bloc rule, the k-Borda rule, and variants of the Chamberlin–Courant rule.

We have focused on the Shift Bribery problem. Originally, this problem was defined for single-winner rules, but it is easy to generalize it to the multiwinner setting: We ask if it is possible to ensure that a given preferred candidate is in the winning committee by shifting this candidate forward by a given number of positions in some of the votes.

We have analyzed the parametrized complexity of the Shift Bribery problem for all our rules, for parametrizations by the number of candidates, the number of voters, and the number of positions by which we can move the preferred candidate. We have found that the results for multiwinner voting rules are quite different from those for their single-winner analogs. For example, for the parametrization by the number of shifts we have found strong hardness and inapproximability results, whereas for single-winner analogs of our rules there are polynomial-time and FPT algorithms. On the other hand, for the parametrization by the number of candidates we found FPT algorithms for all our rules. For the parametrization by the number of voters our results were most varied and, thus, most interesting.

One particular obstacle that we found in our work is that the Chamberlin–Courant rule is NP-hard to compute. In effect, Shift Bribery and all standard manipulation problems for it are, immediately, NP-hard as well. Luckily, for most of our parametrizations the rule can be computed in FPT time. However, to alleviate the problem further, we have also included approximation algorithms for the Chamberlin–Courant rule in our study. We found that the complexity of Shift Bribery may strongly depend on which approximation algorithm for the Chamberlin–Courant rule we choose.

In effect of our study, we have prepared a preliminary manuscript with our results.