COST Action IC1205 on Computational Social Choice: STSM Report

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I visited Prof. Falizewski at the AGH University of Science and Technology and worked on two projects with him: Shift Bribery under non-monotone rules, and Combinatorial Voter Controls.

The input to the Shift Bribery problem consists of an election $E = (C, V)$, where C is a set of alternatives and $V = (v_1, v_2, \ldots, v_n)$ is a set of voters, a preferred candidate $p \in C$, a list $\Pi = (\pi_1, \pi_2, \ldots, \pi_n)$ of price functions, and a budget $B \in \mathbb{N}$. Each voter has a preference order which is a linear order over C. Each price function $\pi_i : [m] \to \mathbb{N}$ is a non-decreasing function specifying the cost of shifting p forward by a given number of positions in the preference order of voter $v_i \in V$. The problem asks whether there is a list $\vec{s} := (s_1, s_2, \ldots, s_n)$ of shifts which does make p the winner when applied to E, and whose cost $\Pi(\vec{s})$ does not exceed B. During my visit, we studied this problem for non-monotone voting rules such as STV, Greedy Monroe, and Greedy Chamberlin-Couran. We found that Shift Bribery for STV is $W[2]$-hard for the parameter "total number of shifts".

The second problem is a new model we developed which occurs naturally in the context of election control problems. In this setting, we are given an election $E = (C, V)$, a preferred alternative $p \in C$, a list W of "unregistered" voters, a bundling function $\kappa : W \to 2^W$, and an integer bound $k \in \mathbb{N}$, and ask whether there is a size-at-most-k subset $W' \subseteq W$ such that p wins the election $(C, V + \kappa(W))$. We studied this problem for two voting rules, Plurality and Condorcet, for different parameters. It turns out that while in general such combinatorial control is computationally significantly harder than its non-combinatorial version, there are some naturally tractable cases. We submit our results to the MFCS 2014.

Finally, I thank the STSM commitee for giving me the chance to pay a visit to Prof. Faliszewski. I very much enjoyed staying there and working with him.