Introduction to Game Theory

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Exercise Sheet 7

Due: Thursday, June 23, 2016

Exercise 7.1 (Properties of voting procedures, 4 points)

Consider the voting procedures **plurality vote**, **instant runoff voting**, and the **Borda count**. Again, we assume that ties are broken in favor of the candidate with the lower index. Moreover, $|A| \geq 3$. Consider the following properties:

Majority criterion: If for more than half of the voters i, $b \prec_i a$ for all $b \in A \setminus \{a\}$, then $f(\prec_1, \ldots, \prec_n) = a$.

Reversal symmetry: Let $\prec_1, \ldots, \prec_n \in L$ and for all $i = 1, \ldots, n$, let $\prec'_i \in L$ be defined such that for all $a, b \in A$, $a \prec_i b$ iff $b \prec'_i a$. If $f(\prec_1, \ldots, \prec_n) = c$, then $f(\prec'_1, \ldots, \prec'_n) \neq c$.

Incentive compatibility: $f(\prec_1, \ldots, \prec'_i, \ldots, \prec_n) \preceq_i f(\prec_1, \ldots, \prec_i, \ldots, \prec_n)$ for all $\prec_1, \ldots, \prec_n, \prec'_i \in L$.

For each of the nine combinations of voting procedure f and property P, show that f satisfies P or give a counterexample.

Exercise 7.2 (Schulze method, 4 points)

For the following preference relations determine the set of possible winners according to the Schulze-method[1]:

20 voters have the preference $b \prec_i c \prec_i e \prec_i d \prec_i a$

10 voters have the preference $d \prec_i e \prec_i c \prec_i b \prec_i a$

15 voters have the preference $b \prec_i d \prec_i a \prec_i e \prec_i c$

12 voters have the preference $a \prec_i b \prec_i c \prec_i e \prec_i d$

13 voters have the preference $a \prec_i e \prec_i c \prec_i d \prec_i b$

The exercise sheets may and should be worked on and handed in in groups of two to three students. Please indicate all names on your solution.

[1] http://en.wikipedia.org/wiki/Schulze_method