

Homework #3

Deadline: Tuesday, 20 April 2021, 18:00

Question 1 (10 marks)

Consider the basic model of liquid democracy introduced in class. Suppose the voters are situated on a social network that is a directed acyclic graph and voters will only consider delegating to other voters they can ‘see’, i.e., we can be certain that the delegation graph will not contain any cycles. Recall the *Paradox of Unwelcome Delegation* discussed in class, which occurs when a casting voter i^* would benefit from some other voter *not* choosing i^* as her proxy (but to instead cast a vote herself).

Prove that every resolute voting rule F that is the result of pairing a positional scoring rule with a lexicographic tie-breaking rule is subject to this paradox when used to aggregate the induced preferences to compute a winning alternative.

Briefly discuss the conditions on n (the number of voters) and m (the number of alternatives) under which you are able to obtain this result.

Question 2 (10 marks)

We saw in class that the greedy approval mechanism is strategyproof for the restricted domain of participatory budgeting instances for which all projects have the same cost. We also saw that the same mechanism is approximately strategyproof in the general case. Do these two results also apply to the max-approval mechanism? For each of them either prove that it does or provide a counterexample that illustrates a successful manipulation attempt. Be precise about what assumptions you make regarding tie-breaking.