

## Report on the outcomes of a Short-Term Scientific Mission<sup>1</sup>

Action number: CA16228

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### **Details of the STSM**

Title: Conditional Approval Elections

Start-End Date: 29/03/2022 to 06/04/2022

### **Description of the work carried out during the STSM**

During my STSM, I firstly tried to communicate to the members of the LAMSADE laboratory, the published works we have, together with my PhD advisor, Evangelos Markakis, on Conditional Minisum Approval voting rule. To achieve this goal, I gave a presentation in a workshop that was organized in Paris Dauphine University by J. Lang.

Secondly, together with J. Lang, we observed that, in contrast to other voting rules (such as the unconditional analog of the rule that we study) there are no works that examine axiomatic properties of the Conditional Minisum Approval voting rule. Hence, we started, together with one of his PhD students, to work on the generalization of common voting axioms in the conditional setting. Furthermore, we defined a wide family of Conditional voting rules, based on the definition of (the well-studied in the Computational Social Choice literature) Thiele's voting methods and we did an initial discussion on their axiomatic properties.

Thirdly, a pleasant event was that another leading expert of the Computational Social Choice field, Markus Brill (who is an Assistant Professor in TU Berlin and the leader of the research group "Efficient Algorithms" there) as well as a PhD student of him, happened to be in Paris Dauphine University, also visiting J. Lang, during the dates that I was there. In an attempt to combine their research interests with Conditional voting, we formalized some proportionality notions for the conditional setting, as well as some new Conditional voting rules that are good candidates for satisfying proportionality axioms.

Fourthly, J. Lang, E. Markakis and I, did a preliminary discussion on the implementability of Conditional Minisum Approval voting rule and on the possible outcomes of a potential addition of such a rule in an existing web application dedicated to collective decision making and everyday life voting.

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<sup>1</sup> This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

Finally, together with E. Markakis and another prominent member of the LAMSADE laboratory, Michael Lampis, we specified some questions that have been remained open regarding the parameterized complexity of the winner determination problem of elections under Conditional Minisum Approval voting rule.

### **Description of the STSM main achievements and planned follow-up activities**

The planned short-term outcomes that were listed in my STSM application have been definitely achieved as justified by the previous section. Regarding the long-term goals specified in my STSM application, I expect that the consensus for follow-up collaboration between myself, the host of my STSM J. Lang, my PhD advisor E. Markakis and the rest of the prestigious scientists with whom I worked during the days of my visit, will lead to the achievement of all expected outputs.

A more specific discussion about the research problems related to Conditional Minisum Approval Voting, that we started to work on during my STSM and which we agreed to continue working on remotely, follows:

- First of all, we have strong evidence that a Conditional Thiele's rule  $f$  satisfies a certain set of highly desirable and meaningful in the conditional setting axioms if and only if the rule  $f$  is the Conditional Minisum Voting rule, which would provide the first important axiomatic characterization of the rule.
- Furthermore, given that Conditional Approval Voting is definitely an interesting voting framework, however the winning outcome of Minisum Approval voting rule does not necessarily satisfy any proportionality properties, we are planning to work towards the specification of voting rule(s) for elections over combinatorial domains that achieve a higher level of expressiveness of the voters' ballots and at the same time they satisfy some, well-defined and important for real life elections, proportionality properties.
- Additionally, even though our discussions on the possibility of developing a test-suite for the comparison of voting rules for elections in which the voters have conditional preferences have not yet matured enough, we still believe that we can have more progress in the near future and eventually have a large scale experimental work.
- Finally, we are highly interested in determining the exact computational implications, from the parameterized complexity viewpoint, of allowing voters to submit conditional ballots and in the case that (as we conjecture) the computational problem becomes exceptionally hard, we will try to examine which restrictions could be posed in Conditional Approval Elections in order to define a tractable (in the context of parameterized complexity) voting framework that enhances the expressiveness of the voters' ballots.