

COST Action IC1205 on Computational Social Choice: STSM Report

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April 19, 2015

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Dates	March 15th—29th 2015

I visited Gerhard Woeginger at the Eindhoven University of Technology and continued our work on characterizing 1-D Euclidean preferences.

It is known that

- 1-D Euclidean preferences are necessarily single-peaked and single-crossing, and
- single-peaked preferences as well as single-crossing preferences both can be characterized by finitely many forbidden substructures, respectively.

Thus, substructures that preclude the single-peaked property or the single-crossing property also preclude the existence of the 1-D Euclidean property. A natural research direction is to discover other forbidden substructures of the 1-D Euclidean property. Our first finding is a single-peaked single-crossing profile with 3 voters and 6 alternatives which is *not* 1-D Euclidean. Interestingly, this profile is *minimally* not 1-D Euclidean, that is, deleting any voter results in a 1-D Euclidean profile. We succeeded in constructing for each number k , a single-peaked single-crossing profile with $2k$ voters and $4k$ alternatives which is minimally not 1-D Euclidean. As a conclusion, we can show that the 1-D Euclidean property *cannot* be characterized by a finite number of forbidden substructures.

We also worked on profiles which are minimally not 1-D Euclidean, but single-peaked and single-crossing, with a small number of voters and alternatives. Our findings support the conjecture that our profile with 3 voters and 6 alternatives is the smallest single-peaked single-crossing profile which is minimally not 1-D Euclidean.

We will submit our results to a journal in the beginning of May.