COST Action IC1205 on Computational Social Choice: STSM Report

- **Applicant:** Piotr Skowron
- **Home institution:** University of Warsaw
- **Home country:** Poland
- **Host:** prof. Jerome Lang
- **Host institution:** Universite Paris-Dauphine
- **Host country:** France
- **Dates:** 18/06/2013 to 28/06/2013

During my visit in Paris we considered the computational problems in multi-winner elections. In the first considered problem we assumed that the agents have their preferences over the set of alternatives. The preferences are expressed as the utility functions. The goal in the problem is to select exactly K alternatives so that to maximize the agents' satisfaction. In the Monroe's and Chamberlin-Courant's multi-winner voting rules it is assumed that the satisfaction of the individual agent i from the set of the K selected alternatives W (also referred to this set as the set of winners) is the satisfaction of a from the single alternative from W that is assigned to a; we call such alternative the representative of a. In particular, in Chamberlin-Courant's rule the satisfaction of a from W is the satisfaction of a from the most preferred element from W. In our approach we generalized this view. We considered the setting in which the satisfaction of the agent a is measured as the weighted ordered average of the utilities of a from alternatives from W.

We already obtained the preliminary results showing the relation between the form of the ordered weighted average (OWA) and the approximability of the problem. For some OWA we obtained the negative results claiming that the problem is hard to approximate. Finally, we worked on the Integer Programming formulation of the problem.

In the second problem we assumed that the agents have their preferences expressed over the multiple attributes (like, age, height, education level) of the alternatives instead of the alternatives themselves. The alternatives are identified with the vectors of the values of the attributes. In this approach the goal is also to select the set of K alternatives W. However, now we want to ensure that for each attribute A and for each possible value of this attribute x, the proportion of the alternatives in W having $A = x$ is equal to the proportion of the agents preferring $A = x$ most.

In considered the computational complexity of the problem. We obtained the NP-hardness result. However, our preliminary results show the existence of the good approximation algorithms.