Scientific Report

Purpose of the visit

The main propose of my visit has been the exchange of ideas and documentation related with our research works. On the Finnish hand, about Rubus Portfolio Modeling methodology to deal with multicriteria portfolio optimization problems under incomplete information and, on the Spanish hand, about the Participatory Budget elaboration problem. Both research works are related each other. We was interested in some ideas developed by the Finnish team to be applied in our models and methods with the aim of improving our web based system to support participatory budget formation.. It has started a new future research collaboration in such topics between both institutions which belong to the steering committee of the TED programme.

Description of the work carried out during the visit

Review of work and software with the Canadian team:

I presented to the Finnish TED node the work in which I am working within the TED programme and the web based system to support groups in participatory budget elaboration that we are developing in Spain. The Finnish team is working in Multiple Criteria Portfolio Analysis and they have develop a methodology to deal with incomplete preference information over criterion weights and project performance scores, stand for Robust Portfolio Modeling (RPM). RPM extends Preference Programming methods into multiple criteria portfolio decisions in which a subset of project proposals should be chosen. This research project is directed by Dr. Ahti Salo at Systems Analysis Laboratory in Helsinki University of Technology. They showed me the algorithms that they are using to can solve large-scale multiple criteria project portfolio selection problems under incomplete information. These algorithms are also implementing in a decision software tool, called RPM solver, which carry out the computations associated with the interactive decision support process to which RPM methodology leads.

I also had the opportunity to learn more about interactive support tools for individual decision making as well as for group collaboration and negotiations available at decisionarium site (http://www.decisionarium.hut.fi/):
- Web-HIPRE
- Smart Swaps
- RICH decisions
- Opinions On-line
- Joint Gains

The decisionarium project leader is Raimo Hämäläinen, one of the members of the steering committee of TED.

Development of ideas to be applied in our methodology to support the participatory budgets elaboration process:

The RPM methodology has also been applied to support groups in project portfolio selection. It allows for computing the nondominated portfolios under a information set which is compatible with the preferences of all decision makers. The algorithm for determining those nondominated portfolios is based on dynamic programming. We have improved the algorithm for computing the nondominated budgets with regard to the preferences of all citizen participants in the participatory budget methodology based on some idea from the Finnish team.

RPM methodology presents to the decision maker a set of nondominated portfolios instead of a unique solution. But RPM is able to make incontestable decisions at individual project level based on their *project core indexes*. That is, it possible to characterize those projects that should be surely selected or rejected in the final portfolio decision. We have used that project core index concept in the participatory budget approach to characterize, at each iteration of our negotiation process, those projects which will be in the final nondominated budget if an agreement is reached and those which will not be. Citizens participants will have to face with the remaining set of projects to look for an agreement about which ones will be included in the final budget through the following iteration of the negotiations. The number of remaining projects at each step have been interpreted for us as a measure of the dissensus breadth's, which will be reduced at each step by our negotiation method.

We have studied the possibility of project interactions in which the additive assumption in which the overall value of a portfolio is the value sum of its constituents projects does not apply. We are modelling such interactions through additional dummy project and corresponding constraints.

Development of software:

I have been implementing the previous ideas in our participatory budget elaboration support system. A first version has been implemented using Matlab software successfully.

Description of the main results obtained

1. Development of new methods for computing non-dominated budgets from the preferences of all citizen participants in the participatory budget problem.

2. Use of project core index information in the negotiation phase which guides further negotiation efforts.

3. The use of cluster analysis techniques to discover groups with similar interests determined from the preferences of all citizen participants in the participatory budget problem. It allows for a better structured communication process within our negotiation method.

4. Measures of dissensus based on borederline projects and the clustering of the citizen participants' preferences.

5. Extension of the type of constraints which can be considered in the budget structuring phase of our participatory budget methodology and its incorporation in the algorithm to compute feasible and nondominated budgets.

6. Modelling project interactions.

Future collaboration with host institution

I have disscused with Professor Harri Ehtamo about the method of improving directions developed to support multilateral negotiation and implemented in Join Gains. We are interesting in a modification of it based on trade-offs and its implementation as z possible collaboration. I have also talked with Juuso Liesiö about the development of a user interface to explore the outputs of RPM solver software.

Projected publications/articles resulting or to result from your grant

I have prepared during my TED grant the following working papers, related with my PHD thesis on "Supporting group decision through the web: the case of participatory budgets.", integrated within the TED programme:

- Issues in e-democracy

- A framework for participatory budget elaboration support

- Supporting e-participatory budgets

Other comments

I would like to thank ESF programme for giving me the economic support and the opportunity to work on these topics related with the TED programme.