SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA15210
STSM title: Stable-matching IP models and recourse in KEPs.
STSM start and end date: 9/12/2018 to 14/12/2018
Grantee name: Xenia Klimentova

PURPOSE OF THE STSM:

One of the main research lines to be discussed during the visit was a continuation of collaboration on finding stable exchanges. This research line was established during the visit of Hungarian group and is relevant for practice of kidney exchange programs. The clinical specialists may define the "preferences" for patients among available donors' kidneys and the stable exchange will be found in a way that there is no possible exchange cycle such that all the participants in that cycle get better kidney. Several IP programming formulations have already been proposed. The main purpose of the visit in this research line is to develop further extensions for the other variants of the problem and to discuss the plan of evaluation of the effectiveness of the proposed approach.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

During the visit we exchange the current research developed in both groups. One of the main focuses of the discussion was the development of the integer programming formulations for solving stable exchange problem. The previously developed integer programs (IP) were adapted for the case of non-strict preferences and for inclusion of altruistic donors chains. In addition, new formulation was proposed and possibilities of developing the compact formulation, that have both polynomial number of variables and constraints, was studied. Finally, further steps for preparing the scientific paper for publication were discussed.
The grantee had presented the current results on this line ("New Integer Programming Formulations for the Stable Exchange Problem") at the VOCAL Optimization Conference (http://vocal.p-graph.org/) in Esztergom.

In another line, the grantee participated in the discussion of the new formulations proposed in the Hungarian group for addressing the modelling issues for the case when several countries with different internal restrictions collaborate in the joint exchange pool. The possibilities of simplifications of the proposed models were investigated.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The main results of the collaboration are the following:
- Integer programming formulations for the stable exchange problem were extended for the case of non-strict preferences and inclusion of chains initiated by the altruistic donors;
- New integer programming formulation for the mentioned problem was proposed;
- The structure of computational analysis on comparison of the proposed IPs and evaluation of the effectiveness of the proposed approach for the kidney exchange problem was established as well as the content of the scientific paper.

FUTURE COLLABORATIONS (if applicable)

Collaboration will be further developed during the planned visit of the team in Porto by Márton Gyetvai, PhD student at Corvinus University.