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# Optimization and its Applications in Learning and Industry (OptALI)

IRSES

## Ongoing Deliverable D1.2

# Description of Research Seminar: A Bi-Objective Decomposition Method for Solving the Bi-Objective Multi-Commodity Minimum Cost Flow Problem

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| Start date of the Workpackage: | December 2010 |
| Duration: | 48 months |
| Due date of deliverable: | November 2014 |
| Actual submission date: | December 2013 |
| Participants: | UGOE<br>UNIKL<br>DTU<br>UOA<br>UC |
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# Research Seminar

offered by Siamak Moradi (The University of Auckland)

in June 2013,

in Kaiserslautern, Germany

Subject: A Bi-Objective Decomposition Method for Solving the Bi-Objective Multi-Commodity Minimum Cost Flow Problem

Problem: The multi-commodity minimum cost flow problem (*MCMCF*) can be defined as a network optimisation problem where we want to send several commodities from their source nodes to their sink nodes. Individual commodities share arcs and compete for the capacity of the arcs. In many application contexts of network models, there is more than one objective that has to be taken into account. Thus, multi-objective multi-commodity flow models may be more appropriate for modelling real-world decision making situations than the single objective models. We present a new method for solving the bi-objective multi-commodity minimum cost flow problem.

Main Results: Our method is based on the standard bi-objective simplex method and Dantzig-Wolfe decomposition. The method is initialized by optimising the problem with respect to the first objective, a single objective multi-commodity flow problem, which is solved using standard Dantzig-Wolfe decomposition. Then, similar to the bi-objective simplex method, our method iteratively moves from one non-dominated extreme point to the next by finding entering variables with the maximum ratio of improvement of the second objective over deterioration of the first objective. As we use the Dantzig-Wolfe method in the initial iteration, we do not have a complete set of variables. Our method generates entering variables by finding the optimal solution of single commodity flow sub-problems with the ratio objective function. We find the optimal

solution of each sub-problem among the extreme efficient solutions of a bi-objective network flow problem. The solution with the best ratio objective value out of all sub-problems represents the entering variable. The method stops when all the non-dominated extreme points are obtained. The implementation of the method and numerical results are explained.

Participants: researchers from the University of Kaiserslautern

Publication: -