



OPTEC short course

When: May 14, 2014 10:00 AM to May 15, 2014 12:15 PM
Where: Chemical Engineering Department, room PW 01.01,
W. de Croylaan 46, B 3001 Leuven.

Introduction to Some Methods and Applications of Nonlinear Multiobjective Optimization

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Abstract

In multiobjective optimization, the goal is to find the best possible solution in the presence of several, conflicting objectives. Multiobjective optimization is important because most real-life problems contain more than one objective and they should be considered simultaneously. Using mathematical tools we can define a set of nondominated or Pareto optimal solutions where none of the objective values can be improved without impairing at least one of the other objective values. Because vectors cannot be ordered completely, we need some additional preference information from an expert, a decision maker, to find the most preferred Pareto optimal solution as the final solution to be implemented.

Multiobjective optimization methods can be classified according to the role of the decision maker in the solution process. We review different types of methods and summarize their strengths and weaknesses. We pay most attention to interactive methods, where the decision maker takes actively part in the solution process and directs the search for the final solution according to her/his desires and hopes. This enables the decision maker to gain insight about the interdependencies of the conflicting objectives and learn about one's own preferences. Among the methods to be discussed is the classification-based NIMBUS method.

Finally, we study some complex real-life problems that have been successively solved by applying multiobjective optimization software and demonstrate how useful it is to consider several objectives simultaneously. The problems are related, for example, to chemical engineering processes, optimal shape design and wastewater treatment. To conclude, we collect some experiences.

Keywords: Multiple objective optimization, nonlinear optimization, MCDM, decision support, interactive methods, NIMBUS, software.

Biographical Information

Kaisa Miettinen is a Professor of Industrial Optimization at the Department of Mathematical Information Technology, University of Jyväskylä in Finland. She is also vice-rector of the University of Jyväskylä. In this position she chairs the science council and the graduate school for doctoral studies. She received her Ph.D. and M.Sc. degrees at the Department of Mathematics of the University of Jyväskylä in 1994 and 1988, respectively. She is the President of the International Society on Multiple Criteria Decision Making (<http://www.mcdmsociety.org>) and previous chair of EUROPT, the EURO Working Group on Continuous Optimization. She has been awarded the Väisälä Award of the Finnish Academy of Science and Letters in the field of mathematics in 2009 and she was chosen as Researcher of the Year at Helsinki School of Economics in 2007. Recently, she was invited to be a member of the Finnish Academy of Science and Letters, Section of Science. For further information, see <http://users.jyu.fi/~miettine/engl.html>. Kaisa Miettinen's research interests include theory, methods, applications and software of nonlinear multiobjective optimization including interactive and evolutionary approaches and she heads the Research Group on Industrial Optimization (<http://www.mit.jyu.fi/optgroup/>).

Registration

Registration to the course: Participation to this course is free, but for organisational reasons we ask the persons, interested in the course, to register by sending an email to optec.secretariaat@esat.kuleuven.be with cc to filip.logist@cit.kuleuven.be.

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