Kaisa Miettinen
Multiobjective Optimization Group, Faculty of Information Technology, University of Jyvaskyla, Finland

Title: Some Perspectives to Interactive Evolutionary Multiobjective Optimization Methods.

Abstract: Solving multiobjective optimization problems means finding the best possible solution in the presence of several, conflicting objectives. Because of the conflict, we have a set of Pareto optimal solutions with different trade-offs, where improving any objective function value implies impairment in at least one of the others. To identify the final solution that can be implemented in practice, we need some additional information. Typically, we incorporate preference information from a decision maker, an expert in the problem domain to find the most preferred Pareto optimal solution.
Multiobjective optimization methods can be classified according to the role of the decision maker in the solution process. We review the strengths and weaknesses of different classes and focus on interactive methods, where the decision maker actively directs the solution process with one's preferences. In this way, the DM can learn about the interdependencies among the conflicting objectives and the feasibility of the preferences, and adjust them whenever needed. The decision maker can, thus, concentrating on such solutions that seem most promising, which keeps the cognitive load limited, and eventually gain confidence on the most preferred solution found. At the same time, computational resources are saved when only solutions of interest are generated. Developing interactive methods has a long history in the multiple criteria decision making field but they have received less attention in the evolutionary community. We discuss some findings of a survey on decomposition- based interactive evolutionary methods as well as challenges of developing interactive evolutionary methods. We can hybridize elements of different methods to benefit from their strengths and overcome weaknesses. In this spirit, we also present some interactive multiobjective optimization methods that utilize evolutionary approaches. Finally, we discuss some experiences in solving real problems and introduce briefly the open-source software framework DESDEO devoted to interactive methods.

Biography: Kaisa Miettinen is Professor of Industrial Optimization at the University of Jyvaskyla. Her research interests include theory, methods, applications and software of nonlinear multiobjective optimization including interactive and evolutionary approaches. She heads the Research Group on Multiobjective Optimization and is the director of the thematic research area called Decision Analytics utilizing Causal Models and Multiobjective Optimization (DEMO, www.jyu.fi/demo). She has authored over 200 refereed journal, proceedings and collection papers, edited 18 proceedings, collections and special issues and written a monograph Nonlinear Multiobjective Optimization. She is a member of the Finnish Academy of Science and Letters, Section of Science and has served as the President of the International Society on Multiple Criteria Decision Making (MCDM). She belongs to the editorial boards of seven international journals and the Steering Committee of Evolutionary Multiobjective Optimization. She has previously worked at IIASA, International Institute for Applied Systems Analysis in Austria, KTH Royal Institute of Technology in Stockholm, Sweden and Helsinki School of Economics, Finland. She has received the Georg Cantor Award of the International Society on MCDM for independent inquiry in developing innovative ideas in the theory and methodology.