

Solving multiobjective optimization combinatorial optimization problems with FICO Xpress

Sébastien Lannez

FICO, Fair Isaac House, International Square, Starley Way, Birmingham, B37 7GN, UK
SebastienLannez@fico.com

Mots-clés : *multi objective combinatorial optimization, mixed integer programming, epsilon constraint methods.*

The two functionalities we will present during this talk allow the user to explore the objective function value space and discover the relationships between various objectives by solving multiple objective combinatorial optimization problems. The first approach is specific to Xpress Decision Optimizer. It allows the user to specify the objectives or constraints to explore, defines ranges and the exploration step size and lets the software search for optimal solutions in the partitioned feasible space. This approach can be seen as a simplified version of the epsilon constraint method described by Haimes, Ladson and Wismer in [1] in which the epsilons are uniformly sampled over a distribution defined by the end user. The optimization problem is solved for every partition and the optimal solutions are displayed on a two-dimensional graph for which the two axes are taken from the set of objectives. The second approach has been developed as an Xpress Mosel package and applies a more dynamic algorithm based on an implicit enumeration of all possible epsilon values as proposed by Kirlik and Sayin in [2]. This latter approach ensures that all non-dominated solutions will be found but is computationally more demanding.

Références

- [1] Haimes, YY, Ladson, LS & Wismer DA, "Bicriterion formulation of problems of integrated system identification and system optimization." IEEE Transactions on Systems Man and Cybernetics, vol. 3, pp. 296, 1971
- [2] Kirlik G, Sayin S, "A New Algorithm for Generating All Non-dominated Solutions for Multiobjective Discrete Optimization Problems." European Journal of Operational Research, Vol. 232, pp. 479—488, 2014