Session "Topic in Combinatorial Optimization" invited by Paolo Toth

Anytime Algorithms for Robust Multi-Objective Next Release Problem*

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Abstract The Next Release Problem consists in selecting the subset of requirements that will be developed in the next release of a software product. This selection must be done in such a way that stakeholders satisfaction is maximized and the implementation cost is minimized. At the same time, a set of dependences between the requirements must hold [1]. The data used to compute requirement cost and stakeholder satisfaction both have uncertainty that can be modeled with a random variable. As a result, the overall cost and value of any solution are also random variables. A decision maker usually prefers solutions with a low uncertainty in their objective functions. This can be translated to minimizing the variance of the random variables, at the time as the expected value. Thus, we propose a robust formulation of the NRP with four objectives: the two original objectives (expected cost and value) and the variance of them. In the literature, Monte Carlo simulation has been used to deal with uncertainty in this problem [2]. The main drawback of this method is that only approximate Pareto fronts can be obtained. We propose an Integer Linear Program to exactly solve the multi-objective problem and new exact algorithms to solve the 4-objective robust next release problem. The exact algorithms proposed can be stopped at any time, yielding a set of efficient solutions (belonging to the Pareto front) that are well spread in the objective space.

Keywords: *Robust optimization, next release problem, multi-objective optimization*

References

[1] Zhang, Y., Harman, M., and Mansouri, S.A., *The multi-objective next release problem*, Proceedings of GECCO 2007, 1129–1137.

[2] Li, L., Harman, M., Letier, E., and Zhang, Y., Robust next release problem: Handling uncertainty during optimization, Proceedings of GECCO 2014, 1247–1254.

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