

Alexander Diewald, Sebastian Voss and Simon Barner. A Lightweight Design Space Exploration and Optimization Language. *Proceedings of the 19th International Workshop on Software and Compilers for Embedded Systems (SCOPES '16)*, ACM, May 2016, pp. 190-193.

Abstract:

The solution of many engineering and scientific problems requires the exploration of a huge n-dimensional design space. Typical approaches rely on an abstract problem model consisting of a system model (description of the problem's variable couplings) and an optimization specification defining the objectives as well as the constraints bounding the design space. Advances in solver technologies enabled to efficiently search the solution space, however the diversity of the approaches led to problem descriptions that are difficult to reuse, as well as to solutions that are hard to compare. Our Exploration Meta-Model (EMM) addresses this issue by providing a unified language for optimization specifications that is a well-defined basis for model-based implementations of solver-independent design-space exploration (DSE) tool-chains. The EMM is a light-weight framework that allows to a) describe optimization specifications independent of particular optimization methods and solvers, b) relate solutions and optimization specifications, and c) define domain profiles that provide high-level optimization specifications that ease the adoption of automated DSE by domain experts. The applicability of our framework to different optimization methods is demonstrated by applying it to the generic vector optimization problem and to single-objective linear programs. The EMM's support to relate optimization results to input specifications is exercised for the Opt4J framework. Finally, a profile for real-time embedded systems demonstrates how the EMM can be tailored to specific domains.

Article:

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