The Comet Programming Language and System

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COMET is a novel, object-oriented, programming language specifically designed to simplify the implementation of local search algorithms. Comet supports a constraint-based architecture for local search organized around two main components: a declarative component which models the application in terms of constraints and functions, and a search component which specifies the search heuristic and meta-heuristic. Constraints, which are a natural vehicle to express combinatorial optimization problems, are *differentiable objects* in COMET: They maintain a number of properties incrementally and they provide algorithms to evaluate the effect of various operations on these properties. The search component then uses these functionalities to guide the local search using multidimensional, possibly randomized, selectors and first-order control structures such as events, neighbors, and nondeterminism.

As a result, COMET programs often feature models similar to those of constraint programming, although the underlying technology is fundamentally different in nature. In particular, COMET models are high-level, compositional, and modular. It is possible to add new constraints and to modify or remove existing ones, without having to worry about the global effect of these changes. COMET also separates the modeling and search components, allowing programmers to experiment with different search heuristics and meta-heuristics without affecting the problem modeling. COMET has been applied to many applications and is often competitive with tailored algorithms for complex applications.

This system demonstration illustrates COMET on a variety of applications in resource allocation, facility location, and scheduling. It will cover both the sequential and parallel implementations and the COMET environment.

References

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