

Construct, Merge, Solve & Adapt

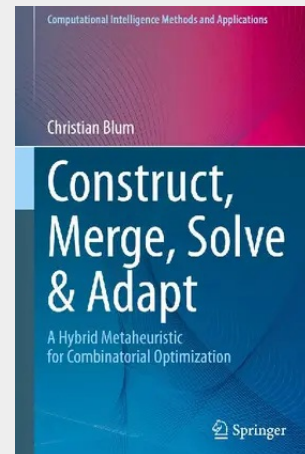
A Hybrid Metaheuristic for Combinatorial Optimization

This book describes a general hybrid metaheuristic for combinatorial optimization labeled Construct, Merge, Solve & Adapt (CMSA). The general idea of standard CMSA is the following one. At each iteration, a number of valid solutions to the tackled problem instance are generated in a probabilistic way. Hereby, each of these solutions is composed of a set of solution components. The components found in the generated solutions are then added to an initially empty sub-instance. Next, an exact solver is applied in order to compute the best solution of the sub-instance, which is then used to update the sub-instance provided as input for the next iteration. In this way, the power of exact solvers can be exploited for solving problem instances much too large for a standalone application of the solver.

Important research lines on CMSA from recent years are covered in this book. After an introductory chapter about standard CMSA, subsequent chapters cover a self-adaptive CMSA variant as well as a variant equipped with a learning component for improving the quality of the generated solutions over time. Furthermore, on outlining the advantages of using set-covering-based integer linear programming models for sub-instance solving, the author shows how to apply CMSA to problems naturally modelled by non-binary integer linear programming models. The book concludes with a chapter on topics such as the development of a problem-agnostic CMSA and the relation between large neighborhood search and CMSA. Combinatorial optimization problems used in the book as test cases include the minimum dominating set problem, the variable-sized bin packing problem, and an electric vehicle routing problem.

The book will be valuable and is intended for researchers, professionals and graduate students working in a wide range of fields, such as combinatorial optimization, algorithmics, metaheuristics, mathematical modeling, evolutionary computing, operations research, artificial intelligence, or statistics.

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