



Memetic Search for the Generalized Quadratic Multiple Knapsack Problem

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Résumé en anglais

The generalized quadratic multiple knapsack problem (GQMKP) extends the classical quadratic multiple knapsack problem with setups and knapsack preference of the items. The GQMKP can accommodate a number of real-life applications and is computationally difficult. In this paper, we demonstrate the interest of the memetic search approach for approximating the GQMKP by presenting a highly effective memetic algorithm (denoted by MAGQMK). The algorithm combines a backbone-based crossover operator (to generate offspring solutions) and a multineighborhood simulated annealing procedure (to find high quality local optima). To prevent premature convergence of the search, MAGQMK employs a quality-and-distance (QD) pool updating strategy. Extensive experiments on two sets of 96 benchmarks show a remarkable performance of the proposed approach. In particular, it discovers improved best solutions in 53 and matches the best known solutions for 39 other cases. A case study on a pseudo real-life problem demonstrates the efficacy of the proposed approach in practical situations. Additional analyses show the important contribution of the novel general-exchange neighborhood, the backbone-based crossover operator as well as the QD pool updating rule to the performance of the proposed algorithm.

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