

Abstract :

Genetic Algorithm (GA) has emerged as a powerful method for solving a wide range of combinatorial optimisation problems in many fields. This paper presents a hybrid heuristic approach named Guided Genetic Algorithm (GGA) for solving the Multidimensional Knapsack Problem (MKP). GGA is a two-step memetic algorithm composed of a data pre-analysis and a modified GA. The pre-analysis of the problem data is performed using an efficiency-based method to extract useful information. This prior knowledge is integrated as a guide in a GA at two stages: to generate the initial population and to evaluate the produced offspring by the fitness function. Extensive experimentation was carried out to examine GGA on the MKP. The main GGA parameters were tuned and a comparative study with other methods was conducted on well-known MKP data. The real impact of GGA was checked by a statistical analysis using ANOVA, *t*-test and Welch's *t*-test. The obtained results showed that the proposed approach largely improved standard GA and was highly competitive with other optimisation methods.