Abstract

This article contains a draft...as a backbone for an article over the computational investigation of the hardness the Multidimensional Knapsack Problem (MKP) as well as the on performance of algorithms for the solution of instances.

1 Introduction

The 0-1 Multidimensional Knapsack Problem (MKP) is a generalization of the Knapsack Problem where an item expends more than a single resource type. A MKP having n itens and m dimensions can be defined as follows.

$$\begin{aligned} &\text{maximize} \sum_{j=1}^{n} p_j x_j \\ &\text{subject to} \sum_{j=1}^{n} c_{ij} x_j, \quad i = 1, \ldots, m, \\ &\qquad x_j \in 0, 1, \quad j = 1, \ldots, n. \end{aligned}$$

The problem can be applied on budget planning scenarios, subset project selections, cutting stock problems, task scheduling and allocation of processors and databases in distributed computer programs. The special case where $m = 1$ is called Knapsack Problem (KP). Several contributions have been made addressing exact, heuristics, approximation and probabilistics approaches for the problem.

Due its simple definition, wide application and challenging difficulty, MKP turned out to be a quite addressed problem for experiments with metaheuristics in recent years. Although none of those heuristics exhibit competitive performance compared to comercial MIP solvers, at least, over the instances existing on literature.

2 Algorithms

3 Instances

4 Research Questions and Expectations