Lab3

The work consists of the implementation of three metaheuristic approaches - based on simulated annealing, tabu research, genetic algorithms, particle swarm optimization or differential evolution - to solve each of these problems (1) and (2). Use two approaches to solve problems (1) and two approaches to solve problems (2), at least one of which is different.

The most relevant aspects of the procedures (representation of solutions, neighborhood structures, operators, parameter values used, etc.) should be documented, as well as details of the computational experiments (solutions obtained with several parameter sets - better values, worse values And average for a set of races, number of iterations, cpu time, etc.). A report (with a maximum of 10 pgs. A4) shall be the subject of evaluation, where the essential methodological aspects of the approaches, details of the computational implementations and a critical analysis of the solutions obtained should be mentioned.

(1) The generalized allocation problem is a combinatorial optimization problem that consists of determining the minimum cost allocation of n tasks to m agents so that each task is assigned to exactly one agent, subject to the availability of agent capacity.

Let I = {1,2, ..., m} be a set of agents and J = {1, ..., n} a set of tasks. For each i ∈ I ej ∈ J, c ij is the cost of allocating agent i to task j, r ij is the amount of resources required by agent i to perform task j, and bbi is the capacity (resource availability) of the Agent i. The binary variable x ij takes the value 1 if agent i performs the task j and the value 0 otherwise. The mathematical formulation of this problem is:

$$\text{minimizar} \quad \sum_{i \in I} \sum_{j \in J} c_{ij} x_{ij}$$

$$\text{sujeito a} \quad \sum_{i \in I} x_{ij} = 1, \forall j \in J$$

$$\sum_{j \in J} r_{ij} x_{ij} \leq b_i, \forall i \in I$$

$$x_{ij} \in \{0,1\}, \forall i \in I, \forall j \in J$$

Problema 1
Number of agents (m), number of tasks (n)
5 15
For each agent i (i = 1, ..., m):
Cost of assigning task j to agent i (j = 1, ..., n)
17 21 22 18 24 15 20 18 19 18 16 22 24 24 16

23 16 21 16 17 16 19 25 18 21 17 15 25 17 24
16 20 16 25 24 16 17 19 19 18 20 16 17 21 24
19 19 22 22 20 16 19 17 21 19 25 23 25 25 25
18 19 15 15 21 25 16 16 23 15 22 17 19 22 24

For each agent i (i = 1, ..., m):

Resources consumed in the assignment of the task j to the agent i (j = 1, ..., n)

8 15 14 23 8 16 8 25 9 17 25 15 10 8 24
15 7 23 22 11 11 12 10 17 16 7 16 10 18 22
21 20 6 22 24 10 24 9 21 14 11 14 11 19 16
20 11 8 14 9 5 6 19 19 7 6 6 13 9 18
8 13 13 13 10 20 25 16 16 17 10 10 5 12 23

Capacity of agent i (i = 1, ..., m)

36 34 38 27 33