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"Uma Metaheurística Genética não Convencional e Ant Colony Systems para Resolver o problema do Caixeiro Viajante com Grupamentos"

Frequently found problems, are the combinatorial problems. Many of them consist of the search, on a given graph, for a set of edges satisfying certain conditions. One of these problems is the Traveling Salesman Problem (TSP), which consists of the determination of the minimum cost Hamiltonian cycle in the graph.

One of the several extensions of TSP is the Clustered Traveling Salesman Problem (CTSP), where the vertex set is partitioned into subsets or "clusters" of vertices that must be visited contiguously. This problems is a NP-Hard problem, it limits the exclusive use of exact techniques.Therefore, most of the works found in the literature present approximate procedures or heuristics for its solution.

Nowadays, many of the computational methods for the solution of complex problems are inspired in natural processes. These methods appear from the interpretation of mechanisms used by the nature (as the evolution, the adaptation and the memory) as principles for the intelligent solution of problems.

Two bio-inspired methods, that have been applied independently with success in the solution of this and other problems, are the Genetic Algorithms and the Ants Colony Systems which share the characteristic of working with a population of individuals.

As the genetic algorithms determine quickly promising areas in the search space, they are frequently used with local search or refinement of the best-found solution methods. On the other hand, the Ant Colony System is a method that has been applied with sucess to different problems. However, due to the fact that the updating of the pheromone trill and the emulation of some behavioral characteristics take a meaningful computational time, this method have succeeded only when it was applied to small instances. Hence, it became necessary to develop ways to overcome these disadvantagers. The Ant Colony System is a slow learning system that becomes more efficient as it acquires knowledge.