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"Algoritmos Genéticos não Convencionais: Aplicações ao Problema de Steiner em Grafos Direcionados"

In this we propose a new Genetic Algoritms (GA) to find near optimal solutions to the Steiner Problem in Directed Graphs (SPDG).

V, for each arc∈ Given a Directed Graph D= (V,E) with root r E is associated a positive number Cij (cost of (i,j)). Let (r), Vo, S be∈ (i,j) S). Nodes in Vo are named demanded nodes, or∪ Vo ∪a partition of the V(V=(r) obligatory nodes, nodes in S are named optional nodes or possible Steiner nodes. the SPDG is to find directed paths from this root to all the nodes of Vo of minimum total cost.

First we present the Steiner problem and some important cases: The Steiner problem in the Euclidean and Rectilinear Plane, the Steiner Problem in Undirected Graphs (SPUG) and the Steiner Problem in Directed Graphs(SPDG), including a bibliographic revision of main heuristics and exact algorithms, and some mathematics formulations for the SPDG.

We present some reductions tecnique for the problem which enable us to reduce the size of the instances by eliminating nodes and arcs.

Finally, we propose a new non-conventional genetic algorithm including techniques of local search to solve the SPDG. To associate a solution of the problem in the chromosome structure, was used a representation with integer number for Steiner nodes and each gene has associate a binary number, where a 1 or 0 corresponds to whether or not a node is included in the solution arborescence. The corresponding Steiner r-arborescence is computed using a deterministic SPDG hybrid heuristic. The proposed algorithm present news ideas to realize a intensive search in more promising regions and a new tchnique for population diversification.

The genetic algorithm is tested on some SPUG instances from the OR-Library choosing any obligatory node as the root, and creating,,for each edge (i,j) belonging to the undirected graph with cost Cij, a pair of arcs(i,j) and (i,j) with the same cost Cij. Computational results show the efficiency of the proposed procedure.