Path planning on a cuboid using genetic algorithms.

Summary: The Traveling Salesman Problem (TSP) is one of the most extensively studied problems in the fields of Combinatorial Optimization and Global Search Heuristics. A variety of heuristic algorithms are available for solving Euclidean TSP, and Planar TSPs. However, optimization on a cuboid has potential applications for areas like path planning on the faces of buildings, rooms, furniture, books, and products or simulating the behaviors of insects. In this paper, we address a variant of the TSP in which all points (cities) and paths (solution) are on the faces of a cuboid. We develop an effective hybrid method based on genetic algorithms and 2-opt to adapt the Euclidean TSP to the surface of a cuboid. The method was tested on some benchmark problems from TSPLIB with satisfactory results. A web-based interactive visualization tool has also been developed using Java 3D, and optimization results for different point densities on the cuboid are presented.

MSC:

68T20 Problem solving in the context of artificial intelligence (heuristics, search strategies, etc.)
90C27 Combinatorial optimization

Keywords:

optimization; TSP; path planning; genetic algorithms; 2-opt; local search; visualization; cuboid

Software:

TSPLIB

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References:
