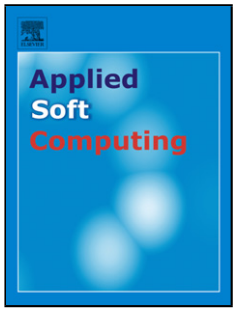

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Improving variable neighborhood search to solve the traveling salesman problem

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Abstract

The Traveling Salesman Problem (TSP) is one of the classical combinatorial optimization problems and has wide application in various fields of science and technology. In the present paper, we propose a new algorithm for solving the TSP that uses the variable neighborhood search (VNS) algorithm coupled with a stochastic approach for finding the optimal solution. Such neighborhood search with various other local search algorithms, named as $VNS-1$ and $VNS-2$, has been reported in the literature. The proposed algorithm is compared in detail with these algorithms, in the light of two benchmark TSP problems (one being symmetric while the other is asymmetric) suggested in the $TSPLIB$ dataset in programming language `R`, along with two asymmetric problems obtained through simulation experiment. The present algorithm has been found to perform better than the conventional algorithms implemented in `R` for solving TSP's, and also, on an average, found to be more effective than the $VNS-1$ and the $VNS-2$ algorithms. The performance of the proposed algorithm has also been tested on 60 benchmark symmetric TSPs from the $TSPLIB$ dataset. Apart from solving the TSP, the flexibility of the proposed hybrid algorithm to solve some other optimization problems related to other disciplines has also been discussed.

Keywords: Neighborhood structure, Hybrid VNS, Stopping rule, Near-optimal solution, Cost matrix.

1. Introduction

The TSP is a well-known, popular, and an extensively studied problem in the field of combinatorial optimization. It has immense applications in the field of engineering science like designing hardware devices and radio electronic devices in communications, in the architecture of computational networks, designing of microchips, DNA sequencing [1], data