

A Second Order Genetic Algorithm for Traveling Salesman Problem

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Abstract : The traveling salesman problem (TSP) is one of the best-known problems in optimization problem. There are many research regarding the TSP. One of the most usage tool for this problem is the genetic algorithm (GA). The chromosome of the GA for TSP is normally encoded by the order of the visited city. However, the traditional chromosome encoding scheme has some limitations which are twofold: the large solution space and the inability to encapsulate some information. The number of solution for a certain problem is exponentially grow by the number of city. Moreover, the traditional chromosome encoding scheme fails to recognize the misplaced correct relation. It implies that the tradition method focuses only on exact solution. In this work, we relax some of the concept in the GA for TSP which is the exactness of the solution. The proposed work exploits the relation between cities in order to reduce the solution space in the chromosome encoding. In this paper, a second order GA is proposed to solve the TSP. The term second order refers to how the solution is encoded into chromosome. The chromosome is divided into 2 types: the high order chromosome and the low order chromosome. The high order chromosome is the chromosome that focus on the relation between cities such as the city A should be visited before city B. On the other hand, the low order chromosome is a type of chromosome that is derived from a high order chromosome. In other word, low order chromosome is encoded by the traditional chromosome encoding scheme. The genetic operation, mutation and crossover, will be performed on the high order chromosome. Then, the high order chromosome will be mapped to a group of low order chromosomes whose characteristics are satisfied with the high order chromosome. From the mapped set of chromosomes, the champion chromosome will be selected based on the fitness value which will be later used as a representative for the high order chromosome. The experiment is performed on the city data from TSPLIB.

Keywords : genetic algorithm, traveling salesman problem, initial population, chromosomes encoding

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