

Genetic algorithm for the selective travelling

Salesman problem

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The selective travelling salesman problem (STSP) is an optimization of vehicle routing problems, the STSP consists of a simple determining circuit of maximal total profit between supplier and customers. In other words, the task is to determine a circuit of several customers, in order to be used for minimal cost. This is hold in the sake of serving several customers divided in a network .Simultaneously to satisfy certain constraints related to the total costs between the nodes.

We present below a formulation integers oriented version of the STSP. Let $G = (N, A)$ a complete graph, where $N = \{1, \dots, n\}$ is the set of n vertices , with the vertex 1 acting as a deposit , and where A corresponds to the set of arcs . Associating a gain $g_i \geq 0$ to each vertex $i \in N$ (with $g_1 = 0$) and a cost $C_{ij} \geq 0$ for each arc $(i, j) \in A$ The formulation presented a binary variable X_{ij} associated with each arc $(i, j) \in A$, or X_{ij} is equal to 1 if the corresponding arc is used in the solution, and 0 otherwise.

The STSP can be formulated as the following integers program:

$$\text{Max } \sum_i g_i \sum_j x_{ij}$$

Subject to:

$$X_{ij} \in \{0, 1\}$$

$$\sum_i \sum_j C_{ij} X_{ij} \leq C_{\max}$$

$$i \in \{1, 2, 3, \dots, n\} \quad j \in \{1, 2, 3, \dots, n\}$$

In this paper, we present a state of the art, of STSP and in wich we propose an approach based on genetic algorithms. this initiated approach is assured to maximize the total gain of a tour

by the creation of a population under the criterion ratio **gain / cost**; introduced to be maximal. Then, a coding diagram is showed to represents parameters characterizing each individual of the population.

In fact , the chromosomes coding is used to represent the solutions as chromosomes mutations considering this process , we tent to suggest mechanism related to the initial population generation thereby producing a population of individuals which form the basis for future generations . The choice of the initial population is important because it can make a rapid convergence to the global optimum. In our case, we will generate two types of populations : the First noted P_{cost} which represents all arcs to be visited by the vehicle , according to the coding in which the position is list permutation in an increasingly order of utilized cost while, the second noted P_{gain} represents the set of vertices to be visited by the vehicle according to the decreasing order of the gains that will result a new population $P_{\text{gain/cost}}$ combining P_{cost} and P_{gain} using the genetic algorithm operations .then, we will make a new surveyed evaluation of new population with the objective function. Finally, we will present numerical results using simulation.

Keywords: genetic algorithm, selective travelling salesman problem (STSP), optimization

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