A GENETIC ALGORITHM WITH CONSTRUCTIVE HEURISTIC FOR THE CAPACITATED ARC ROUTING PROBLEM

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ABSTRACT

Routing is a well-known problem and capacitated arc routing problem (CARP) is defined as its variant with various applications. In the CARP, set of demands are considered on the edges rather than being on the nodes of a network. Road maintenance, garbage collection and postal delivery can be formulated as a CARP. The objective of the problem is to minimize the total routing cost with respect to vehicle capacity constraint. CARP is NP-Hard, therefore in this paper a constructive heuristic approach is presented. Then a genetic algorithm framework with different strategies for the mutation operator is considered to solve the problem. Numerical examples show that combination of the genetic algorithm with the proposed constructive algorithm has better results or can acheive acceptable solutions in less computational time.

Keywords: Capacitated arc routing, Genetic algorithm, Constructive Heuristic, Proposed operators

1 INTRODUCTION:

Routing problems can be classified as node routing and arc routing problems. The objective of routing problem is to service demands with the least cost. In the node routing, demands are placed in nodes of a network so the problem is defined as servicing of all nodes and return to the depot. This kind of routing problem is known as vehicle routing problem (VRP). While in the arc routing, demands are distributed along edges and servicing arcs is respected. Arc routing problem can be classified into the Chinese Postman Problem (CCP) Eiselt and et al. [1] Rural Postman Problem (RPP) Arbib and et al. [2] while in the first one, all arcs should be served and in the second one, a subset of arcs is required to be served. In case of considering vehicles capacity restrictions, the problem is called CARP.

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