

CONSTRUCTIVE GENETIC ALGORITHM FOR THE VEHICLE ROUTING PROBLEM WITH LOADING CONSTRAINTS WITHIN THE CONTEXT OF SUSTAINABLE LOGISTICS

Abstract

This study addresses the Capacitated Vehicle Routing Problem where customer's goods to be delivery is set by two-dimensional items. The objective was to use a homogeneous fleet of vehicles with a single depot node to minimize vehicle trips and reduce total transportation cost. All items in each vehicle trip must satisfied the two-dimensional packing constraints. However, in contrast to other papers in the literature, this paper suggests the establishment of a model that develops economic and environmental objectives in an integrated way by measuring the associated balanced costs and promoting sustainable logistics. Additionally, a Constructive Genetic Algorithm (improved using the Tabu search) capable of solving the routing problem is presented, in which the container loading by the binary tree procedure solved the loading component of the problem. Through computational tests with the proposed approaches, the effectiveness of the algorithm is demonstrated, where high-quality results are achieved for 180 instances of 2L-CVRP used in previous publications in the literature. The main contribution of this paper is provides a novel, large-scale sustainable solution to 2L-CVRP through the calculation of energy consumption and emissions using an internationally standardized framework.

Keywords: vehicle routing, container loading, 2L-CVRP, sustainable logistics, Constructive Genetic Algorithm