An evolutionary algorithm for the location-allocation-routing problem

Herminia I. Calvete*†[1], Carmen Galé‡[1], and José A. Iranzo[1]

[1]Universidad de Zaragoza – Spain

Abstract

The problem addressed in this work focuses on a multi-echelon distribution system which consists of a central depot, a set of potential intermediate warehouses and a set of customers with known demand. Goods are supplied from the central depot to a subset of warehouses using a fleet of homogeneous vehicles. Customers are not served directly. Instead, each customer is allocated a warehouse where he/she goes to collect his/her goods. Therefore, the problem simultaneously handles the selection of the location of the warehouses which are visited, the design of the routes to serve them and the allocation of the customers to the selected warehouses. These are decisions which are interrelated and have a strong impact on the quality of customer service and on the costs of the distribution system. The aim of the model is to minimize the total distance travelled by all vehicles which serve the warehouses, while guaranteeing a good service to customers measured in terms of the distance they need to travel from their location to their allocated warehouse. An evolutionary algorithm is developed to solve the problem. Chromosomes provide the selected warehouses and the number of routes. For each chromosome, the algorithm uses a heuristic to construct feasible solutions. Uniform crossover and mutation are used to construct offspring. The fitness of a chromosome measures its quality by means of the objective function value of its associated feasible solution. Elitist survivor selection is applied. A computational experiment is carried out to demonstrate the performance of the algorithm.

*Speaker

†Corresponding author: herminia@unizar.es

‡Corresponding author: cgale@unizar.es