A GENETIC ALGORITHM FOR THE DISTRIBUTION OF PERISHABLE FOODS TO CONVENIENCE STORES WITH UNCERTAIN DEMANDS

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Abstract

Industrial growth and expanding employment opportunities have led to the urban-oriented economic development in many countries. Demand of transportation, both in terms of passengers as well as for freight is also increasing in and around these big urban conurbations. A high proportion of total goods movement occurs within cities[1)], and most of this movement is based on road transport. Traffic congestion, noise, vibrations, generation of NOx, SPM, CO_2 and other environmental problems, crashes and loading and unloading on the street side are typical problems caused by the road-based freight transport in urban areas. Such freight movement related problems has magnified the need for research in the field of city logistics.

On of the logistics application is the delivery of perishable foods such as lunch boxes (called Obento in Japan) at various branches of many convenience store located in the cities. This distribution of lunch boxes comes with many typical characteristics such as the demand/consumption at the shop can not be pre-determined and therefore it is uncertain. If the supply is more than the consumption (determined at the end of a fixed time period, say a day), remaining lunch boxes has to be disposed off, causing a loss. Similarly, if the supply is less than the consumption, it incorporates a loss of opportunity cost as well as loss of clientele. This study formulates this distribution as a one period inventory routing problem with penalties on excessive and short supply under the condition of uncertain demand/consumption.

The above-mentioned inventory routing problem is solved by designing a two tier chromosome representation, with the first tier shows the routing (i.e. the order of customers to be visited) and the second tier shows the supply to the corresponding customer as shown in Figure 1. Each of these chromosome tiers are subjected to different crossover and mutation operators. The uncertain demand is simulated by generating a set of different consumptions and the fitness of chromosomes are evaluated based on these demand samples. Details results will be presented at the conference.

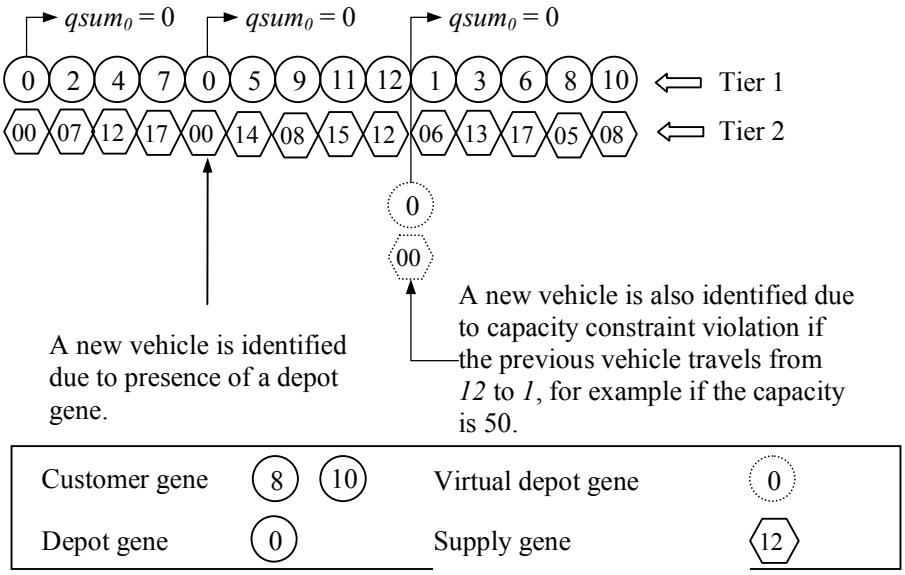

Figure 1: A two tier chromosome

References:

1) Taniguchi, E., *et al.*: City Logistics; Network Modeling and Intelligent Transport Systems, Pergamon, Oxford, 2001.

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