Demand and routing models for urban goods movement simulation

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Abstract

This paper presents a macro-architecture for simulating goods movements in an urban area. Urban goods supply is analysed when the retailer is the decision-maker and chooses to supply his/her shop. Two components are considered: demand in terms of goods supply and vehicle routing with constraints to simulate goods movements.

To analyse demand we consider a multi-step model, while to analyse goods movements a Vehicle Routing Problem with Time Windows (VRPTW) is formalized. We examine the distribution process for a VRPTW in which the optimum paths between all the customers are combined to determine the best vehicle trip chain. As regard optimum path search, a multipath approach is proposed that entails the generation of more than one path between two delivery points. Some procedures (traffic assignment, real time system measurement, reverse assignment) to estimate system performance are also proposed.

Finally, heuristics to solve the proposed problem are reported and their results are compared with those exact.

Keywords: City Logistics; Goods movement; Vehicle routing problem.

1. Introduction

In this paper a macro-architecture to simulate goods movements in urban/metropolitan areas is presented. Two components are considered: demand in terms of goods supply and vehicle routing with constraints (time windows, fleet size, load factor …) to simulate goods movements.

We consider a multi-step model, which on two different levels, gives as output: 1) commodity flows, 2) vehicle flows. The first level is a commodity-based demand model that simulates goods movements in terms of quantity: here we recall briefly a commodity-based model, which simulates the quantity of goods purchased by a retailer. The second simulates path choice made by the retailer. In this paper we report in detail the Vehicle Routing Problem with Time Windows (VRPTW).

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