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Simulating logistic innovation in a growing urban environment

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Abstract

A modelling framework to simulate Urban Goods Movements (UGMs) is presented. It is based on two models designed to estimate the road space consumption of Inter-Establishment Movements (IEMs) and End Consumer Movements (ECMs). Two kinds of evolution of the environment are considered: the long term evolution and the seasonal fluctuation of the economic activity. We then present how a scenario involving an Urban Consolidation Centre (UCC) can be modelled. First, we evaluate which movements are potentially transferable to the UCC. Then, we define a catchment area. Finally, we evaluate the efficiency of the UCC by referring to continuous approximation methods.

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1. Introduction

It is now widely recognized that city logistics has an important role to play to support the urban activities and the quality of life and the economy in urban centers. A poor conception of the infrastructures devoted to city logistics

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may, to a certain extent, generate some negative externalities such as congestion, noise and air pollution that are likely to penalize the development of a given urban area.

However, a clear understanding of Urban Goods Movements (UGMs) at a global scale is a very complex issue. Various constraints often apply on what is being transported and the amount that can be transported. As a result, goods transportation is performed through organizations of different kinds both from the economic and the logistic points of view and involves a large number of stakeholders. To complete the picture, the information on what is being transported, where and when, is, most of the time, hard to obtain since that is operated by private stakeholders.

In such a context, it is thus particularly useful to organize information and to provide public decision makers with decision support systems that are able to give a better understanding on how flows are organized and how these organizations may be shifted under various assumptions. Indeed, if little is known on the amounts that are actually transported, the potential effect of new measures aiming at reorganizing UGMs may, sometimes, just be a question of belief from the public decision maker.

During the last decades, several developments have been initiated to allow city planner to be aware of the level of activity reached by urban freight transportation. Some other developments aimed at predicting how UGMs may be reorganized through the deployment of logistics innovations such as consolidation centers. Prototypes of decision support systems have been realized for those purposes. Nevertheless, it is often considered that the urban environment remains static. This assumption is particularly restrictive knowing that the infrastructures settled to reorganize UGMs may require several years before being fully operational.

This work is dedicated to investigate a global framework through which UGMs can be simulated within a growing urban environment and that integrates a panel of potential innovations for city logistics. Further use of this framework is to define the architecture of the decision support platform SILOGUES (Fig. 1) whose purpose is to simulate urban logistics in its economic and spatial environment. In the following, we present the models that are used to perform the estimation of UGMs. Two models are combined to estimate both End Consumer Movements (ECMs) and Inter-Establishment Movement (IEMs). Then, we present how we model the evolution of the urban environment in a way that matches the requirements of the UGMs estimation. Finally, we describe how logistic innovation is integrated in the global modelling framework, by focusing on a scenario involving an Urban Consolidation Centre (UCC).

Nomenclature

ECM	End Consumer Movement
IEM	Inter-Establishment Movement
UCC	Urban Consolidation Centre
UGM	Urban Goods Movement

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