## Simulation and Real-Time Management of Innovative Mutualized Urban Logistics Systems

Rafik Makhloufi<sup>\*†1</sup>, Diego Cattaruzza<sup>2</sup>, and Frédéric Meunier<sup>1</sup>

<sup>1</sup>Centre d'Enseignement et de Recherche en Mathématiques et Calcul Scientifique (CERMICS) – École des Ponts ParisTech (ENPC) – 6 et 8 avenue Blaise Pascal Cité Descartes - Champs sur Marne 77455 Marne la Vallée Cedex 2, France

<sup>2</sup>Département Sciences de la Fabrication et Logistique (SFL-ENSMSE) – CMP-GC, École Nationale Supérieure des Mines - Saint-Étienne – 880, route de Mimet 13541 GARDANNE - FRANCE, France

## Résumé

This work is done in the context of the MODUM (Mutualization and Optimization of Urban Freights Distribution) ANR project. The latter aims at proposing a new organization of urban merchandize distribution based on mutualized and optimized resources. For this, shuttles are used to carry goods between a set of urban distribution centers connected by a ring around a city, and more light and ecological vehicles are used to serve customers inside the city.

In this context, our contribution is twofold. On one hand, we develop a set of models and mechanisms to manage merchandize distribution and we re-utilize those proposed in the project. We develop a reservation system that enables customers to request a merchandize transportation service (delivery and collect) or to book a vehicle for a self-service. For this, two main decision modules are implemented: (1) an online module that immediately processes arriving requests by searching for a feasible solution and decides to accept or reject them, and (2) an offline module that is executed when the reservation system is closed. It looks for optimized solutions starting from the feasible schedule defined by the online module. On the other hand, we propose and develop a new discrete event simulator MODUMS (MODUM Simulator) which implements such a system and evaluates its economical and environmental impact. MODUMS takes as inputs the two previous decision modules, information about the transportation means, geographic data and demand information with the tuned probability distributions of requests. It gives as outputs indicators on the impact of mutualization on the quality of urban logistics in terms of, for example, rejection rate of self-service requests, satisfying time of delivery/collect requests and CO2 impact. This work opens challenging algorithmic and modeling issues like in the management of the ring and the design of decision modules.

A research report is available at: http://rafikmak.free.fr/Files/MODUMSreportMAK.pdf

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<sup>\*</sup>Intervenant

 $<sup>^{\</sup>dagger} Auteur\ correspondant:\ rafik.makhloufi@cermics.enpc.fr$