

Post-doctoral position “Traffic modeling” at ENPC-LVMT, Chair on the “Socioeconomic Analysis of Urban Passenger Transit”

Background

The LVMT – Laboratory on City, Mobility and Transport – is a joint research unit at Université Paris-Est, shared by Ecole des Ponts ParisTech (ENPC), IFSTTAR and UPEM. It is an interdisciplinary laboratory dedicated to the holistic understanding of territorial systems, their population as a society and their mobility. Its research projects associate Human and Social Sciences (geography, sociology and economics) to Engineering Sciences (traffic physics, behavioral and economic modeling, complex system modeling and simulation).

The Academic and Research Chair on the “Socioeconomic Analysis of Urban Passenger Transit” is a 10-year partnership linking ENPC and Ile de France Mobilité, the Mobility Organizing Authority in the Ile-de-France region. The Chair’s most salient activity pertains to traffic assignment modeling: the “CapTA” model of Capacitated Traffic Assignment is developed along a three-layer framework as follows. From bottom up, there are:

- (i) the “run model” of a vehicle trajectory along its service route, with emphasis on passenger flows and in-vehicle crowding and comfort;
- (ii) the “line model” involves one or several transit routes sharing a common infrastructure: it combines platform waiting for boarding, on the passenger side, to the issue of track occupation, on the vehicle side, together with the “run models” of these routes.
- (iii) The “network model” involves the full set of transit routes serving the urban area: this layer deals with the issues of passenger route choice on every origin-destination pair, flow loading on the network and traffic equilibrium.

Missions

The scientific stake is to refine the representation of space in the CapTA framework. This concerns the heterogeneity of passenger distribution along cars in a train, as well as that along a particular station platform for boarding and alighting. Furthermore, the two spatial distributions interact in the dwelling of the train at the platform, leading to the “critical door” issue in the formation of the dwell time, which drives the line capacity.

In this setting, the research issues are to develop the physical representation, the simulation framework and the computation scheme.

The candidate works in close association to the Chair director as project supervisor and also with M.Sc Alexis Poulhès, research engineer at ENPC, who has developed the CapTA simulation software.

Candidate profile

The ideal candidate holds a PhD in traffic assignment modeling. He or she has a strong research interest in both traffic physics and simulation algorithms at the network scale.

He or she has strong computing and programming skills.

He or she is sensitive to the spatial issues as well as to the individual behaviors of trip-making along a transit path.

Also required are English proficiency and team working ability.

Outputs

- At least one paper in a peer-reviewed international journal about the scientific contributions of the position.
- Several technical reports.

Tentative work plan

- 1/ Bibliographical review of spatial detail in transit assignment models, and qualitative presentation of the research stakes: 2 months
- 2/ Spatial detail of a train and its treatment in the Run model: physical analysis and computer model: about 2 months
- 3/ Spatial detail of a platform and its treatment in the Line model: physical analysis and computer model: about 2 months
- 4/ Interfacing the two models of train and platform respectively, to model the traffic phenomena of passenger alighting, boarding, waiting and positioning: about 3 months
- 5/ Spatial model of a station, linking platforms to station pedestrian facilities and access-egress nodes: model: about 3 months
- 6/ Preparation of papers: about 3 months.

Working environment

15-18 month-long position to begin in December 2018 or January 2019

Location at LVMT, Building Bienvenue, 16-18 Avenue Newton, Cité Descartes, Champs-surMarne, 77455 Marne la Vallée

Wages in relation to professional experience (reference level at about 1,800 euros just after PhD defending)

Candidature expected 5 November 2018

For further information, contact Prof. Fabien Leurent, fabien.leurent@enpc.fr or M.Sc Alexis Poulhès, alexis.poulhes@enpc.fr.

Bibliography on the CapTA model

- Leurent, F., Chandakas, E., Christoforou, Z. (2015) A Transit Bottleneck Model for Waiting Passengers and its Implications for Traffic Assignment, MT-ITS Conference.
- Leurent F, Chandakas E, Poulhès A (2014) A traffic assignment model for passenger transit on a capacitated network: Bi-layer framework, line sub-models and large-scale application, Transport. Res. Part C, Vol. 47/1: 3-27.
- Leurent F., Pivano C. and Poulhès, A. (2017) On passenger traffic along a transit line: a stochastic model of station waiting and in-vehicle crowding under distributed headways. *Transportation Research Procedia*. 27: 1219-1226. <http://authors.elsevier.com/sd/article/S2352146517309730>
- Poulhès, A., Pivano C. and Leurent F. (2017) Hybrid Modeling of Passenger and Vehicle Traffic along a Transit Line: a sub-model ready for inclusion in a model of traffic assignment to a capacitated transit network. *Transportation Research Procedia*. 27:164-171.