Towards a dynamic modeling of coevolution processes between transportation and land-use : Construction of a research agenda

Working Paper

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Abstract

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1 Introduction

1.1 Context

Within an evolutive urban theory [Pumain et al., 2006], a considerable body of knowledge on urban systems self-organisation has recently been built through the construction, the exploration and the calibration of thematic-based models of simulation, of which the serie of Simpop models is emblematic [Pumain, 2012a]. The elaboration of an integrated platform for the construction and the evaluation of geographical models, including the development of the user-friendly, yet powerful by the transparent access to grid computation ressources, Model Experiment software OpenMole [Reuillon et al., 2013], but also an epistemological framework and associated meta-heuristics for model validation [Rey-Coyrehourcq, 2015], was central for the establishment of evidence-based thematic conclusions, which differentiation with the consequent previous amount of geographical research lead by similar methods of agent-based modeling and simulation was indeed the introduction of novel methods and tools going a step further for the validation stage. A illustrative example is the application of the Calibration Profile algorithm (which reveals a single parameter influence on model performance within the whole parameter space) to the sufficient and necessary parameters to reproduce existing urban systems patterns on a long time scale by the SimpopLocal model [Schmitt et al., 2014], and other methods such as PSE algorithm aimed to detect rare outputs of a model, were successively applied, to the Marius model in that case [Chérel et al., 2015].

At first sight this methodological and scientific context seems rather disconnected from our geographical objects of study which are the processes of coevolution between transportation network and urban growth, in a generic form (i.e. at any scale temporal and spatial scales, and in any geographical context) in a first approach and of course geographically contextualized once the entreprise of this paper will have been completed. These works are indeed the giants on which shoulder we intend to stand on. We rely on Bretagnolle concluding considerations in [Bretagnolle, 2009], insisting on the need to pursue the various empirical findings on long-time network and cities interactions, by modeling approaches which should shed light on underlying coevolution processes. We propose to explore that paradigm which has been poorly tackled and has many obstacles associated with. Theoretically, Bretagnolle's work is positioning precisely within the evolutionnary urban framework, which assets include the compliance with complexity approaches which allow to take into account the particularities of urban systems such as their non-ergodicity [Pumain, 2012b]. Methodologically, it seems intuitively suitable to our purpose, what will be confirmed further.

1.2 Modeling the coevolution : overview of the scientific landscape

1.3 Proposing a research agenda

The rest of the paper is organised as follows

2 Giere's Deamon, or when disciplinary compartimentation narrows perspectives

3 Empirical analysis : "Lost in the Smog"

4 Methodological Foundations, need for concrete

5 Modeling the Governance : the Grand Pari(s)

6 Proposition of a research agenda, towards calibrated dynamic models of coevolution

7 Conclusion

References

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