Spatialdata: a scala library for spatial sensitivity analysis

J. Raimbault[*1,2,3], R. Reuillon[2] and J. Perret[4,2]

[1]Center for Advanced Spatial Analysis, University College London
[2]UPS CNRS 3611 ISC-PIF
[3]UMR CNRS 8504 Géographie-cités
[4]LaSTIG STRUDEL, IGN, ENSG, Univ. Paris-Est

Summary

The sensitivity analysis and validation of simulation models require specific approaches in the case of spatial models. We describe a scala library providing such tools, including synthetic generators for urban configurations at different scales, spatial networks, and spatial point processes. These can be used to parametrize geosimulation models on synthetic configurations, and evaluate the sensitivity of model outcomes to spatial configuration. The library also includes methods to perturbate real data, and spatial statistics indicators, urban form indicators, and network indicators. It is embedded into the OpenMOLE platform for model exploration, fostering the application of such methods without technical constraints.

KEYWORDS: Sensitivity analysis; Geosimulation; Spatial synthetic data; Model validation; Model exploration.

1 Introduction

Openshaw (1984)

Kwan (2012)

In the case of Land-use Transport interaction models, Thomas et al. (2018) show how the delineation of the urban area can significantly impact simulation outcomes. Banos (2012) studies the Schelling segregation model on networks, and shows that network structure strongly influences model behavior.

2 Spatial sensitivity methods

Reuillon et al. (2019) Reuillon et al. (2013) Passerat-Palmbach et al. (2017) workflow and reproducibility

---

[*]juste.raimbault@polytechnique.edu

3 Applications

Different applications of the library have already been described in the literature. Regarding the generation of synthetic data in itself,

4 Discussion

References

Banos, A. (2012). Network effects in schelling's model of segregation: new evidence from agent-based simulation. *Environment and Planning B: Planning and Design*, 39(2):393–405.

Kwan, M.-P. (2012). The uncertain geographic context problem. *Annals of the Association of American Geographers*, 102(5):958–968.

Openshaw, S. (1984). The modifiable areal unit problem. *Concepts and techniques in modern geography*.

Passerat-Palmbach, J., Reuillon, R., Leclaire, M., Makropoulos, A., Robinson, E. C., Parisot, S., and Rueckert, D. (2017). Reproducible large-scale neuroimaging studies with the openmole workflow management system. *Frontiers in neuroinformatics*, 11:21.

Reuillon, R., Leclaire, M., Raimbault, J., Arduin, H., Chapron, P., Chérel, G., Delay, E., Lavallée, P.-F., Passerat-Palmbach, J., Peigne, P., et al. (2019). Fostering the use of methods for geosimulation models sensitivity analysis and validation. In *European Colloquium on Theoretical and Quantitative Geography 2019*.

Reuillon, R., Leclaire, M., and Rey-Coyrehourcq, S. (2013). Openmole, a workflow engine specifically tailored for the distributed exploration of simulation models. *Future Generation Computer Systems*, 29(8):1981–1990.

Thomas, I., Jones, J., Caruso, G., and Gerber, P. (2018). City delineation in european applications of luti models: review and tests. *Transport Reviews*, 38(1):6–32.