

Abstract

Simulation of a realistic residential development with the integration of two existing models

In a global context of urban sprawl and increasing housing costs, policies for residential development are an important aspect of urban and regional planning. There are two major planning concerns: firstly, to ensure that housing supply meets housing demand both quantitatively and qualitatively, and secondly, to reduce the negative environmental impacts that may result from residential development, especially an increase in the length and the number of trips by car and the fragmentation of natural and agricultural areas. In France, several planning documents exist that aim to control residential development. Regional planning policies are contained in the Schéma de Cohérence Territoriale (Territorial coherence framework) or SCoT, and the PLH (Local Housing Plan). In addition, each local authority has its own local urban masterplan (in French, Plan Local d'Urbanisme -PLU). The PLU defines places where residential developments can occur and also specifies the design parameters of allowable buildings on the site, such as building height, orientation to existing context, and building location within the parcel. A problem arises while applying the recommendations and the zonings contained in each of these documents. The form and location of residential developments as defined in these planning documents will often contradict one another.

In this paper, we present a spatial simulation platform to support the integration of regional and local planning policies that aim to control residential development. This simulation platform integrates two models: MUP-City and SimPLU. MUP-City simulates scenarios of residential development for an entire urban region given a set of planning rules. The first rule ensures that the pattern of cells worth urbanising is fractal. The other planning rules take account of the proximity of roads, accessibility of shops and services, accessibility to public transport, proximity of open spaces, and the presence of areas that cannot be built on. The identification of cells worth urbanising takes the form of a raster map of potential building cells, each characterised by the worth of urbanising them. How worthwhile it is for a cell to be urbanised ranges from zero to one. SimPLU simulates the potential building possibilities in a cluster of houses by generating 3D building configurations that respects the constraints of the PLU. Those potential buildings maximize functions, for example floor surface and are inserted into static parcels. Coupling MUP-City and SimPLU implies several methodological challenges. We are focusing on how to select one regional spatial configuration of residential development among all configurations that can be simulated with MUP-City, with the intent of using this data as input for a simulation with SimPLU.

We test the application of the simulation platform on the urban region of Besançon, known as Greater Besançon, in eastern France. This urban region includes a core city (117,000 inhabitants) and peri-urban residential areas with low population densities spread across fifty-eight small local authorities. The simulation platform was used in this context to explore the possible outcomes of spatial planning policies, set by both the Greater Besançon authority and each local municipality, on residential development over a twenty year period.