

A METHODOLOGY FOR URBAN AND LAND-USE MANAGEMENT SIMULATION USING SPATIAL SELF-ORGANIZATION PROCESSES

Rawan Ghnemat¹, Cyrille Bertelle¹ and Gérard H.E. Duchamp²

¹LITIS - University of Le Havre
25 rue Philippe Lebon, BP 540, 76058 Le Havre cedex, France

²LIPN - University of Paris XIII
99 avenue Jean-Baptiste Clément, 93430 Villetaneuse, France

Corresponding author email: cyrille.bertelle@gmail.com

Abstract. In this study, we develop a methodology based on computational intelligence concepts, for decision making tools using simulation of self-organized complex systems. Land-use management is considered here as the output of sustainable development strategies, dealing with the achievement of many objectives, interacting in a complex way, like environmental, economical and social objectives. The methodology presented here can be considered as a conceptual evolution in simulation processes from the simulations based on rule systems over geographical cellular automata toward the simulations involving self-organized agent-based systems over geographical information systems (GIS). Our methodology is based on self-organization patterns detection which emerge from spatial and behavioral systems. According to the complex systems modelling principles, we let the system evolve by itself with only partial control implemented here by an evolutive and selective process based on a fitness function over the whole system.

Keywords. Land-use, self-organization, geographical information systems, agent-based modeling, automata with multiplicities, community detection, territorial intelligence.

1 Introduction: Complexity Concept Approach for Land-Use Management

Land-use management, in regional or urban development, deals with *Territorial Intelligence* concepts. The word “Intelligence” has to be considered from its latin root, “Intelligere”, which means understanding. So, our purpose is to understand the territorial management by the complex interaction of many kinds of phenomena. The description proposed here for territorial management is based on the *Sustainable Development* strategies which try to avoid naive solutions which may appear at first efficient to solve specific problems in short a term vision. Without understanding the complex implication of