

Multi-scale and Multi-dimensional Spatial Dynamic Field and Process Representation and Simulation for Informed Decision Making

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Short Abstract

This talk will focus on my research program, which aims at the development of new methods and tools to improve GIS capabilities for more realistic modeling, representation, geovisualisation and analysis of complex geographic and social dynamics. Global warming, global outbreak of H1N1 Swine Flu, inundation, erosion, urban growth, traffic and human movement and behaviour are examples of geographic and social dynamics. A realistic modelling and representation of such changes is necessary for better characterising, understanding, analysing and predicting of the behaviour of those phenomena at all local, regional and global levels. Current GIS through their powerful capabilities to process spatial data provides modelers with strong computing platforms for data management, integration, visualization, querying, and analysis. However, GIS are prone to problems when it comes to effective representation and visualisation of the geographic dynamics and have been criticized for not providing the necessary functionalities for analysing and predicting the behaviour of such phenomena. Geographic dynamics are usually multidimensional and change over time and space and their understanding needs multi-scale and multi-resolution representation, analysis, geovisualisation and management tools. These types of representations are particularly interesting in the context of decisional spatial databases which can facilitate the exploration and analysis of complex spatial dynamic phenomena for the users and decision makers in different domains of application. Hence, the objective of this research program is to revisit and expand the fundamental concepts related to the representation, analysis and geovisualisation of geographic dynamics and their uncertainty and to develop new methods and tools to enhance GIS capabilities in this regards. To achieve this objective, we use techniques in computational geometry, computer sciences and the rendering of virtual and augmented reality as well as the geosimulation methods linked with advanced spatial on-line analytic processing technologies in spatial databases. These methods offer interesting opportunities for multidimensional representation, geovisualisation and analysis of geographic dynamics as well as their uncertainties.