GUEST EDITORIAL PREFACE

Special Issue on Spatial Information for Environmental Applications

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INTRODUCTION

One of the first research fields in Geographical Information Science was centered on the uncertainty in defining spatial object boundaries.

In the 90-ties, the topics of choosing the appropriate way of defining, representing and managing spatial objects was subject of vivid discussions in the research community. While it was easy enough to define artifact and administrative boundaries, it was quite complicated to precisely define the edge of environmental features.

For example: if someone asks to a geologist and to a botanist to define the edge of the bed of a river, it is very difficult to obtain the same perimeter. In the same way it is not easy to define the exact border of a forest or of a lake and the limit that separates the sea from the beach. These differences are due to the fact that each discipline involved in analyzing environmental data views the problem from a different perspective, adopts different mathematical models, often applied to similar concepts, and uses different approaches to represent its own vision of reality.

These approaches produce a degree of uncertainty in object boundaries definition. There are many kind of spatial uncertainty and each step of the geographic analysis increases the distance among the real world and its representation. There are many forms of Uncertainty. Uncertainty in the conception of geographic phenomena, uncertainty in measuring and representing geographic phenomena, uncertainty in analyzing geographic phenomena (Molenaar, 1998; Timpf, 1997; Longley et al., 2002; Leung, 1988; Egenhofer & Frank 1992).

In many cases geographical objects are compressed in a crisp boundary, producing a representation which is often very far from the reality, because frequently object based

image analysis is influenced by effects of a priori knowledge. But in many cases objects do not have crisp boundaries or do not have boundaries at all (Couclelis, 1992; Burrough & Frank, 1996).

Heterogeneous and multiscale spatial information in many cases is not useful to the large part of potential users, because, if data with a different accuracy are combined adopting a common scale, there is the risk of error propagation and results can be meaningless or potentially dangerous (Zhang & Goodchild, 2002).

The other principal research trend in environmental application of spatial information is mainly based on predictive models in order to build complex spatial analyses. In last decades a lot of techniques and methods of Geovisualisation, Geocomputation and Geosimulation have been developed in order to analize socio-economic and environmental spatial data (Benenson, & Torrens, 2004; Murgante et al., 2009; Murgante et al., 2011).

These topics are contained in the papers included in this special issue. The manuscripts are extended versions of short papers presented at AGILE 2012 conference held in Avignon (France).

Special Issue Contributions

The paper "Environmental Object Recognition in a Natural Image: an Experimental Approach Using Geographic Object Based Image Analysis (GEOBIA)" by Aryal and Josselin covers a field of investigation at the interface between psychology and remote sensing. More particularly, it investigates the relevance of scale and color/texture in the recognition of objects at multiple scales. Starting from three samples of users, the study analyzes whether there is a "good scale" to identify a certain land-cover type.

The paper "Structure analysis of hedgerows with respect to perennial landscape lines in two contrasting French agricultural landscapes" by da Silva et al. proposes a study on the spatial distribution of hedgerows in two regions of France characterized by different agricultural landscapes.

Structural analysis of spatial relations between hedgerows and other perennial landscape lines (roads and channels) has been developed at a very detailed scale.

Results are a correlation between hedgerows distribution and perennial lines; thus, it is important to understand dynamics of plant and animal populations.

The paper "Use of Geo-Information in Environmental Policy: Limitations, Advantages and Challenges" by Vullings et al. defines a conceptual framework to evaluate the effectiveness of geospatial implementation. In particular, the authors propose a framework to use geo-information in environmental policy illustrated using five case studies.

The discussion of results demonstrates the usefulness of this framework.

The paper "Flash flood hazard assessment in small agricultural basins coupling GIS - data and Cellular Automata Modelling: Experimentation in Upper-Normandy (France)" by Douvinet adopts geosimulation techniques in order to support decision in disaster prevention and management. In particular RUICELLS, a cellular automata model, has been applied to flood hazard assessment. This approach based on a set of three deterministic hydrological rules of flow pathways allows to detect also non-linear effects very important in improving the effectiveness of a flood alert system.

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