Preface

The 3D geo-information has become an important research area in the last several years because of the increased complexity of task in many geo-scientific applications, such as sustainable urban planning and development, civil engineering, risk and disaster management and environmental monitoring. Moreover a paradigm of cross-application merging and integrating of 3D data is observed. The problems and challenges facing today's 3D software, generally application-oriented, focus almost exclusively on 3D data transportability issues – the ability to use data originally developed in one modelling/visualisation system in other and vice versa. Tools for elaborated 3D analysis, simulation and prediction are either missing or, when available, dedicated to specific tasks.

To be able to respond to the 3D geo-information demand, a new type of system has to be developed. The fully developed 3D geo-information system should be able to manage 3D geometry and topology, to integrate 3D geometry and thematic information, to analyze both spatial and topological relationships, and to visualize the data in a suitable form. In addition to the simple geometry types like point line and polygon, a large variety of parametric representations, freeform curves and surfaces or sweep shapes have to be supported. Approaches for seamless conversion between 3D raster and 3D vector representations should be available, which will allow performing analysis on a representation most suitable for a specific application.

In the last decades, the research and the industry have addressed a variety of technical issues related to 3D data acquisitions, processing, visualization, data management, and spatial analysis towards fully developed 3D geo-information system. A variety of new sensors (space, airborne, terrestrial) have contributed to accelerating the research in 3D reconstruction. As demonstrated by some authors in this book, integrated utilisation of sensor data will allow for fully automatic approaches for 3D data reconstitution at various Levels of Detail. However, due to the rapid developments in sensor techniques large amounts of 3D data have become available. This poses new challenges to storage and management. Emerging visualisation applications such as 3D globe based interfaces, navigation systems presenting a 3D perspective, etc, have greatly contributed to acceptance and understanding the benefits 3D systems. These visualisation environments have to be further developed towards spatial queries, simulations, etc.

The critical topic in 3D remains the modelling process. In the last decades a large number of geometry and topological models have been researched and tested. 3D models can be maintained in TEN (Tetrahedral Network), constructive solid geometry (CSG) models, TIN boundary representations, 3D layered/topology models, voxel based models, 3D polyhedrons-based models, but a limited number of solutions are available on the market. 3D topological models are still only in the research labs. They are expected to boost 3D analysis and 3D simulation techniques, which will

enrich the 3D spatial applications. In the last years much attention has been given to 3D indoor building models and possibilities to integrate construction designs with existing 3D geo-information. Several attempts have been already reported to bridge 3D formal models used in Architecture, Construction and Engineering (ACE) and GIS, which opens new exciting areas for research and developments.

Indeed these dynamic developments require intensive dialog between researchers, developers, data providers and users. It is also very important to document appropriately the progress that is made. This book is an attempt to achieve this goal. This book contains twenty-six full papers prepared by the contributions of sixty-nine authors. The papers are organized in two parts. Part I contains three chapters that are the invited keynotes related to 'From Map to GIS and Virtual Geographic Environments', 'Introduction to Korean Land Spatialization Program', and 'Introduction to CityGML'. Part II contains twenty-three chapters that are organized in five themes: 3D Data Models, 3D Database Management, 3D Data Acquisition and Processing, 3D Data Analysis and 3D Geo-Visualization.

The papers in this book are selected from the Third Workshop on 3D geo-information, 13-14 November, Seoul, Korea (http://3DGeoInfo.uos.ac.kr). The papers in this book have been thoroughly reviewed by three members of the international programme committee. The authors of the best and most original submissions were asked to submit revised versions based on these comments. Two similar previous events took place in Kuala Lumpur, Malaysia, on 7-8 August 2006 and Delft, on 12-14 December 2007. The selected papers from the first workshop were published in 'Innovations 3D Geo Information Systems' edited by Abdul-Rahman, Zlatanova and Coors, Springer-Verlag, 2006 and the papers from the second were published in Van Oosterm, Zlatanova, Penninga and Fendel (eds) 'Advances in 3D Geoinformation Systems', Spinger-Verlag, 2008.

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