

Rüdiger Mach
Peter Petschek

Visualization of Digital Terrain and Landscape Data

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A Manual

With 264 Figures

Autodesk®

 Springer

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Dedication and Acknowledgement

For Christine, Wolf and Ruven (thank you all for just being there)

Rüdiger Mach

For Luciana and my parents

Peter Petschek

The list of the Kind, the Patient and the Helpful who have contributed to this book now includes the following very special persons: M. von Gadow (It is only thanks to Marga, that the English version came into existence), Prof. K. von Gadow, Dr. S. Ervin and Y. Maurer.

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Foreword

This book reflects a profound change that has taken place in the practice of landscape architecture and planning in the past twenty years. Traditional modes of representation – pen, pencil, watercolor, marker, *et al* – have been supplanted by digital modeling and animation. This transformation is not just in the medium of representation, however; it is more than a substitution of one marking device for another, such as may have been the case in the past when, for example, mechanical pens with cartridges replaced pens with nibs that were filled by dipping. Even changes such as that had their impacts (as longer straighter lines, for example, or more precision in details became possible) on the interplay between designer, design medium, and designed artifact(s). The emergence of digital media as representational tools for designers has accompanied a transformation in the language of discourse in design and planning, in the very conception of the designed world we live in, and in the substance and role of the essential representations and abstractions used by planners and designers.

In the past, when 2D planar representations (drawings, usually on paper) served as the conventional means of communication for designers (both with themselves and with others), physical objects or arrangements in 3D were transformed into a series of lines in 2D (plans, sections, elevations, e.g.) by the draftsmen's and renderers' craft; those lines and images were then reconstructed by the viewer's "mind's eye", into a virtual construction, and evaluations and judgments were rendered, as to beauty, fit, function, etc. This stylized communication, still largely in place in many engineering, design, and construction contexts, depends upon a system of conventional signs and symbols, and in most cases, professional training, to achieve good communications (a high 'signal to noise ratio'). For many ordinary lay persons, the highly stylized 2D representations such as contour plans of terrain are virtually incomprehensible, and so the 'artists' conception', 'illustrative sketch', and 'perspective rendering' are widely used to convey basic 3D form, color, and texture so that the observer's mind's eye has less work to do. These 3D artists' renditions however, in spite of techniques that increasingly make them appear 'photorealistic', have a deserved reputation for bias and fictions, as the artists' subjectivity,

agenda of persuasion or selling, and media-dependent distortions, often overwhelm the objective basis of the proposed plans.

With computer graphics and digital modeling techniques, the potential for distortion and variable interpretation is no less; but the technical details are much changed. The advent of affordable, complex, sophisticated software running on powerful desktop computers has brought the possibility of combining and exploring objectivity and subjectivity in new and exciting ways. With computer graphics visualizations, and techniques such as those detailed in this book, the hand of the artist (the designer, or renderer, or visualizer) is once removed from the artifact; and yet the final visualization is closer to an intermediate virtual representation. Whereas the watercolor renderer of old chose brush, paper, and color, and applied strokes and washes directly, in a deft moment that permitted little hesitation and with very little chance for re-doing or erasing, the modern digital artist has both more choices, more leisure, and a whole new universe of design possibilities, in the virtual world. These 3D visualizations have taken the place both of final artist's conceptions, and of designers' initial sketches and preliminary models. Their transforming role in both the 'praxis' and the 'poetics' of landscape architecture is undeniable.

Twenty-first century digital techniques allow for many subtle variations and transformations, for collage and assemblage, for un-doing, re-doing and for tracking multiple variations in the process of making virtual models and their visualizations. Modern digital artists 'sample' the real world in a variety of ways – much as modern musical artists sample music for remixing --, measuring, surveying, photographing, digitizing, generating, transforming, and combining data both from the objective world and from their designerly imaginations. The virtual models they create have a status all their own, independent either of the real-world conditions they may seek to illustrate, or the renderings and animations that will be produced from them. The images produced by software from these models can have an objective factual basis as accurate as their creator wishes; while at the same time, can contain fantastic and singular objects, phenomena, and effects in ways unimaginable just twenty years ago.

This book is a guide to this rich and evolving world of possibilities. The authors combine the speculative and adventurous curiosity of the academic and researcher with the rigorous and realistic experiences of the practitioner. Rüdiger Mach and Peter Petschek each bring their own particular viewpoint and experience, gained from both hypothetical exercises and reality-based work. Their facility with modern digital tools, both as science

and as art, combined with their deep experience of built works and social processes, gives this book its unique flavor and value.

Although many of the basic techniques presented here have been known and used for some time, and some are now built-in to modern modeling and rendering software, their best uses and combinations are still being discovered. Putting them all together, providing a synthesis of both possibilities and opportunities with constraints and actual needs, is the great contribution of this volume. The discipline of landscape architecture provides a perfect testing ground for these approaches, covering as it does the broad range of human, technical and environmental concerns, from urban open space plans to residential gardens and regional forests and wilderness preserves. The essential subjects of landscape – terrain, vegetation, water, and the atmosphere that suffuses them – provide technical challenges to computer modeling, being as they are curved, irregular, fuzzy, fractal, fluid, ethereal, and dynamic. The technical approaches to modeling and visualizing these objects and phenomena are still emergent, but some techniques are well enough established that they can be and are effectively used today. The authors provide examples in the text of these techniques and projects across a range of scales and contexts, tied together with an orderly and structured approach which starts with systems of measurement and concludes with practical examples of workflow and organization of a real-world visualization project. Ethical concerns for creators of visualizations, as well as emergent techniques for collecting real time data and working with digital video are also covered.

This book is not so much a smorgasbord of digital techniques, as a well-conceived multi-course meal, with each part contributing to the overall effect.

Enjoy the feast!

Stephen M Ervin
Harvard Graduate School of Design
August 2005

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