Andrew U. Frank Werner Kuhn (Eds.)

Spatial Information Theory

A Theoretical Basis for GIS

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Foreword

COSIT, the Conference On Spatial Information Theory, has become a regular event for scientists who are interested in the understanding and representation of spatial information. It is a truly interdisciplinary meeting, where common problems are approached from the viewpoints of many disciplines. It is not only multi-disciplinary, as results from many different disciplines are necessary to achieve a complete picture; but interdisciplinary in the sense that an approach from one discipline must be combined with approaches from other disciplines to allow for new questions to be posed.

Spatial Information Theory brings together three fields of research of enormous importance for the Geographic Information System (GIS) technology:

- spatial reasoning,
- representation of space, and
- human understanding of space.

These three strands of research, two more technical and the third more cognitive, are concerned with Geographic or Environmental Space, i.e., the space which is populated with immovable objects larger than human beings and in which humans move around to learn about it.

Spatial reasoning is oriented towards the logical deduction of spatial information from spatial facts; it is related to formal logic and deduction. *Representation of space* has its roots in the tradition of Artificial Intelligence, but it is also practically important for the design of spatial data structures. Spatial Information Theory brings these efforts together with the discussion of *human spatial cognition*. How do people think about space? What logical (or illogical) conclusions do they draw? What spatial aspects can be represented in natural languages? What are the components of spatial information? These questions connect efforts that focus on the understanding of space from the cooperating fields of philosophy (spatial ontology), linguistics, and psychology.

COSIT'95 documents the advances in the field of spatial information theory during the last five years since the NATO Advanced Study Institute on Cognitive and Linguistic Aspects of Geographic Space [Mark and Frank 1991]. After a conference in Pisa (Italy) in 1992, with a similar title [Frank and others 1992], the first COSIT conference was organised in 1993 on the Island of Elba (Italy) [Frank and Campari 1993]. Many references to papers from these meetings have appeared in the literature, demonstrating the continuous and growing interest in the subject of spatial information theory.

This year, 78 papers were submitted to COSIT by scientists from all over the world, slightly more than half of them from Europe and most of the rest from North-America. The submissions showed great variety, ranging from contributions improving on previous results, to reports on new observations and hypotheses, to reviews of the 'state of the art' and discussions of new approaches. The authors came from a wide variety of disciplines, namely Computer Science (20), Geography (20), Spatial Reasoning (10), Cognitive Science (8), Linguistics (3), Surveying (3), Artificial Intelligence (3), Planning (3), Psychology (3), Engineering (2), Cartography (1), Philosophy (1), and Management (1).

Each paper was reviewed by three experts, at least two from the same or a closely related discipline as the authors. The reviewers were generally very diligent and provided high quality assessment of the papers, often with extensive comments to the authors for possible improvement of the presentation. The program committee and the additional experts who willingly took on the burden of careful review made a strong contribution to the quality of the conference and of this book. The choice of the 36 papers which could be presented in the single track conference program was extremely difficult, but we are confident to have succeeded in selecting a stimulating and balanced program.

Sabine Timpf has organized a 'Doctoral Consortium' immediately following the COSIT'95 conference. It provides an opportunity for young scientists to present their research topics to their peers and to discuss them with experienced researchers. For this consortium, we are preparing a set of papers on work in progress as a separate volume (available from the Department of Geoinformation at the Technical University Vienna).

The conference organization was in the hands of the staff of the Department of Geoinformation. Sabine Timpf contributed much to the entire organization and Roswitha Markwart, Irene Orchard, Edith Unterweger, and Rebecca Winn worked long hours to deal with the administrative side. Their contribution is gratefully acknowledged. The conference was only made possible by the combined efforts of all the authors who submitted papers, and of the reviewers who helped to select the best contributions and to improve the presentation. We gratefully acknowledge their contribution.

Vienna, July 1995

Andrew U. Frank

Werner Kuhn

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