

## COSIT Conference Series

COSIT, the Conference on Spatial Information Theory, is one of the key conference series that has marked the evolution of GIS from geographic information systems to geographic information science. The conference grew out of meetings organized by the US National Center for Geographic Information and Analysis (NCGIA) in 1988-1990 and especially the NATO Advanced Study Institute held in Las Navas, Spain in 1990. This COSIT “zero” led to the establishment of a regular, bi-annual conference with the theme “Spatial information theory—A theoretical base for GIS”.

### Las Navas, the beginning

The NATO Advanced Study Institute in Las Navas del Marquez (near Avila, Spain) in 1990 was a starting point for the recognition of the role of scientific theory and spatial cognition in the GI science domain. The title of the meeting was “Cognitive and Linguistic Aspects of Geographic Space” and was founded on the then current belief that through language an easy—at least easily observable—access to human cognition was possible. The meeting brought together for the first time GI scientists, linguists, philosophers, and formal scientists (those who are concerned with abstract forms of representation such as logic, mathematics, and structured programming languages). Many important cross-disciplinary linkages were forged at this meeting.

Observation of verbal expression to learn about human cognition was introduced to cognitive science by one of its founders, Herbert Simon, through ‘think aloud protocols’. As a consequence, George Lakoff and Len Talmy, linguists with an interest in spatial cognition, contributed an analysis of the metaphorical use of language using spatial concepts. Examples include a static spatial situation described in terms of movement (the road runs along the valley), time expressed in spatial terms (we step into the future) or non-spatial situations expressed spatially ( we are at a cross-roads in our relationship). Previous work had established that terms for directions were often metaphorically derived from body parts (“facing”, “in your back”). These research concerns directly influenced later work by many of the meeting participants (including Campari, Freksa, Frank, Hernandez, Kavouras, Kuhn, Mark), especially in trying to identify spatial Image Schemata.

Other items on the agenda of the meeting covered topics that have later become important in GI science. Discussions with the formal scientists led to consideration of computational models of how humans understand and communicate about space. Presentations about conflicts in the philosophical foundation of cognitive science led participating GI scientists to begin considering the ontological bases of their work. Other later research themes that were inspired by this meeting include:

- Investigations of *cultural differences* in spatial cognition and what is common for all humans (so called *universals*).

- Wayfinding as a research paradigm to advance understanding of human spatial cognition.

Map semiotics as a means of communicating spatial information through cartography.

Formal tools provided in various branches of mathematics as a means to advance research in spatial cognition.

User interfaces, especially spatial query languages, reconsidered from a linguistic and cognitive viewpoint.

### **The COSIT meetings**

The COSIT series started in 1992 in Pisa (Italy) with the international conference titled “GIS—From Space to Territory: Theories and Methods for Spatio-Temporal Reasoning” organized by Frank, Campari and Formentini. A COSIT meeting is now held every second year, alternating in principle between locations in Europe and America. The conference is held in remote sites and has a single track of sessions to allow intense interaction between the typically 80 to 100 participants from multiple disciplines (typically Geography, Computer Science, Surveying and Mapping, Cognitive Science, Mathematics, Linguistics, Planning, etc.)

The conference was the first GIS conference with all papers submitted as full text and reviewed prior to acceptance for inclusion in the program, imitating the typical procedures of computer science conferences. About one third of the submitted full papers are accepted for presentation and publication. The proceedings are published by Springer as Lecture Notes in Computer Science and are therefore found in many libraries and bookstores, which contributes to the high citation rate of papers published in COSIT proceedings.

The conference was started to establish a counter-point to several concurrent applied GIS conferences at which reports on applications and development in GIS technology were made but often without a contribution to scientific theory and literature. The focus from the beginning was on theory, especially theories of space and time as relevant for constructing GIS theory. This was successful, as over the years, gradually more papers on temporal aspects appeared and papers, building on previous publications, advance scientifically, but keeping the original focus on large-scale space (i.e., spaces too large to be seen from a single vantage point). The interest is in human cognition, but contributions discussing issues of robot navigation have been fruitful. Ontology of space themes have become more prominent since 1995. Originally, most papers assumed (near) perfect spatial information, but recently, a number of papers have discussed uncertainty of spatial information, leading the path to a better understanding of how spatio-temporal data is treated cognitively and in computer systems.

Andrew U. Frank

## Website

COSIT.info, [www.cosit.info](http://www.cosit.info)

(Frank et al. 1991)(Frank et al. 1992; Frank et al. 1993; Frank et al. 1995; Hirtle et al. 1997; Freksa et al. 1999; Montello 2001; Kuhn et al. 2003; Cohn et al. 2005; Winter et al. 2007)

- Cohn, A. G. and D. Mark (2005). Spatial Information Theory COSIT '05. Berlin Heidelberg, Springer Verlag.
- Frank, A. U. and I. Campari, Eds. (1993). Spatial Information Theory - Theoretical Basis for GIS (European Conference on Spatial Information Theory COSIT'93). Lecture Notes in Computer Science. Berlin-Heidelberg, Springer-Verlag.
- Frank, A. U., I. Campari and U. Formentini, Eds. (1992). Theories and Methods of Spatio-Temporal Reasoning in Geographic Space. Lecture Notes in Computer Science 639. Pisa, Italy, Springer Verlag.
- Frank, A. U. and W. Kuhn, Eds. (1995). Spatial Information Theory: A Theoretical Basis for GIS (International Conference COSIT'95). Lecture Notes in Computer Science. Berlin-Heidelberg, Springer-Verlag.
- Frank, A. U. and D. M. Mark, Eds. (1991). Cognitive and Linguistic Aspects of Geographic Space. NATO ASI Series D. Dordrecht, The Netherlands, Kluwer Academic Publishers.
- Freksa, C. and D. M. Mark, Eds. (1999). Spatial Information Theory (Int. Conference COSIT'99, Stade, Germany). Lecture Notes in Computer Science. Berlin, Springer-Verlag.
- Hirtle, S. C. and A. U. Frank, Eds. (1997). Spatial Information Theory - A Theoretical Basis for GIS (International Conference COSIT'97). Lecture Notes in Computer Science Vol.1329. Berlin-Heidelberg, Springer-Verlag.
- Kuhn, W., M. Worboys and S. Timpf (2003). Spatial Information Theory Foundations of Geographic Information Science. Intern. Conf., COSIT 2003, Kartause Itting, Switzerland, Springer-Verlag.
- Montello, D. R. (2001). Spatial Information Theory: Foundations of Geographic Information Science, International Conference. COSIT 2001, Morro Bay, CA, USA, Springer-Verlag.
- Winter, S. and M. Duckham (2007). Spatial Information Theory COSIT '07. COSIT 2007, Mt. Eliza, Melbourne.