Constructing and Understanding Visuo-spatial Representations in Design Thinking

vsdesign'06 – A Design Computing and Cognition 2006 Workshop

Eindhoven, The Netherlands

Call for Participation

The vsdesign'06 workshop advertises an open call for contributions.

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The role of the committee is to review submissions, as a basis for deciding which contributions will be included in the workshop program. Attending committee members will form the workshop's discussion panel.

Aims Visuo-spatial reasoning is an interesting subject for research areas focused on problem solving. Designing is frequently described as a problem solving process; design problems, however, are often ill-defined problems. In terms of problem solving attributes, this means that (a) either the initial problem representation, (b) the description of the design goal, or (c) the methods and procedures to reach the latter from the former are partially unknown at the outset, and that, potentially, all three are.

Explorative methods aimed at increasing this knowledge often involve defining and re-defining a given problem. Design thinking and, in particular, problem solving in design involves constructing internal (mental) representations, many of which draw on visuo-spatial memory systems. Similarly, externalizing mental representations plays a principal role and can be seen as a prime example of problem re-defining. For many visual and spatial problem types, sketches and diagrams correspond to visuo-spatial mental representations and re-representation cycles involving both sides can be seen to capture the essence of many design reasoning processes.

Mental representations can be externalized at different levels of abstractions (e.g., visual, spatial, or conceptual abstractions). In this way such externalisation conveys specific meaning to the person who generates them, and may convey different meaning to others. How sketches and diagrams are externalized may be closely related to how they have been mentally constructed in the first place.

The issues addressed by this workshop will focus on the construction of internal and external representations as well as on the understanding and interpretation of them. Constructing visuo-spatial representations refers to the making of spatial models and/or visual representations of the necessary elements either internally or externally to be used in a problem solving activity. Tracing the construction of visuo-spatial representations may inform design research about how conceptions are formed, developed, represented and re-interpreted. Understanding visuo-spatial representations refers to revealing what meanings visuo-spatial representations convey and what they may reflect about design thinking. Developing an understanding of visuo-spatial representations therefore also refers to the problem types and research methods.

In light of the multifarious aspects surrounding constructions of visuo-spatial representations a number of topics will be addressed by the workshop in the following four areas.

1. *Understanding visuo-spatial representation in design:*
    - How can we empirically and theoretically assess the relevant processes and representations involved?
    - Which phenomena and artifacts do we have to look for? How should we look for them without influencing the construction and understanding processes (and thus changing the system)?
    - How can we optimize our investigations and keep data collection and analysis efforts minimal (e.g., in coding schemes, linkography, thinking aloud methods, recording-based methods, post-hoc reports, expert ratings, etc.)
2. *Constructing percepts/concepts in design:*
    - What roles do visuo-spatial representations play in understanding the design problem and in structuring the problem domain?
    - What are the crucial factors involved (i.e., representation types, process types, phenomena, etc.)?
    - What is the role of sketching as a reasoning activity? How does the process as a combined internal/ external activity relate to

both internal and external representations?

- How do variants in construction affect understanding?
- Is an understanding of the problem a prerequisite to constructing internal and/or external representations? Or does understanding follow largely from the construction process itself?
- Does the type of problem as an ill-defined problem influence the construction and/or the understanding of visuo-spatial representations?

3. *Modeling reasoning by construction:*
    - How can we conceptually and computationally model the relevant processes and representations involved?
    - How can we model these adequately/effectively with respect to
        a. developing a better understanding and description of phenomena,
        b. developing a better understanding of a specific designer's behavior and cognitive states during design processes, and
        c. developing computational tools and agents that are well tailored to the specific designer's behavior and cognitive states and are able to offer assistance in constructing and understanding representations during specific design processes.
4. *Cognitive and user modeling issues*:
    - Which computational approaches are suitable? Do we need complex cognitive models or simple architectures?
    - What can be achieved with simple (e.g. rule-based) processing models?
    - Where is the connection to user models and models employed for system usability tests?

It is the general objective of the topics outlined here to attract participants that represent a number of disciplines.

Significance

Internal and external representations play an essential role in visuo-spatial reasoning. An individual's ability to produce, interpret and understand both internal and external representations significantly influences aspects of their mental, physical, social, and cultural activities. The process and product of constructing internal and external representations (of the environment and the diverse artifacts contained in it) remains a nascent area for research. Given the importance of visuo-spatial reasoning, understanding the construction of internal and external representations is of cognitive, economic, as well as cultural importance.

For these reasons, visuo-spatial representation and reasoning has become the focus of intense research efforts. This workshop brings together a number of communities, such as those studying the design process and those studying cognitive systems, with a general goal of finding ways to understand and model visuo-spatial representations.

Of central importance to cognitive processes surrounding the construction of internal and external representations is the interplay between different types of knowledge, such as abstract, conceptual knowledge and perceptually-based knowledge. Visuo-spatial reasoning comprises the cognitive processes that link these different types of knowledge. It is the understanding of such links that may provide insights to potential ways to understand and model how internal representations are constructed by the observer, as well as how external ones are interpreted by them.

The process of designing reflects the interplay between different types of knowledge. At its core, designing is a cognitive process involving visuo-spatial imagining, sketching, and reasoning. Designers are trained in constructing internal spatial representations and experts in reasoning about external ones. However, our understanding of how designers and individuals in general, construct and reason about representations falls short and we are only beginning to learn in detail how this happens.

Research into constructing and reasoning about visuo-spatial representations forms the focus of this workshop. Increasing our understanding could make significant contributions to the effects of cognitive processes in design processes. By bringing together different research communities, the results of this workshop are likely to have implications not only for the design domain but also in others such as: wayfinding and navigation, reasoning about maps and graphs, interface design, artworks and the many other visual fields that are used today.

Format

The workshop will take place before the DCC'06 conference on the morning of Sunday, 9 July 2006, from 9:00am to 12:30pm. The workshop will start with a brief introductory talk that addresses the position paper and focus questions. Next will follow presentations by the authors with discussions. There will be two main sessions with one 30 minute break in-between.

The workshop will conclude with a 30-45 minutes panel discussion with committee members. Depending on the contributions and the participants' interest, a subsequent special edition of the AIEDAM journal will be proposed.

Submission

Participants who would like to make a contribution are asked to submit a one-page abstract in reaction to the position paper together with a brief CV / description of research interests. The committee members will review the submissions to the workshop. Based on this review process, 5-6 submissions will be included in the workshop program. These submissions will be distributed among the group of participants, together with a short list of key questions that should be addressed in the talks at the workshop.

Abstracts for review (1 page maximum) must be submitted electronically in Acrobat PDF, RTF or Microsoft Word formats. Abstracts should be formatted according to the DCC'06 paper guidelines.

Please submit your workshop paper to the chairs by sending an email to vsdesign06@informatik.uni-bremen.de.

Important Dates

Friday, 12th May 2006	Submissions due
Monday, 29th May 2006	Notification of acceptance
Friday, 9th June 2006	Revised submissions due
Sunday, 9th July 2006, 9:00 - 12:30	Workshop

Participants and Attendees

As the topic of the workshop spans multiple disciplines, we seek participation from individuals with one or multiple background(s) in architecture, design research, computer science, or in the cognitive sciences.

In addition, anyone interested in attending the workshop is welcome to do so (space permitting). Registration for the workshop is available through the DCC'06 conference web site or on site at the day of the workshop.

Registration Fees

In accordance with the conference's policy, workshop registration for DCC'06 conference attendees will be €35.00 and for those not attending the conference €65.00 to cover the base costs.

All workshop attendees will have to register.