On the Role of Spatial Analysis in Design Synthesis -
the Case of Wayfinding

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Extended Abstract

Over the past five years we have investigated the design knowledge and processes of architectural designers with a focus on wayfinding design. As we will argue in this workshop contribution, designing for wayfinding provides some unique challenges of integrating analytic and synthetic competences of the design professional and consequently requires a multi-method approach of the design cognition researcher.

In the field of spatial cognition we find a long tradition of investigating the cognitive processes underlying human orientation and navigation abilities in natural and built environments. Cognitive and environmental psychologists have described a number of environmental features that influence and shape human wayfinding in urban and indoor environment, including visual access, layout complexity, architectural differentiation as well as signage and maps for navigation (e.g. Weisman, 1981). Architects like Romedi Passini (1984) as well as information designers (signage / maps) have prescribed corresponding design criteria for design professionals.
By contrast, the academic literature is rather limited on how architectural designers incorporate wayfinding into their design activities, especially when specifying large, public buildings, such as transport terminals, healthcare facilities or university buildings. We have combined expert interviews, design studies and systematically controlled cognitive/perceptual experiments to elucidate which knowledge, skills and processes characterize successful design activity with respect to supporting wayfinding in complex indoor environments.

We started out with a series of expert interviews with practicing architects in Germany and the United Kingdom (Brösamle & Hölscher, 2007, 2008). Addressing wayfinding issues turned out to be one of many aspects under consideration by the designer in his/her multi-faceted design activity. Wayfinding was described as strongly intertwined with other design issues and thus its role can be described in terms of iterative switching of focus regarding different dimensions of design constraints (Bertel et al., 2007).

These expert interviews revealed remarkable differences in how architects argued about the building as whole vs. how they tried to mentally anticipate how buildings users might react to design decisions, and this was systematically reflected in verbal utterances. While in their general assessment they were able to integrate information about spatially dispersed configurational properties, their anticipation of user behaviors was rather localistic. From this study we conclude that the systematic anticipation of the users’ situation immersed in a complex building is a demanding task for the designing architect. The limited scope of the architect’s user anticipation is seen as an indicator of a potential mismatch between an analytic requirement (analyzing potential user behavior) and an otherwise highly synthetic task structure characterized by highly dispersed information and rapid switches in focus and integration across locations for making configurational decisions.

In the expert interviews and subsequent design experiments, it has also become increasingly evident that understanding the design knowledge and procedures of our informants cannot be adequately achieved by only analyzing their verbal protocols. In fact, the architects constantly refer to graphic elements in their descriptions, be it hand-made sketches or detailed floor plans provided by the interviewer. We have developed new tools for analyzing such a multi-modal corpus of verbal and gesture data (Brösamle, Hölscher & Dalton, submitted). Again we find specific patterns in gesture usage while wayfinding issues are considered by the designers, e.g. 3D gestures indicating vertical movement relevant in multi-level settings.

Much of the expert knowledge brought to bear for designing building layouts and corridor systems is based rather informal and intuitive reason-
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The architectural theory of space syntax (Hillier & Hanson, 1984) provides an approach of making at least part of such knowledge explicit, and offers a set of analytic techniques to predict human movement, including some facets of wayfinding by analyzing spatial relations in a building. In a design experiment (Al-Sayed et al., 2010), we investigated to what extent architects with formal training in space syntax differ from those without such training in designing an office environment. The results of this study suggest that these architects refer more to functional concerns of human movement in their verbal commentary and that they show a stronger orientation towards a user perspective while solving the design task. An analysis for design outcomes, i.e. the layouts proposed by the participants, shows an increase in supposedly wayfinding-friendly design features, like a simplified hallway configuration. This can be seen as a positive example of how an analytic approach to capturing environmental features can positively inform design reasoning and the synthetic task of allocating corridors and room functionality in a potentially complex building.

In a controlled experiment, architects and laypeople were asked to judge the complexity and wayfinding-friendliness of a series of building layouts (Hölscher & Dalton, 2008). These layouts were presented either from a top-down plan view (allocentric) or as a movie, thus from the ego-centric perspective of a person following a route along the corridors in the building. We find systematic differences in the assessments of experts and laypeople, and these interact with the presentation modality, with expert assessments leaning towards the allocentric plan view which allows for simultaneous inspection of the layout as a whole. In the same study we investigated to what extent measures from space syntax can predict the judgments of experts as well as novices and thus how much of their intuitive assessment of complexity or navigability can be directly captured by such an analytics-oriented approach.

Finally, an in-depth protocol study was conducted on how an architect and two cognitive scientists address the challenge of introducing empirical-analytic techniques into the design process (Brösamle, Mavridou, Hölscher, accepted). More specifically, they jointly planned for an experimental investigation of building usability as part of an evidence-based design approach. The main aim of this approach was to test how the different perspectives of the two disciplines can be connected, with cognitive science introducing an analytic, empirical approach of isolating individual environmental factors. Analysing the session protocols revealed further evidence for the friction between such inherently analytic approach and a “holistic” architectural design practice that has taken into account a multi-
tude of constraints and often introduces rapid and radical changes to an evolving design proposal.

In this workshop contribution we are connecting these strands of investigation for the first time. Taken together, wayfinding has an unusual status in design practice as it links very different requirements. Clearly, wayfinding usability competes with other design issues, and architects show individual differences in how they handle this factor. We find significant differences between the architect’s and the building user’s conceptualization of complexity and navigability, pointing to difficulties of the architect’s for putting themselves in “the user’s shoes”. One important issue for bridging both differences between architects and users, and between analytic and synthesis-oriented facets of designing will be to successfully incorporate a cognitive perspective as part of an evidence-based design approach.

References


