

The role of roomware and sensing technology for supporting narratives in ubiquitous computing environments

Matina Halkia*, Norbert Streitz**

*Starlab Research Laboratories N.V.
Sint Michielslaan 47
Brussels, Belgium
Email: matina@starlab.net

**GMD - German National Research Center for Information Technology
IPSI - Integrated Publication and Information Systems Institute
GMD-IPSI, Dolivostr.15, D-64293 Darmstadt, Germany
Email: streitz@ darmstadt.gmd.de

In our view, the study of situated interactions in office environments requires consideration of the following design spaces: mental and social space, information space as well as the physical environment enveloping it (Streitz *et al.*, 1998). It also requires extending context-awareness methods to make accurate and meaningful inferences about human activity in physical space (Halkia & Solari, 1999).

In this workshop, we would like to emphasize the importance of the architectural component in situated interactions and the need to translate the specificity of “place” of physical environments in the information landscape. Buildings in general, and as an example, working environments, have a language of implicit communication, which transparently prompts us to behave accordingly in different types of spaces. In a large public hall with resonant walls we are likely to be quieter than in a room of absorbent cladding. In a corridor we are likely to be moving than standing, in a very important executive office we are likely to be more attentive, careful or formal than in the entrance hall. The cues of physical space whether established by symbol or convention, or communicated by form and material, condition our behavior and movement, and importantly so, our ability to absorb or manipulate information. Physical cues can modify context-awareness and by analyzing action in physical environments we can make useful assumptions about social and organizational context.

We would like to propose introducing narrative and/or cinematic techniques in situated interactions to ensure engaging, cohesive, interactive experiences for people. This may take the form of “scripting of events” in ways that are both predictable and unexpected within a range of possibilities that does not confuse or undermine the user’s trust in the system. A useful working term in developing narrative interactive structures is the “memory of the building” whereby the physical envelope is understood as an interface in relation to time rather than as a surveillance or control tool.

Functionality in these information-enhanced, collaborative environments can be achieved by providing so called roomware components (Streitz *et al.*, 1998), i.e. combining familiar interfaces and tools, such as physical objects, chairs, tables, bulletin boards or wall surfaces, pens, key

chains with known or emergent computer functionality. Existing examples are CommChairs integrating a chair with a laptop computer, Dynawalls integrating collaborative working methods in writing boards, and InteracTables incorporating intuitive physical gestures in the manipulation of information objects. The Passage mechanism demonstrates how a physical object can be enhanced with information capabilities without obstructing the natural use of the object (Konomi *et al.*, 1999).

Designing in context-aware situations requires sensing devices and technologies that can “read” presence and action of people in physical environments as well as meaningfully draw inferences about the dynamic evolution of organizations in time. MUSE is such a system, enabled by a sensor board (TEA board) by Schmidt (*et al.*, 1999), which reads light and sound levels as well as detects motion. Using infrared technology we were able to detect presence and location of people and by combining data from the sensor board, and the specific location of events, we were able to make useful distinctions between public and private meetings, importance of office activity, working patterns etc (Halkia & Solari, 1999).

In the future, we will explore how to play out interactive scenarios for social contexts and increased productivity in the workplace in a series of room types and in a continuous, cohesive, and engaging physical space. We will explore traditional design methodologies and their use in hybrid spaces – virtual and real – to ensure simple and effective information manipulation without the drawbacks of information noise or information redundancy. We will also explore non-electronic characteristics of objects and spaces that can be used to tag electronic documents or information objects onto them, therefore assign physical objects to “aware” information without reverting to hardware components.

It is necessary that these aware buildings, integrated furniture and enhanced office aids have a robust and a flexible network infrastructure, which will have to be interoperable, affordable, reconfigurable and safe. It is also important that the network solution will be transparent and will not require drastic physical changes in the building envelope.

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