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# Towards Embodied Spatial Interaction

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**Abstract**

As we enter the age of ubiquitous computing, where computers are worn, carried or embedded into the environment, we must be careful that the ideology the technology embodies is not blindly incorporated into the environment as well. As disciplines, engineering and computer science make implicit assumptions about the world that conflict with traditional modes of cultural production. Space is commonly understood to be the void left behind when no objects are present. Unfortunately, once we see space in this way, we are unable to understand the role it plays in our everyday experience. Space is never merely a neutral background for human activity; culture is built into its forms. The social nature of the interface allows us to situate it within Henri Lefebvre's notions of space as a social product and provides new tools for thinking about how computing practice engages space and opens avenues to rematerialize the environment through embodied interaction [1].

**Keywords**

Embodied interaction, design practice

**ACM Classification Keywords**

J5. Computer Applications, Arts and Humanities.

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## Introduction

In [2] Lefebvre argues that any attempt to understand the contemporary world that ignores spatial considerations are both partial and incomplete. The meanings that we attribute to space are inextricably bound with our understandings of the world in which we live. Our basic understanding of the world originates from the sensory spatial relationship between our body and the world. Our understanding of space is directly related to our understanding of the space of our body, which has long been sundered in Western culture by the Cartesian duality. If we do not accept this separation, what is the resultant space?

Lefebvre confronts considerations of space that reside “comfortably enough within the terms of mental (and therefore neo-Kantian or neo-Cartesian) space.” His central claim, that space is a social product, directly challenges the predominant “idea that empty space is prior to whatever ends up filling it.” [2]. Lefebvre’s re-conceptualization of space is, at least partially, related to his conception of the body and its place in Western culture.

“Western philosophy has betrayed the body; it has actively participated in the great process of metaphorization that has abandoned the body; and it has denied the body.” [2]

Lefebvre describes the body, as he does many things, in the form of a triad: perceived–conceived–lived. Introducing a third term into the equation already destabilizes any notions of Cartesian duality. The body, as simultaneous subject and object, “cannot tolerate such conceptual division,” [2] and can be liberated through a production of space. This occurs, in part,

through the distinction between physical, social and mental space. Lefebvre states:

Social space will be revealed in its particularity to the extent that it ceases to be indistinguishable from mental space (as defined by philosophers and mathematicians) on the one hand, and physical space (as defined by practico-sensory activity and the perception of ‘nature’ ) on the other. [2]

The unique properties of social space allow it to become the site for reconciliation between the physical and the mental, concrete and abstract.

## Embodiment and Social Space

Social space can be broken down further into the triad spatial practice–representations of space–representational space. Lefebvre describes each as follows [2]:

1. Spatial practice, which embraces production and reproduction, and the particular locations and spatial sets characteristic of each social formation. Spatial practice ensures continuity and some degree of cohesion. In terms of social space, and of each member of a given society's relationship to that space, this cohesion implies a guaranteed level of competence and a specific level of performance.
2. Representations of space, which are tied to the relations of production and to the 'order' which those relations impose, and hence to knowledge, to signs, to codes, and to 'frontal' relations.

3. Representational spaces, embodying complex symbolisms, sometimes coded, sometimes not, linked to the clandestine or underground side of social life, as also to art (which may come eventually to be defined less as a code of space than as a code of representational spaces).

*Spatial practice* is closely related to perceived space. It is the space secreted by society, recursively reifying it. It falls between daily routine and the infrastructure that allows it—the actual routes and networks that organize the daily routine. Ultimately, it is in spatial practice where the effects of ubiquitous or pervasive computing design will be felt and internalized. Computing is part of the infrastructure that organizes daily life.

*Representations of space* refers to conceived space. It is the space of scientists, architects, urban planners and all who privilege the cognitive over the perceptual or lived. It is the dominant space in our society, and it is the space of contemporary visual and computing cultures. It is a mental space separated from physical space, or abstract space imposed on concrete space.

*Representational space* corresponds to lived space, it is where meaning resides. It is “directly lived through its associated images and symbols.” [2] It is the passively experienced space, which overlays physical space, which the imagination is able to change and appropriate. Representational spaces “tend toward more or less coherent systems of non-verbal symbols and signs.” (Lefebvre, 38) Embodied interaction moves the design of computing systems from representations of space to representational space, from conceived to lived space.

These spaces are not always clearly differentiable, they overlap and intermingle in varying intensities. Lefebvre states that in order to understand these three moments of social space, one can map it to the body. The spatial terms (spatial practice, representations of space, representational space) are analogous to the bodily triad of perceived–conceived–lived. (Lefebvre, 40)

Physical	Mental	Social
Spatial practice	Representations of space	Representational space
Perceived	Conceived	Lived

Table 3.1 Lefebvre's spatial and body triads

Lefebvre seems to imply that these triads are in some ways analogous although different. If social space reconciles the duality of the mental and the physical with a nature that is both abstract and concrete, one may also argue that representational space holds a similar position between spatial practice and representations of space just as the lived does between the perceived and conceived. If all interactions with computer systems are social, and the social is the space of embodiment, where mental physical and mental co-mingle, this is the location in which embodied interaction will operate. The layered interfusion of spaces presented by Lefebvre provides a rich framework for thinking about the possibilities of embodied interaction as it extends into everyday space

while simultaneously reflecting embodied interaction's careful negotiation between technology and human

**Citations**

[1] Dourish, Paul. *Where the Action Is: The Foundations of Embodied Interaction*. MIT Press, Cambridge, MA, USA 2001

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[2] Lefebvre, Henri. *The Production of Space*. Blackwell Publishing, Malden, MA, USA 1974