Tangibles for Social Interaction

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ABSTRACT
Even though collaborative aspects are central in most argumentations for tangible interaction, tangibles that are explicitly designed for such settings may not naturally fit within the standard discourse of this specific area. A theoretical focus has instead concerned either individual sensory experiences, or the technical sides of devices, often based on a paradigm of information processing. Neither of these perspectives takes into account *offline* aspects of interaction, which is essential when studying how tangibles are actually used in collaborative settings, as well as when tying back to the core arguments for why the resources have been given a physical form in the first place.

INTRODUCTION
An increasing number of researchers emphasises the use of tangibles in terms of social, physical, affective and collaborative activity [2, 5, 7, 9]. However, when looking at some of the often quoted systems, (e.g. the marble answering machine), they primarily address the needs of individual users, emphasising sensory experience of touch, and the cognitive benefits from working hands on with physical objects [see e.g. 11, 12].

The notions of input and output (and their relation to more or less 'internal' processes), is another topic that has been commonly brought to discussion. Ullmer and Ishii [14] have for instance conceptualised tangibles as devices that may simultaneously work as 'input' and 'output' to a computational system, and at other places the tangibles are considered merely as specialised 'input devices'. Sometimes confusion has aroused since the physical parts, even when they are offline, may come to replace objects that would otherwise be displayed on a screen, and also that arrangements in the physical space may be the only way that the system shows its actual 'state' [4]. What should be considered as 'input' and 'output' is then unclear.

EXAMPLE: INTERACTING WITH PATCHER
One of the results from my earlier explorations is a partly tangible system, Patcher [3], designed for collaborative making of screen-based systems (see Figure 1). An important part in this design process was that instead of focusing on the experience of touch, the goal of the tangibles was to support shared, social, simultaneous interaction. This resulted in a design that in some sense goes against the intuitions of physical manipulation.

The physical resources consist of a mat, a number of reader blocks, a set of plastic cards, and a large screen projection. Every command is based on the same physical action: placing a plastic card on top of a wireless RFID reader. Though the richness of the physical manipulation was limited, the fact that the resources were physical was a highly important aspect of the design.

Perhaps most importantly, the physical setting means that many of the interface actions become 'offline' and directed to the social setting, rather than to the software on the computer. Computationally enhanced physical cards may for instance be organised in a pile for later use, get held up, hidden, or handed between users as a means in the negotiation. When looking at how Patcher is used, it seems that these forms of "interface" manipulations are essential in the activity, both for collaborative purposes, and for planning and thinking about ideas before and along with letting them take effect on the computer.

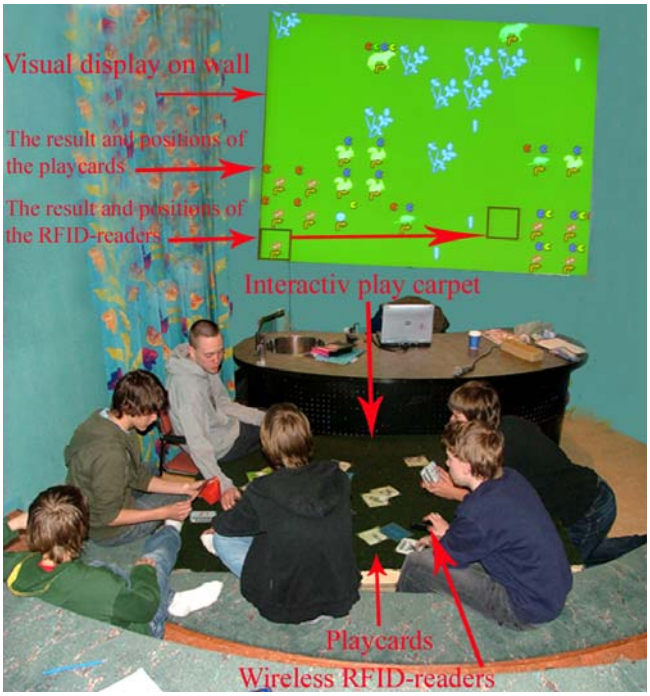

Figure 1. Interacting with Patcher, and with one another.

DISCUSSION

When studying how tangibles are used in social and collaborative settings, much of the actual interaction does not fit naturally within the cycle of transmitting information between users and computer systems. In the case of Patcher, it does not seem fruitful to regard the tangibles as input devices, or as devices for increased sensory experience, but instead as interactive resources in a broader sense. Important interactive qualities in collaborative settings are for instance the ability to incorporate gesture, and how a system – both in hardware and software – may support an increased range of ways for accounting for ones actions in a group, to negotiate interface actions, and to act socially around the resources. Moreover, individual experiences of touch cannot so easily be shared (unless users actually touch one another or the same artefact), and do in that sense not on its own address collaborative aspects of interaction.

All this is closely related to studies of people's actual interaction in technology rich settings, which have repeatedly indicated that knowing and doing are closely intertwined with properties in the physical and social circumstances of a situation. In human computer interaction these views are conceptualised in terms such as 'situated action' [13], 'distributed cognition' [6], and 'embodied interaction' [2]. Central to all these conceptions are that they seek to avoid simplified, dualistic perspectives on human action, such as distinguishing bodily actions from cognitive ones, or regarding interaction as a simple matter of 'input' and 'output'. A common theme is for instance to emphasise how knowledge and decision-making may be supported by, and even off-loaded, to resources in the environment.

One way of interpreting this development is that interactivity must be understood in terms of human *action*, rather than as representation and transformation of *information*. This also illustrates a need to balance ethnomethodological theories, theoretically limited to what is *observable* in the social space, and perspectives emphasising *personal and sensory* experience [e.g. 1, 10], which may in turn be more difficult to study empirically. This also implies a stronger emphasis on aspects such as social and physical *performance* with and around technology [8]. Central to this is how the physicality of tangible resources affords an increased set of user actions, and the challenge may be to let only relevant actions in a meaningful way take effect in software.

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