People Presence or Room Activity
Supporting Peripheral Awareness over Distance

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ABSTRACT

Peripheral awareness is a powerful human resource that has only recently been addressed in media space design. The challenge is to figure out what would be important to convey remotely *and* to strike a balance between too much and too little. Symbolic representation of remote activity is a powerful way to go, but as it turns out also easy to do wrong. This paper presents some early findings on problems and promises of using symbolism: it reports from informal studies of people using the AROMA prototype in regular office and home settings, and it conveys some lessons on designing appropriate and effective symbolic representations.

Keywords

Awareness; abstract, symbolic representation.

INTRODUCTION

Some recent designs in HCI have aimed at supporting awareness over physical distance. It has been recognized that a successful system would have to mind the proper middleground between *too little*: people should be made aware not alerted, and *too much*: people whose activity is reported should not be exposed unduly [1, 3].

Symbolic representation

A promising trend is to explore *symbolic representations* of captured activity data rather than just showing full video and audio. Symbolic representations are characterized by a certain intermediacy with respect to the events being represented, and reading the representations requires an interpretative effort by the user. Thus, an important question to address has been the extent to which the interpretative effort permit us to reach our goal of peripheral, low-attentive perception.

Recently we have seen different takes on symbolic representation: some designers use traditional output mechanisms such as video and audio, while others have been exploring the area of "tangibles" (i.e., non-computer-centric i/o services and devices) [2, 3, 4, 5, 6]. Common to the approaches is the aim for adequate symbolic representations of some remote events or states.

Pedersen&Sokoler have used minimalistic video/visual representations as well as tangibles in the AROMA prototypes [3, 4]. The visual representations are generally characterized by allowing several symbolic mappings to be applied simultaneously; more details about this kind of representations will follow. Smith&Hudson used auditive remapping to remove significant parts of the audio signals to make them less exigent [1].

The AROMA setup

AROMA representations are constructed of mappings *from* combinations of (possibly processed) activity data *to* visual effects that all together make up an active image on a wall-display. The activity data stem from, among others, sound signals that are picked up by microphones, condensed into a crude measure of change and transmitted to the remote site; similarly for capture, processing and transmission of visible movements and abrupt changes in light conditions.

Two main concepts of activity has been explored so far, differing in perceived notion of the source of activity

- Room activity, e.g., reporting levels of visual and/or auditory activity
- People presence, e.g., reporting activity as attributed to a certain number of people

The latter requires additional sensor data and processing to allow us to distinguish between people and other "movable" objects (pets, curtains moving in the wind): we used information from a counting device at the doors.

MAJOR FINDINGS

A first crude assumption would suggest that symbolism requires premeditation and intellectual activity which seems counter to the stated goal of non-attentional, peripheral perception. But that was clearly a much too simplistic story.

Using AROMA with visual representations has confirmed the original hunch that symbolic representation "... of activity data does indeed convey a sense of remote presence and does so in a sufficiently subdued manner to allow the user to concentrate on his or her main activity."[3] But detailed findings show that the users deal with symbolism and abstraction in somewhat surprising ways.

What is being depicted, people or spaces?

The most successful representations of room activity were non-figurative and abstract. Some showed activity as gradual change of colors in an abstract painting with darker nuances representing more activity. Others showed numerous (mostly between 20 and 255) little, moving objects with the order of magnitude giving a hint of the level of busy-ness.

It seemed as if any small number (<5) of moving objects led themselves to be interpreted as depicting human beings. It may be that users are prone to look for visual symbols of human beings, making that an important organizing factor when they are trying to make sense of a blurred image. One example of this was a version of a balloon-and-seagull representation in which sound was mapped into the number of seagulls flying in from the right

in each time unit, and changes in light (i.e., a measure of the visible activity) was mapped to the motion of a red balloon that was seen drifting and wiggling across the sky. The users immediately identified the balloon with an individual (which of course is less of a problem when the number of people present in the remote location is exactly one).

We tried several representations in which we *intentionally* depicted people as specific visuals, e.g., the wiggly red balloon already introduced or a colorful "dancing" object on a floorplan. The most successful representation of people presence was the aforementioned balloon-and-seagull representation: the number of people present were mapped into the number of balloons. It did cause occasional confusion that the activity data for the entire room worked as "fuel" for the movement of each balloon.

Beware of the too familiar symbolisms

It became clear that the strong spatial orientations of many familiar symbolisms, e.g., an architectural floorplan used as background for showing activity in different rooms of a remote house, made people go too far in their readings of the representation. For instance, when the colorful object (representing visible activity) moved towards the upper left corner of the room on the plan, it was read literally: as a remote person moving towards that corner.

However, we were able to amend the floorplan representation by avoiding people-like activity representations and instead using smooth color cycling on the "floor" of each room: darker colors denoting more activity.

Thus, when attempting to show people presence and when accurate location information of each individual is not available, we should avoid representations which suggest spatial arrangements.

The more symbolic the representation, the more important it is to show only such effects that carry semantic significance, e.g., when two visual objects that were moving randomly came close or when they seemed to be pulling apart, the users would tend to read meaning into it.

Beware of complexity

The complexity of the mappings from event to visual representation seemed very important: too complex representations were not only hard to learn but actually rejected by the users even before they had taken the time to familiarize themselves with it. One example of this was a version of the balloon-and-seagull representation. It worked pretty well while showing two or three simultaneous mappings:

- light difference -> acceleration of balloons
- level of sound -> number of seagulls
- number of people -> number of balloons

However, when we added further semantics to the representation, things started to go wrong. None of the following mappings appealed to the users: either they failed to notice the effect, or they claimed it was too hard to read (in the sense of learning the semantics).

- time spent in room -> size of balloon
- history of visual activity -> balloon drifting towards busier, upper half of the display or quieter, lower part

It seems that a complexity of 4-5 individual semantic mappings is already too much for the system to be truly useful for peripheral awareness. The failure may lie in a subtle change required in the human reading of symbols: perhaps involving more intellectual reading.

Tangibles

The success of rather simple representations bodes well for utilizing a most promising trend in interaction design, namely the use of tangibles (e.g., mobiles of all kinds) to show activity.

Jeremijenko represents network traffic as shaking of a dangling string of ethernet cable [6]. Strong&Gaver demonstrated the affordances of very singular installations to represent remote events: an airflow-agitated feather, heat-accentuated scent, and a shaker [5]. Ishii&Ulmer represented web activity by sounds of raindrops or the busy-ness of light as it is reflected through rippling water [2].

Tangibles of very similar kind have been integrated successfully in the AROMA prototype. They seems to work best when representing room activity (rather than the activity of individual people).

PERSPECTIVE

More basic research is lying ahead, now that some initial empirical groundwork has been done. Psychological studies within the gray zone between cognition and perception are particular pertinent. Also promising is an application of semiotics, in particular a study of perceptual implications of using (mostly) symbolic signs, in contrast to those that are mostly iconic (e.g., avatars) and those that are indexical (e.g., controlled degradation of original captures).

REFERENCES

1. Hudson, S.E., and I. Smith. Techniques for Addressing Fundamental Privacy and Disruption Tradeoffs in Awareness Support Systems. In *Proc. CSCW'96*, ACM Press, 1996.

2. Ishii, H., and B. Ulmer. Tangible Bits: Towards Seamless Interfaces between People, Bits, and Atoms. *Proc. CHI '97*, ACM Press, 1997.

3. Pedersen, E.R., and T. Sokoler: AROMA - Abstract representation of mediated presence supporting mutual awareness. *Proc. CHI '97*, ACM Press, 1997.

4. Pedersen, E.R., and T. Sokoler: Awareness Technology: Experiments With Abstract Representation. *Proc. HCI International '97*, Elsevier Publ., 1997.

5. Strong, R., and W. Gaver. Feather, Scent, and Shaker: Supporting Simple Intimacy. *Proc. CSCW'96*, ACM Press, 1996.

6. Weiser, M., and J.S. Brown. Designing Calm Technology, *PowerGrid Journal, v 1.01* (July 1996), http://powergrid.electriciti.com/1.01