
SMOKS: The Memory Suits

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Abstract

This paper describes SMOKS, a pair of electronically enhanced suits that acts as an experimental platform for constructing individual and collective memories, for creating and nurturing social networks, and for personal communication and intimacy.

The suits combine and overlay different interaction methodologies explored in our larger research project called Memory Rich Clothing. Moreover, rather than deploying a single social electronic artifact, we created garments in pairs, balancing the interaction affordances between users and creating conditions for the emergence of playful social networks surrounding the body.

By capturing physical memories, representing traces of human touch, recording and playing sounds, and by providing hiding places for physical mementoes, the SMOKS use fashion and our interactions through clothing to accumulate and display traces of physical memory in personal and playful ways.

Keywords

Reactive garments, wearable computing, electronic textiles, physical touch.

ACM Classification Keywords

J.9.e Wearable computers and body area networks

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Introduction

Physical artifacts such as garments become stained, worn, torn, or scratched over time. They accumulate traces of use and carry the evidence of our identity and our history. Electronic, reactive textiles enable us to record histories of physical interactions and to play with these traces, displaying them in personal and playful ways.

Our research focuses on the development and design of electronic substrates and wearable technologies that focus on aesthetics, personal expression, and the idea of play. At XS Labs, we develop dynamic clothing that has the ability to change color, shape or texture over time and reactive clothing that responds to input with sound, animation or other state changes. Materials such as thermochromic pigments, light emitting components, miniature speakers and conductive yarns are used together with input devices such as soft fabric switches, variable resistors and capacitive sensors to construct reactive garments [1].

SMOKs are an experimental platform for constructing individual and collective memories, for creating and nurturing social networks, and for personal communication and intimacy. Primarily, they are suits that capture physical memories by representing traces of human touch, by recording and playing sounds, and by providing hiding places for physical mementoes.

We are particularly concerned with the exploration of simple interactions that emphasize natural expressive qualities of electronic circuits and of the body, spawning modes of interaction that are not normally associated with computing technologies.



Figure 1. Hugo Desmeules and Shirley Kwok-Choon discover each other's recorded voices in the SMOK suits.

Rather than introducing a single electronic artifact in the social fabric and measuring its repercussions, we created electronic suits that exist in pairs and overlay the different interaction methodologies previously explored in our research [2]. This permits wearers to share both the responsibilities and empowering qualities of the garment, creating an equal level of

communication and balance between the users' interaction affordances. The result is a technology that cultivates physical proximity and creates conditions for the emergence of playful social networks surrounding the body.

Memory Recording Modalities

The suits combine different interaction methodologies explored in our larger research project called Memory Rich Clothing [2]. They integrate thermochromic ink, a sound player/recorder and pockets where it is possible to conceal small objects. They overlay different modalities of interaction: aural, physical and visual (Figure 1).

1. *Fleeting Touch*

Two thermochromic ink patches, located around the shoulder and waist, register and display physical touch (Figure 2). When touched, the ink heats and visually changes from an orange to a bright yellow color. These patches exist and persist as visual representations of past touch events but, similarly to human memory, they fade over time. An important aspect of this physical interaction is the dichotomy between the natural processes through which we feel and interpret touch and those that happen through the evidence of color change on the fabric. In the same way that skin changes color, when touched, and slowly fades back to its natural color, the thermochromic ink goes from orange to a brighter yellow and slowly returns to its original state. When someone touches a SMOK wearer, they not only leave a natural physical impression on the skin, but also a second, artificial and more interpretative mark.

We use thermochromic leucodye inks that can be engineered to change from a specific color to a clear state at arbitrary temperatures between -25°C and 66°C . Many colors are possible and unexpected color changes can be obtained by combining thermochromic and regular inks. By mixing inks that change at different temperatures, a more complex effect can be achieved. In the SMOKs, the images were silk-screened on the textile and the color change is activated by body heat.

2. *Voice Annotation*

The SMOK neckline is outfitted with a microphone to automatically record any intimate sounds or whispers (Figure 2). Recorded sound memories are played back by raising the SMOK arm and bringing the hand close to the ear. The cuff houses a small speaker that whispers back the recorded sounds.



Figure 2. Shoulder patch of thermochromic ink and microphone integrated in the collar.

In this case, rather than focusing on direct physical manipulation of tactile interfaces, we decided to explore a more passive model where subtle whispers can be automatically recorded by the SMOK. The memory of interaction is stored in the sleeve and can be infinitely reproduced without decay. It “lives” in the garment until it is replaced by a new one.

We strive to integrate the electronic technology in a way that is aesthetically appealing, without necessarily pursuing a transparent integration or compromising comfort and fashion.



Figure 3. Detail of pockets that house electronic components and piping technique for the insulation of conductive threads.

The main electronic board and batteries are strategically concealed in a padded pocket, which protects them from the body and, similarly to a backpack, makes the weight less noticeable and negligent. The sound recording and logic control are

done with a PIC16F88 microcontroller and an IDS2560 chip, which receive input from a tilt sensor located in the cuff. While the microphone for the whispering input is located on the collar, the output speaker is co-located with the tilt sensor in the cuffs to allow the movement of the arm to control the playback and recording mechanism.

To connect all these elements together, the conductive threads are insulated from short-circuits through a piping technique, thoroughly covering the conductive material. This technique not only provides flexibility and perfect insulation, but it also protects the conductive steel threads from external interferences and breakage from consistent use (Figure 3).

3. Physical Annotation with Objects

The final feature of the SMOK suits is the presence of small pouches that allow people to squirrel away symbolic tokens, physical mementoes that represent significant moments in time. As opposed to pockets that are made to be easily accessible, these pouches are designed on the back of the garment so as to be more accessible by others. Moreover, the pouches are sewn out of hand-made Shibori fabric, a Japanese technique similar to tie-dyeing that, instead of coloring fabric, heat sets polyester to create very elaborate and rich textural surfaces. This rich texture, together with the luxuriant yellow color of the cloth, provides a compelling surface for people to explore. The very tactile qualities of the Shibori fabric make it a surface that one wants to touch and manipulate.

Interaction Experience

We are interested in the following interaction questions: (1) the symmetries between the wearer

initiating the interaction and the one receiving it (since both garments have the same functionality); (2) the degree of proximity necessary for the wearers to interact (as a result of the sensors and actuators used); and (3) the different kinds of memory the garments can record and retrieve.

Many electronic garments are so expensive and fragile that only one instance of a prototype is produced. We created a pair to allow the wearers to experiment and perceive at the same time the interaction from the point of view of the person initiating an action and the one receiving it. In the case of the microphones and speakers, it is possible to concurrently record a sound in someone else's garment, while listening to the sounds being reproduced by your own garment, and vice-versa. This design promotes a shared responsibility, creating a more balanced and equal collaboration.

The different elements embedded on the garment create distinct degrees of physical proximity that trigger correlated comfort zones on the wearers. Recording the voice, for example, does not require any physical contact and can open an exploratory space for playful interaction without requiring physical touch. However, the pouches for placing and hiding small objects (Figure 4) require a higher degree of physical contact that allows wearers to place objects in each other's garments.

Finally, while the sound interaction allows a memory event to be indefinitely replayed, the color change is proportional to the amount of time a hand rests on the fabric and the amount of body heat produced through touch. While, in the first case, the memory of the

encounter between the wearers resembles the memory we usually encounter in our digital technologies, the second one is more similar to our memories of touch.



Figure 4. Shirley examines artifacts left in her pocket

These intimate interactions are enabled through the sharing of common and familiar physical spaces. The interaction through physical and embodied presence and it can slowly be deconstructed into more personal levels of intimacy according to their interest in each other and the affordances and limitations offered by the technology they wear.

Future Work

The SMOKS are a platform for experimenting with wearable technology that deals with ideas of memory,

intimacy, and social networks, using the body as an instrument for recording our interactions and communications. We will continue this work by exploring the implementation of richer sensors and actuators, which can provide new methodologies for capturing and displaying our body memories, while keeping a focus on aesthetics.

Secondly, we are interested in pursuing the development of electronic garments that exist in pairs and, most importantly, complement each other to develop new forms of collaboration and exchange, creating compelling new social choreographies.

Whether these suits are worn by lovers, friends, or strangers, they question our definitions of private versus public, as well as personal versus shared spaces. Potential applications for these prototypes include therapy situations, where users are encouraged to re-contextualize the memory of their personal relationships as experienced through their body and remembered over time. They might also be used for preserving and triggering a memory associated with a shared physical experience, in the case of lovers living apart from each other.

Conclusion

In this paper, we described SMOKS, a pair of electronically enhanced suits that accumulate and display traces of physical memory in personal and playful ways.

Beyond stimulating awareness of our corporeal relationships, interactive clothing can function as communication devices that allow a richer range of

interaction affordances and make use of a more natural form of electronically enhanced memory.

The result is the development of a wearable platform that uses fashion and our interactions through clothing to construct individual and collective memories for creating and nurturing social networks and for personal communication and intimacy.

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References

- [1] Berzowska, J. Electronic Textiles: Wearable Computers, Reactive Fashion, and Soft Computation, *Textile*, Berg Publishers, London, 2005, Volume 3, Issue 1, pp. 2–19.
- [2] Berzowska, J. Memory Rich Clothing: Second Skins that Communicate Physical Memory, *Proceedings of the 5th conference on Creativity & Cognition*, ACM Press, New York (2005) 32 – 40.
- [3] E.R. Post, M.Orth, P.R. Russo, N. Gershenfeld, E-broidery Design and fabrication of textile-based computing, *IBM Systems Journal*, Vol. 39, 2000.