Exploring Design through Wearable Computing Art(ifacts)

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ABSTRACT
Usability is taken into account in design, however analysis of underlying technological values (such as trust, privacy, security) might become overlooked. In this paper, we illustrate how performance art can be used to elicit information about device design and usage. Wearable computing devices or art(ifacts) were used to spark behavior and debate. It was found that the degree of acceptability of the design was related to the perceived control the wearer had over the device. We suggest that what is learned from performance art can be incorporated into future design.

Keywords
Wearable computing, art, design research

INTRODUCTION
Art theory has been used before to aid the building of actual designs. Artistic techniques have offered new interaction techniques and enhanced usability [1]. Augmenting traditional art objects, such as paintings, has also been suggested as a form of information display [5]. Beyond building actual designs, it is equally important in the design process to examine the values underlying the technology.

Sometimes attitudes toward a design become apparent only the built system gets an unfavorable response. One way in which this becomes apparent is direct subversion of the system by users. For example, the intent of installing a videoconferencing unit in a workplace was to promote informal interaction amongst colleagues [3]. People who thought this video-conferencing system violated privacy subverted the system by placing a pen drawing in front of the cameras and even deliberately disconnected the system [3]. The manner in which the users subverted the system can be viewed as performance art. The users approach is related to the Situationist movement in art, in particular the aspect of detournement [6]. This tactic appropriates tools of the "oppressor" in a disorienting manner.

Situationist theory has been used in the conceptual designs of unusual and even technologically improbable devices to produce cultural effect [2]. Using performance art, we present wearable computing [4] in a deliberately unusual manner where it is left up to the people interacting with the device wearer to imagine the intent of the device. By doing so, the focus is on reactions and comments of the public when they interact with the device and its wearer. We suggest this technique can be used by designers as a way of getting at underlying attitudes towards a design to aid future prototype development.

CHI 2002, April 20-25, 2002, Minneapolis, Minnesota, USA.
ACM 1-58113-454-1/02/0004.

OBSERVATIONS
The observations consist of reactions to three performances.

Performance One: The wearable computer with wearable data projection system
This performance involved a wearable computer with a wearable high power data projector all running from a wearable power pack. The projector was aimed at the ground so that it created a projection space visible to people facing the wearer. The display stimulus consisted of dynamic video of the passer-by and the text "www.existech.com" projected on the ground. By having a salient display, reactions were instantaneously provoked without the need for any initial comments from the wearer of the devices. In this performance, the wearer of the device walked in the streets of downtown Toronto. When the displayed text contained the ".com" URL, many people associated the device with a corporation by asking "what are you selling?" Additionally, this appeared to help legitimize the device. Thus, although the device had a strange appearance, the fact that people interpreted it as credible advertising, somehow mitigated that strangeness. Without advertising as an externalization, many people gave a facial expression that would indicate less approval. We decided that it would be interesting to further probe whether acceptability of the design is related to whether a corporation or some other credible external authority sanctions the device.

Performance Two: Using a hidden camera
In this performance a hidden camera was used but with live video projected onto the ground. One of the most common reactions was that people would try to find the camera, and become quite captivated (disturbed or amused) by the apparent absence of a camera. Provocative text messages such as "ADVERTISING IS THEFT of solitude" were generated and mixed with video. See Fig 1. The apparatus was worn into many establishments such as stores and shopping malls where advertising and surveillance are common but photography is prohibited. Interestingly, clerks often chose to ignore the rather obvious fact that a camera was present.

(a) (b) (c) (d)

Figure 1: (a) Here a person can see his own image together with other computer generated material. (b) Close-up view showing the projector output (c) A favorable reaction was obtained from department store security staff who thought the device was a good invention. (d) On the street, large crowds gathered to see the interactive environment. People would bring their children over to play in the wearable interactive video environment and performance space and even adults enjoyed playing in the interactive space.

Performance Three: Making the camera very obvious

In this performance, a still camera mounted to headgear was used in addition to the device of performance two. The flash on the camera served as a very effective annunciator indicating clearly that a picture was being taken every 19 seconds. When people turned to see what caused the flash their pictures were projected on the ground. Both pictures (still as well as live video from the infrared imaging system) were displayed side-by side along with the text "CAMERAS REDUCE CRIME..." The performance began in a series of restaurants, malls, and department stores and ended on the street as with past performances. In many establishments, objections were raised to the taking of pictures. The system was designed so that the wearer had (or appeared to have) no control over the apparatus. First of all, the wearable computer system was completely hands-free (no controls, keyers, mouse or buttons to push). Secondly, the apparatus was automated or controlled externally, so that it continued to take pictures while the wearer was explaining to the clerk that it was beyond his control (such as being a part of the wearer's job). It was found that if the wearer did not appear to have control of the apparatus, clerks often permitted the wearer to continue to remain in the shop.

DISCUSSION

Performance art indeed served the purpose of sparking reflection and debate about design. In performance one, the use of the device for advertising appeared to contribute to its acceptability. It was shown in performance two that even in establishments where photography is prohibited taking video with a hidden device was tolerated. The reasons for this acceptability were further probed in performance three where the presence of a camera was overt and the degree of personal control of the device was varied. We learned that the less control the wearer appeared to have over a device, the more acceptable the design was to others.

We designed our performance apparatus to make clear the fact that we are taking pictures in order to evoke prominent interaction and behavior. Nevertheless, these elements may be incorporated into more subtle and fashionable designs suitable for everyday use.

We have shown that is its possible to design wearable technologies so that the wearer can credibly disavow responsibility for the device. Apart from being an important observation about underlying attitudes towards design, we further suggest that these results can be utilized in future designs. For example, individuals can use such a device to keep their own records of transactions with clerks. These records can be used to hold establishments responsible in case of any disputes. Thus, resituating establishment surveillance on the individual may be a value-added feature in wearable computing design. Future work needs to be done to establish the efficacy of incorporating these elements in such a design.

CONCLUSIONS

We have found that performance art is an effective technique for the discovery of attitudes toward wearable computer design. For example, the tolerance for violations of rules varied according to the degree of control the user appeared to have over the device. This result may be incorporated into the design of a personal wearable computing device.

ACKNOWLEDGEMENTS

Corey Manders, Betty Lo, Adwait Kulkarni, Samir, Sharon, Tomas Hirmer, Antonio Rodriguez, Chris Aimone, Angie, CITO, Kodak and NSERC

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