

The BubbleBadge: A Wearable Public Display

Jennica Falk and Staffan Björk

PLAY: Applied Research on Art and Technology, Viktoria Institute

Box 620, SE-405 30 Gothenburg, Sweden

<http://viktoria.informatics.gu.se/groups/play/>

{jennica,bjork}@viktoria.informatics.gu.se

ABSTRACT

We are exploring the design space of wearable computers by designing “public” wearable computer displays. This paper describes our first prototype, the **BubbleBadge**. By effectively turning the wearer’s private display “inside out”, the BubbleBadge transforms the wearable computing concept by making digital information *public* rather than *private*. User tests showed that the device introduces a new way to interact with information-providing devices, suggesting that it would be valuable to explore the concept further.

Keywords

Wearable computers, interaction technology, public displays

INTRODUCTION

A wearable computer is defined as a continuously running, augmenting and mediating computational device [2]. Wearable computers are usually highly private, since both input and output is controlled and seen only by the user, who is effectively “hiding” behind a hand-held keyboard and a head-mounted display. But while wearable computing can be a powerful tool for the single user, there is usually no interaction between the system and persons other than the wearer. We propose an alternative approach to interaction with wearable computers, where the interaction is shifted to the *viewer*, rather than the wearer, of a wearable device.

THE BUBBLEBADGE

To explore the potential design space of wearables, we designed the *BubbleBadge* prototype. A BubbleBadge is a wearable computer display in the form of a brooch, capable of displaying dynamic information.

When designing a wearable public display, we looked at conventional “displays” such as clothing and jewelry for inspiration. These are items that people wear to make statements about themselves to other persons. We soon decided that the function of brooches and coat badges was most relevant, as these are primarily eye-catchers conveying some kind of message to other people. The BubbleBadge was therefore designed as a coat badge with a digital display, to be pinned to the wearer’s clothes. An important reason for designing the BubbleBadge like a brooch to be placed in the proximity of the wearer’s face was to promote face-to-face interactions. If the display had for instance been designed to be placed on the wearer’s back, it could have been made larger and thus convey more information, but it might then not encourage eye-contact between the wearer and the viewer in the same way.



Figure 1 & 2: The BubbleBadge display, connected to a hidden wearable computer

The prototype

Our prototype was built based on a handheld video-game (in effect functioning as a low-cost wearable computer) from which we detached the display. The display was then encased in a brooch-like frame and was reconnected to the video-game by a thin cable. The game computer could then be carried where it would not attract attention, such as on a belt. The game computer’s interchangeable cartridges were modified to be reprogrammable, and with the aid of a software development kit, a number of presentations were developed and tried.

The use of existing technology allowed us to do rapid prototyping of the hardware and provided us with a platform for quickly implementing various graphical presentations. The exchangeable cartridges allowed for a diversity of information “moods” to be communicated, just as different jewelry can be worn to convey different emotions.

DESIGN IMPLICATIONS

One of the major decisions when designing a public wearable display should be to determine what kind of information should be presented. We could see three possible providers of the information to display: the wearer of the display; the person viewing the display; or the environment in which the display was located.

The wearer as information provider

This was the most natural option inherited from other wearable systems. One of the advantages is that the wearer *knows* what is being presented, and does not have to be anxious about what information is being shown. It is also the most natural choice if the presentations should be adjustable at runtime. Scenario:

You are at a party for Star Trekkers. A nice touch to your outfit is your phaser and your BubbleBadge. You have

inserted the “Star Trek quotes” cartridge in the computer and the display show one-liners such as “Beam me up, Scotty!” and “Resistance is futile.” You are very cool.

The viewer as information provider

A more radical idea is to let the viewer, i.e. another person, influence what is displayed. This has the advantage that the viewer will get interesting information presented where her focus of attention is naturally located, i.e. on another person. A disadvantage with the system is that the viewer must have a way, supposedly in the form of a separate device, to inform the BubbleBadge what to display. Scenario:

Sitting in the cafeteria at a conference, another conference participant stops by to say hello. Her BubbleBadge informs you that you have received two new emails. Since you are expecting an important message from a paper committee, you say good-bye and leave for the computer room.

The environment as information provider

Another option is to let the environment provide the information. This allows for people and organizations in the immediate vicinity to communicate information that is of practical interest due to its locality. Scenario:

You are walking in your office environment when you meet a fellow employee. Looking at his BubbleBadge, you see that a famous professor is giving a talk in 15 minutes which you wanted to attend but had forgotten about. You hurry over to the location and experience an interesting lecture.

All these categories can be combined to create a suitable mix of what the viewer knows he or she wants to see, what the wearer wants to show and what can be interesting due to the BubbleBadge’s environment.

INITIAL FINDINGS

To test the BubbleBadge concept we implemented limited variants of *wearer* and *environment* information aspects:

- For the wearer information aspect we programmed a cartridge to show Star Trek quotes.
- For the environment information aspect we incorporated a radio transceiver into the device, enabling the BubbleBadge to receive and display broadcasted information about local activities.

We let a number of students try both wearing and viewing the BubbleBadge. They perceived that the BubbleBadge could enhance face-to-face interaction without being intrusive, and it was pointed out that it was more interesting to be the viewer than the wearer of the device. This was not surprising, since the viewer was in fact the active user.

The users also expressed concern about what information was shown on the devices and they specifically opposed the idea of displaying advertisements. Wearers felt it was more important to have knowledge about the information source, than about the information itself. If the information shown would be of general public interest such as important announcements, the test users could see themselves wanting to wear BubbleBadges.

Both lengthy and short text messages were displayed in the tests. The test users showed a greater comfort with the

shorter messages as they were not perceived to interrupt the conversation. Lengthy scrolling messages were regarded to be more distracting than shorter messages, especially if these were blinking or flashing.

RELATED RESEARCH

The BubbleBadge provides a novel interaction form similar to that of the *Meme Tag* [1], i.e. users wear a display intended for others to view, but the purposes of the interaction are different. Meme Tags focus on the spreading, exchanging and sharing of “memes” as autonomous entities, while the information provided by the BubbleBadge is bound to a specific source. A viewer of the BubbleBadge therefore knows that there in the vicinity of the device exists somebody or something that has an association with the displayed information. Furthermore, the BubbleBadge provides information not only in the initial phase of the conversation, but continuously as people interact, augmenting the interaction. The BubbleBadge can also be seen as a form of ubiquitous computing display, which takes advantage of human mobility to be publicly available [3].

CONCLUSION

Placing a public display on a user, in the proximity of the face, proved to be a convenient way to provide information to others. Our preliminary evaluations indicated that the BubbleBadge can augment face-to-face conversation by giving supplementary information without being intrusive. The general opinion of the test users was positive, suggesting that there is potential for wearable computers of this kind.

FUTURE WORK

With wearable public displays, both wearer and viewers are facing a new way to interact with digital information, and the design of devices such as the BubbleBadge should be explored further. A first step might be to extend the devices’ ability to communicate with each other and their surroundings, by utilizing wireless communication. Furthermore, a larger number of BubbleBadges should be built and formally evaluated under controlled conditions.

ACKNOWLEDGEMENTS

We would like to thank Joakim Wigström for his help in the construction of the prototype, and Gunilla Gran for design inspiration. We also thank Lars Erik Holmquist and participants in the evaluation of the device. This project was sponsored by SITI and NUTEK.

REFERENCES

1. Borovoy, R., Martin, F., Vemuri, S., Resnick, M., Silverman, B. and Hancock, C. Meme Tags and Community Mirrors: Moving from Conferences to Collaboration. In *Proceedings of CSCW '98*, Seattle, WA, 1998.
2. Starner, T., Mann, S., Rhodes, B. and Levine, J. *Augmented Reality Through Wearable Computing*. M.I.T Media Laboratory Perceptual Computing Section Technical Report No. 397, 1997.
3. Weiser, M. The Computer for the 21st Century. *Scientific American*, 265 (3), 1991.