Peripheral Interactions with the Interactive Belt-Worn Badge

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Abstract
The Interactive Belt-Worn Badge is a system that was designed with the aim to perform light and quick interactions in mind. This position paper will describe interaction concepts feasible with this device and show on the basis of examples how these concepts can be used to allow peripheral interactions.

Author Keywords
Smart interactive badge; retractable string; interaction techniques

ACM Classification Keywords
B.4.2 Input/output and data comms: Input/Output devices; H.4.1 Information systems applications: Office Automation; H.5.2. Information interfaces (e.g., HCI): User interfaces.

General Terms
Human Factors; Design.

Introduction
In this paper I like to introduce a device which allows peripheral interaction: The Interactive Belt-Worn Badge [1]. This device is basically an augmented version of a traditional identity badge with a retractable string (like those typically worn in offices and labs, etc.). The retractable string of these badges enables to have the

Figure 2: A traditional Badge with retractable string (left) and Interactive Belt-Worn Badge with an augmented retractable string and a display in the form factor of traditional badges.

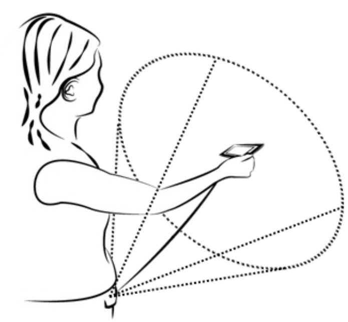

Figure 1: Interaction space

badge very quick at hand and allows a fast and almost automatic interaction in common use cases like proofing the identity or opening a door.

By leveraging and augmenting this form factor, the Interactive Belt-Worn Badge can be a device which allows peripheral interaction. To achieve this the retractable string is augmented with a potentiometer and a joystick to enable sensing the distance and the direction in which the string is pulled out. This creates an interaction space directly in front of the user. It is always relative to position of the user and has the shape of a cone (Figure 1). With the sensed information, the device is capable of calculating its position within this cone.

The badge part is augmented with a screen to dynamically display information and a few buttons to interact with its content. (The prototype seen in Figure 2 features more buttons to figure out the best position for the buttons). The main purpose of these buttons would be to select items or abort an action and to provide a clutching mechanism. The clutching mechanism could be used to bring the screen in a comfortable position to read as well as to extend the interaction space. Additionally the badge part could feature a motion processing unit to detect the motion and orientation of the badge as well as a vibration motor and/or a buzzer to alert the user.

Related Work

The interactive belt-worn badge combines the use of a retractable string for input with the idea of using corporate badges as wearable electronic devices. Both concepts have been explored in previous publications:

Retractable string input devices

Rantanen et al. described a smart clothing system for the arctic environment which featured a unit containing a display mounted at a retractable string [2]. The user

Figure 3: Spatial positions

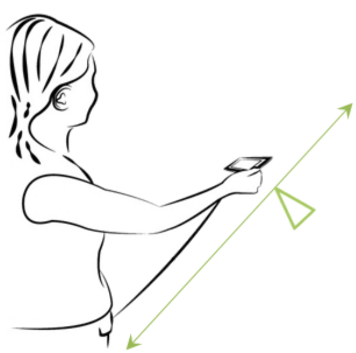

Figure 4: 1D slider

could scroll 1D-menus and enter text by pulling the unit to certain distances and squeeze it to make a selection. The DistScroll system [3] enabled similar interactions and investigated potential uses a bit further.

Koch and Witt proposed a system which could measure the extent and direction a string is pulled out [4]. They evaluated it with a user study in which users had to select voxels from a 3x3x3 grid. The results revealed limitations in their hardware but showed that users could be more accurate in making selections by using a retractable string compared to a gamepad.

Blaskó et al. presented and discussed a retractable string built into a watch or other small device with limited display space as an alternative to other physical controls [5]. Additionally they presented the idea of incorporating display pixels within a retracting string.

Corporate identity badges

The Active Badge [6] is a system that allows to localize users within a room. Later iterations included a buzzer and LEDs for user feedback and two buttons for input. The subsequently developed Active Bat [7] increased the accuracy by using ultrasonic ranging technology, which allowed the interaction with posters and computer displays situated in the environment.

A wearable badge featuring a display was developed by Falk and Björk. Their BubbleBadge [8] was designed to present visual information to the people around the wearer and as such did not support dynamic interactions. The Uber-Badge [9] is another example of a wearable display badge. It supported peer-to-peer communication, resulting in a dynamic information display.

Peripheral Interactions

With the interactive belt-worn badge knowing its relative position to the user, one way of interacting with it is to trigger actions or display informations at specific spatial points in the interaction space (which as shown by Koch and Witt is possible quite accurately). For example the wearer might drag the badge out to a position right in front of him to check his emails (Figure 3). He might want to do this because he thinks of an unanswered email and wants to check if his communication partner has already answered that email.

If the wearer drags the badge out to a position a bit more right the badge might display the upcoming appointments together with information like the time and location. In this way the wearer could quickly look up the room number of the next meeting or see if there is enough time to get a coffee before the next appointment.

This kind of interaction may reduce the mental load required to retrieve informations compared to using a smartphone: Users typically need to get smartphones out of a pocket or bag first, following by unlocking them to select the appropriate application to finally retrieve the desired information. With the Interactive Badge no retrieval from a pocket and no unlocking is needed due to the design of the system: The Badge unlocks itself as soon as it's dragged out of its resting position. Also selecting the application should be faster than it is with a smartphone because the interaction space is larger and the positions might be learned into muscle memory over time. This might lead to mental load that is low enough so that such interactions can become peripheral.

Another concept to interact with the Interactive Belt-Worn Badge is to interpret the spatial position directly as input value. For example the volume of a media player on the smartphone could be adjusted according the distance of the string pulled out (Figure 4). The value could be confirmed with a button press on the display part.

The motion processing unit inside the badge part can be used to detect gestures performed by the user. This can be useful in conjunction with the interaction concepts mentioned before: The media player could fast-forward the music if the badge is tilted or skip the entire song if the user shakes the badge. The calendar and email application could flip to the next or previous page if the badge is tilted.

Ending the interaction

To end the interaction with the Interactive Belt-Worn Badge the user just needs to let go the display. Due to the retractable string the display is pulled back into its resting position. A smartphone in contrast needs to be locked or turned off and then put back to a bag or pocket.

Transition to Explicit Interaction

An interesting aspect of the Interactive Belt-Worn Badge is that many of the interactions might be a peripheral interaction in the beginning. They might stay peripheral, but there is also a chance that they lead to an explicit interaction if certain conditions are met. For example when the user checks his emails to see if he got an answer he is waiting for, the interaction might stay peripheral if the answer isn't there yet. He even might not remember the topics of the three most recent emails if asked directly after checking them. But if the user got that eagerly awaited email, he might decide to open it right away to read it, and therefor switch to an explicit interaction with all attention shifted to that interaction.

The same might occur if the user needs more detail for the next appointment in the calendar (i.e. because he completely forgot about it) or if the user wants to select a specific track from playlist of the media player (i.e. because the current tracks don't fit the current mood of the user).

References

[1] Pohl, N. et al. An interactive belt-worn badge with a retractable string-based input mechanism, Proc. CHI '13, ACM Press, pp. 1465-1468.

[2] Rantanen, J. et al. Smart Clothing for the Arctic Environment, Proc. ISWC 2000, p. 15-24.

[3] Kranz, M. et al. DistScroll - A new One-Handed Interaction Device, Proc. IWSAWC 2005.

[4] Koch, E., Witt, H. Pull'n'Retract: Experimenting with a String-based Wearable Input Device, Pervasive 2008.

[5] Blaskó, G. et al. Prototyping Retractable String-Based Interaction Techniques for Dual-Display Mobile Devices, Proc. CHI '06, ACM Press, pp. 369-372.

[6] Want R. et al. The active badge location system. ACM Trans. Info. Syst. 10, 1 (Jan. 1992), 91–1.

[7] M. Addlesee et al., "Implementing a Sentient Computing System," Computer, vol. 34, no. 8, 2001, pp. 50-56.

[8] Falk, J. and Björk, S. The BubbleBadge: A Wearable Public Display. CHI '99 Posters, pp 381-319.

[9] Laibowitz , M. and Paradiso, J. The Uber-Badge - A Versatile Platform at the Juncture between Wearable and Social Computing, Proc. Pervasive 2004.