Affective Diary – Designing for Bodily Expressiveness and Self-Reflection

Madelene Lindström
SICS
Box 1263
SE-164 29 Kista, Sweden
maddel@sics.se

Anna Ståhl
SICS
Box 1263
SE-164 29 Kista, Sweden
annas@sics.se

Kristina Höök
SICS
Box 1263
SE-164 29 Kista, Sweden
kia@sics.se

Petra Sundström
SICS
Box 1263
SE-164 29 Kista, Sweden
petra@sics.se

Jarmo Laaksolathi
SICS
Box 1263
SE-164 29 Kista, Sweden
jarmo@sics.se

Marco Combetto
Microsoft Research Ltd
7 JJ Thomson Avenue
Cambridge CB3 OFB, England
Marco.Combetto@microsoft.com

Alex Taylor
Microsoft Research Ltd
7 JJ Thomson Avenue
Cambridge CB3 OFB, England
Alex.Taylor@microsoft.com

Roberto Bresin
TMH, KTH
Lindstedtsvägen 24
SE-100 44 Stockholm, Sweden
roberto@kth.se

Abstract

A diary provides a useful means to express inner thoughts and record experiences of past events. In re-readings, it also provides a resource for reflection, allowing us to re-experience, brood over or even shed the thoughts and feelings we've associated with events or people. To expand on the ways in which we creatively engage in diary-keeping, we have designed an affective diary that captures some of the physical, bodily aspects of experiences and emotions—what we refer to as "affective body memorabilia". The affective diary assembles sensor data, captured from the user and uploaded via their mobile phone, to form an ambiguous, abstract colourful body shape. With a range of other materials from the mobile phone, such as text and MMS messages, photographs, etc., these shapes are made available to the user. Combining these materials, the diary is designed to invite reflection and to allow the user to piece together their own stories.

Keywords

Affective Interaction, Emotional Computing, Social Factors, Interactive Design, Mobile Applications

ACM Classification Keywords

H5.m, Classification, Information Interface and Presentation, User Interfaces

Introduction

A diary is generally considered to be a book in which one keeps a regular record of events and experiences that have some personal significance. As such, it provides a useful means to privately express inner thoughts or to reflect on daily experiences, helping in either case to put a perspective on them. Through our diaries we are thus able to brood over intimate thoughts and feelings, shedding some and re-experiencing and "saving" others. We achieve this form of personal expression and the re-living of memories through the assemblage of words and pictures. Crucially, it is how we actively include personal jottings, song lyrics, photos, drawings, etc. in our diaries and how we choose to combine and juxtapose them that shapes both our ways of expression and re-livings.

In this paper, we consider how various other media might be used in diary keeping. With the widespread use of camera-phones, many of us have access to media such as text messages, audio recordings, photos, etc. that we might come to associate with events or people. For the most part, it is still difficult to find ways of saving these and creating narrative structures around them to be kept in, for example, a diary[5]. Our intention in this paper has been to consider how these forms of media might be incorporated into diaries. In addition, we have explored how their use might be combined with data collected using sensor-based technologies such as bio-sensors (pulse, skin conductivity) and other sensors that can pick up on physical, bodily experiences (accelerometers, pressure sensors and those registering body movement and posture).

We have chosen to examine the possibility of using sensor data because we see emotions as having a sig-

nificant physical, bodily component. Specifically, we adopt a cultural-constructivist perspective on emotions and emotional processing. From this perspective, an emotion is viewed as a felt and experienced inner "life", a life that is continuously modified and processed through a cultural lens, and in dialogue with others and our environment [1]. There is a bodily side to this: the experienced felt life, as it gets stuck in our bodies, is what we try to deal with, modify, reflect upon, change, or recollect.

We see these arguably abstract notions as having implications for practical activities such as diary keeping. For instance, how might the reflective aspects of diary keeping be further enabled if one were able to capture a moment in terms of bodily orientation and movement, or physiological state, alongside the more established means of capture such as writing or even photography? Of course, any signals we might be able to capture using bio and movement sensors would only make up a very limited aspect of our experiences. Our concern here though is with how signals from such sensors might be represented to further enable us to reflect in the ways we wish when composing our diaries.

In an effort to address these issues, our approach has been to provide an affective ambiguously represented mirror of one's bodily experiences throughout the day. We imagine the ability to detect physical, bodily reactions together with events such as taking photographs, receiving text messages, or observing Bluetooth-presence of others nearby. In practice we see this being achieved through the extension of a camera-mobile where signals from sensors are used to create an additional level of information—information we refer to as "affective body memorabilia". Later we will describe

Figure 1. The affective diary application on a Tablet-PC connected to a Smartphone.

Figure 2. Examples of material from the cultural probe

how we have designed a system to represent this memorabilia so that users might be reminded of some of the physical properties of an event.

On a deeper level, our aim has been to explore whether this kind of feedback can increase people's awareness of their own physical reactions, their stress levels, what makes them calm or even happy. Obviously, the interpretation of such high-level concepts can only be done by the users themselves—but our hope is to *empower* them to further explore their own physical reactions. An important issue here has therefore been to represent these memorabilia in such a form that users are able and even feel compelled and empowered to alter the representation of their experiences and create their own "stories". The goal has thus been to provide a tool for brooding over or even shedding the negative and reinforcing the positive events we record in diaries.

Below we present an early working prototype we have implemented, one enabling us to run basic experiments (Fig. 1). We also describe the user-centred design process that lead to it, and some aspects of our philosophy on how to address affective interaction.

User-centred design

A combination of design- and technical probes were used to design the working prototype. End-users were involved in all stages of this design process. *Cultural probes* [2] were used early on in the project to encourage end-users to document their diary keeping and their use of materials. Design feedback and end-users' reactions to the final prototype were obtained through participatory design methods and *staged lived experiences* [6].

Cultural probe

The first step then was to perform a cultural probe exercise. We invited three categories of probe-participants (12 participants in total): teenagers (4), dance students (3) and senior citizens (5). Teenagers and senior citizens were chosen because we assumed that they would be occupied with their own emotional reactions and also have time to enter into a dialogue with us. The dance students were invited because we assumed that they would have a more reflective perspective on bodily experiences.

As noted by others [2], people are surprisingly willing to share quite intimate, personal aspects of their lives when confronted with a probe (see Fig. 2 for examples from our probe material). With the probes, we attempted to abide by Gaver's original intentions, looking upon the collected probes as inspirational materials—keeping the "magic aura" that surrounded them—not as materials to be used for a more analytical analysis. Thus, some materials were more important than others in our design process. For example, the probe materials showed that emotions circle around life as it occurs not only today, but also tomorrow and yesterday. One of the probe postcards had participants add to the statement "My strongest emotional experience today was when…" and an older man answered "I became a father for the first time Nov 20, 1956". It appears that some days the awareness of the past or thinking about the future might be very much in focus, whereas on other days it just lingers in the back of our minds. A woman also touched on this when asked on a postcard "What happened to you today? Which feelings comes to mind first?" Her reply was "I went to the cemetery with flowers for my husband, who died fourteen years ago."

Figure 3. The colour of the day
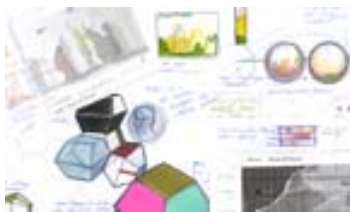
Figure 4. Sketches on concepts

Figure 5. The concept chosen to go forward with

Another woman, in her seventies, talks about how she feels bullied by her friends and how she worries about how it might feel when they next meet. In general, we learnt how important it is to allow for expressions of not only positive, but also negative emotions. There appeared to be a wish amongst our participants to 'take the lid off' and be more expressive of their inner thoughts and emotions. On the positive side, many re-visited their positive moments looking to re-live them.

In one postcard we prompted the participants to draw the colour of the day. It became evident how colour and shape is, somehow, very closely connected be-cause one woman did not only paint in pink but also painted pink in the shape of hearts (Fig 3).

As an aside, it was obvious from the probe exercise that the participants were very aware of the fact that their materials were being viewed by others and in par-ticular by researchers, contrasting with the personal qualities of a diary. The materials we obtained should therefore only be seen in this light. However, since the idea of our probes were to serve as an inspiration and to see how people express themselves using other mo-dalities, such as colour, shapes, clay, or photographs, we remain convinced of the value of the materials.

Affective mirror: design process

We were looking for a design that fulfils 3 criteria: first, we wanted it to reflect the more bodily experiences of the day; second, users should feel empowered to work with and change content to better fit their own experi-ences, much like in a traditional diary; and thirdly, their experience should not be a disembodied one, some-thing we shall come back to below. We translated these goals into a design through making use of ambiguous

expressions [3]. Instead of trying to provide a "true image" of what the user's day was like we wanted to provide users material to work with.

Mirroring experiences: a user interaction scenario
In the first stage, three concepts were sketched, cre-ated to be as different as possible in order to open up a vivid discussion (Fig. 4). Out of these, we picked a nar-rative illustration with a humanlike character, shaped like an abstract body representing the user's day (Fig. 5). The abstract, ambiguous, body postures symbolises the user's state in a shape that directly connects the data obtained using sensors. The system collects sen-sor data (pulse, pedometer, accerolometer picking up whether standing or lying down) and activities on the mobile phone, such as texting, MMS, photographs and Bluetooth presence, during the day. At the end of the day, the user loads all data into the computer and re-ceives a graphical representation of the day, which is strengthened by expressive sound and music played in the background. The sensor-data is fed into the anima-tion of the 'body' while the photographs, text mes-sages, etc. are placed above the body's head. The rep-resentation of the data can be played as a movie, ani-mating the body morphing from one state to the next (Fig. 6). It is possible to modify and edit the content of "the movie" to replay it at different rates. The user can reflect upon the day, interpret and alter the representa-tion through changing the body state or colour, scrib-bling diary-notes onto the surface as well as manipulat-ing the photographs and other data.

Body postures
There are seven characters with different body postures that are used to express different levels of arousal or movement (Fig. 7). *Movement* is picked up through a

Figure 6. The final concept

Figure 7. Seven different body postures

Figure 8. The colours representing time

Figure 9. Representations of SMS and Bluetooth.

pedometer and several accerolometer sensors placed in a bracelet to be worn around the wrist. *Arousal* is picked up through measuring pulse and sweat and removing all those instances when this is only related to movement. The underlying model is thus a very simple dimensional model (cf. Russell's circumplex model of affect with arousal and valence [7]). While the relationship between sensor input and body posture is a simple, straightforward one, it may very well not capture what the user felt. Users' can therefore change the body posture by manipulating it, as if manipulating a puppet's strings, thereby altering its expression to better fit with what they were experiencing.

Colour
Colour is used in two different ways in his design. First it is used together with the body postures to convey different levels of arousal (Fig. 7). The power of colour as a means to convey emotion has been known for centuries [4], even if there does not really exist a simple one-to-one mapping from colour to emotion and many aspects of it are culture-dependant. Typically, red is often seen as containing the most energy as we move along a colour scale that ends with blue, which is supposed to contain the least amount of energy [9].

The second use of colour in our system is to convey a sense of time by trying to mirror the colours of night and day light. This alternative way of conveying a sense of time was incorporated since we found that users were not particularly interested in knowing the precise time. Instead of a specific timeline this gives a greater feeling of whereabouts in time. Only six colours are used but blending effects allow for several colours to come into play (Fig. 8).

Other mobile data
The representation of input from activities of the mobile phone follows the same colour scheme as the time representation (Fig. 9). The text messages are represented by animated increasing or decreasing circles, visualising received or sent messages. The actual messages can also be viewed by clicking on the circle. The Bluetooth presence is represented in a similar manner where a mouse-over will show the name of the Bluetooth-resource the user encountered. In other studies we have found that more users than expected keep Bluetooth on in their mobile phones, named something that makes it possible to detect who the owner of the phone is [8]. The Bluetooth encounters thus have the possibility of reminding users of some parts of the social circumstances they have been in during the day.

User discussions
To get some feedback on the graphical design we performed some preliminary user discussions with 4 potential users. A Flash movie illustrating the idea was shown. In summary, the discussions indicated that the design allowed users to feel empowered to change the bodies and colours, and to scribble their diary notes on top of the representation. The time visualisation by using colours was intuitive and perceived as separated in meaning from the colours of the characters.

Initial testing of sensors

As indicated above, we are experimenting with a very simple dimensional model that we created from the sensor input. The two dimensions are *arousal* and *movement*. Similar to how we worked with the design of the diary representation described above, we have worked from a user-experience driven perspective with the sensors. All of us wore a whole range of sensors for
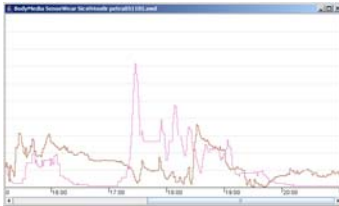
Figure 10. Sensor data.

24 hours and kept a diary of our activities – a staged lived experience [6]. The obtained data (e.g. Fig. 10) we then used to see when and where we got feedback either on something that we did recognize from our day as an important event, or when the sensors provided feedback that surprised or intrigued us. The experience of using these sensors showed that there is a real risk of creating a disembodied experience based on these data if represented using graphs (Fig. 10). The body starts to live a life of its own, in a sense separated from our experiences of what was really going on. While this may be very entertaining and fun to experiment with, our design goal is to instead create an embodied experience of the day. The events during the day (as picked up by the sensors) need to be represented in such a manner that it becomes a familiar experience, something we recognise as closely related to what happened. Thus, moving away from those graph-like diagrammatic representations to the body postures and colours discussed above is seen to encourage a more holistic experience. Our early testing of this is promising, though more experimentation is needed.

Summary

The affective diary system shows that it is possible to mirror some aspects of physical, bodily experiences so that the design invites interpretation, empowerment and a diary-like experience. We avoid resorting to a simplistic, disembodied model of users' experiences. The materials in the diary and the interaction possibilities in the design have been aimed at allowing the user to organise, reflect on and alter their own stories.

Acknowledgement

References

[1]   Boehner, K., DePaula, R., Dourish, P., and Sengers P. Affect: From Information to Interaction. Critical computing Conference 2005, Århus, Denmark, 2005.

[2]   Gaver, B., Dunne, T., Pacenti, E. Design: Cultural probes, Interactions, 6(1), pp. 21–29, ACM Press, 1999

[3]   Gaver, W., Beaver, J., and Benford, S. Ambiguity as a Resource for Design. Proc. of the conf. on Human factors in comp. sys., CHI'03, Ft. Lauderdale, Florida. pp. 233-240., 2003.

[4]   Goethe, J. V. Goethes färglära, Kosmos förlag, Stockholm, Sweden, 1976 (translated by Pehr Sällström from Zur Fahrbenlehre, 1810).

[5]   Gemmell, J., Williams, L., Wood, K., Bell, G. and Lueder, R. Passive Capture and Ensuing Issues for a Personal Lifetime Store, Proceedings of The First ACM Workshop on Continuous Archival and Retrieval of Personal Experiences (CARPE '04), pp. 48-55, 2004.

[6]   Iacucci, G., Iacucci, C. and Kuutti, K. Imagining and experiencing in design, the role of performances, Proceedings of the second Nordic conference on Human-computer interaction, Aarhus, Denmark, pp. 167 – 176, 2002.

[7]   Russell, J.A. Circumplex Model of Affect, Journal of Personality and Social Psychology, Vol. 39, No. 6, 1161-1178, American Psychological Association, 1980.

[8]   Rudström, Å., Svensson, M., Cöster, R. and Höök, K. MobiTip: Using Bluetooth as a Mediator of Social Context. Ubicomp 2004 Adjunct Proceedings, 2004.

[9]   Ryberg, K. Levande färger, ICA Bokförlag, Västerås, Sweden, 1991.