

eMoto – Affectively Involving both Body and Mind

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ABSTRACT

It is known that emotions are experienced by both body and mind. Oftentimes, emotions are evoked by sub-symbolic stimuli, such as colors, shapes, gestures, or music. We have built eMoto, a mobile service for sending affective messages to others, with the explicit aim of addressing such sensing. Through combining affective gestures for input with affective expressions that make use of colors, shapes and animations for the background of messages, the interaction pulls the user into an embodied ‘affective loop’. We present a user study of eMoto where 12 out of 18 subjects got both physically and emotionally involved in the interaction. The study also shows that the designed ‘openness’ and ambiguity of the expressions, was appreciated and understood by our subjects.

Author Keywords

Affective interaction, gestured-based interaction, user-centered design, ambiguity

ACM Classification Keywords

H.5.2 [Information Systems]: User interfaces – *graphical user interfaces (GUI), interaction styles, screen design, user-centered design.*

INTRODUCTION

Research in psychology and neurology shows that both body and mind are involved when experiencing emotions [2,3]. Emotions influence somatic signals, hormones, heart rate, and body movements, and sometimes emotions become reinforced or even initiated by such bodily signals [4]. Thus, it should be possible to design for stronger affective involvement with artifacts through addressing physical, bodily interaction modalities. Tangible interaction [8], gesture-based interaction [1], and interaction through plush toys and other artifacts [9], are all examples of such physical modalities.

The feedback from the system, in turn, may also make use of a range of sub-symbolic expressions addressing our sensual emotional experience. Instead of focusing on expressing emotions through ‘labels’ of emotions or facial expressions of interactive characters, we can make use of colors,

shapes, animations, sounds, or haptics.

Our approach to affective interaction differs somewhat from the goals in affective computing [10]. Instead of inferring information about users’ affective state, building computational models of affect and responding accordingly, our approach is user centered. Users should be allowed to express their own emotions rather than having their emotions interpreted by the system.

We have summarized our design aims into what we name an *affective loop*. In an affective loop, users may consciously express an emotion to a system that they may or may not feel at that point in time, but since they convey the emotion through their physical, bodily, behavior, they will get more and more involved with the experience as such and with their own emotional processes. If the system, in turn, responds through appropriate feedback conveyed in sensual modalities, the user might become even more involved with the expressions. Thus, step by step in the interaction cycle, the user is ‘pulled’ into an affective loop.

Our aim is to create affective loop applications for communication between people. The process of determining the meaning of a message with some emotional expression is, similar to any human communication, best characterized as a negotiation process. The message is understood from its context, who the sender is, his/her personality, the relationship between sender and receiver, and their mutual previous history. Through the sensual modalities and with somewhat ambiguous and open-ended designs such a negotiation process is possible.

To better understand whether and how it is possible to create a user-centered affective loop for communication purposes, we have designed, implemented and evaluated a mobile service named *eMoto*. eMoto is a mobile messaging service for sending and receiving affective messages [6].

EMOTO

eMoto is built in Personal Java and runs on P800 and P900 mobile phones, two of Sony Ericsson’s Symbian phones, both have touch-sensitive screens that the user interacts with through a stylus pen. see Figure 1. In eMoto, the user first writes a text message and then finds a suitable affective expression to add to the background of her text message. To find this expression, the user navigates in a background of colors, shapes and animations, see Figure 3, through using a



Figure 1: The extended stylus and a P900 running eMoto

set of affective gestures, see Figure 2. The gestures are picked up with an accelerometer and a pressure sensor that we have added to the stylus pen, see Figure 1. The colors, shapes and animations in the background of the message aim to convey more of the emotional content through the very narrow channel that a text message otherwise provides.

We aim to avoid a one-to-one mapping between emotion, gesture and expression. Instead, there is a certain level of ambiguity which allows people to express themselves in their own personal way. This is inspired by the work by Gaver et al. [7]. But where Gaver and colleagues define and make use of ambiguity to make users reflect on and appropriate technology, our aim is just to create some space for individual interpretation of the expressions.

Affective gestures

As we aim to make the user emotionally involved in a physical sense, it is important that the gestures we pick are not singular, iconic or symbolic gestures, but gestures that give rise to a physical experience that harmonizes with what the user is trying to express. An angry gesture should feel angry when performed. It needs to be sustained for a certain period of time, not too long, nor too short, in order to be experienced.

To achieve some of this naturalness both gestures and graphical expressions are designed from an analysis of emotional body language where we have used Labanotation to extract underlying dimensions of emotional gestures [5]. However, the exact gestures of emotional body language are highly personal. In eMoto the gestures are therefore not specified in detail. Instead the system captures the underlying dimensions of emotional gestures in terms of movement and pressure. This design decision came from an analysis of emotional body language where it became apparent that even though negative and positive emotions not always differ in terms of arousal, most negative emotions have more tense expressions. Therefore the affective gestures in eMoto are set up as combinations of valence, ranging from negative to positive emotions, expressed in terms of level of pressure and amount of arousal communicated through more or less movement; see Figure 2, describing the four extreme gestures. However, in between those ex-

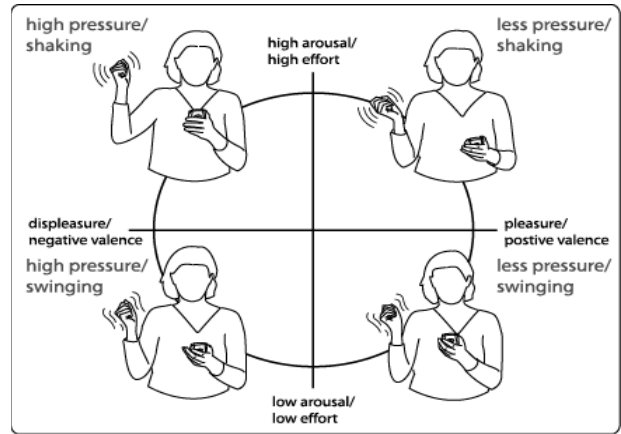


Figure 2: The Affective Gestures

tremes there can be a whole range of combinations of movement and pressure.

Affective expressions

The characteristics of emotional body language were also applied on the design of graphical expressions in the background of the messages as described above. The expressions used in the background, formed as a circle, are non-symbolic and designed from what is known about the effects of colors, shapes and animations (see Figure 3).

The resulting colorful circle is a hundred times larger than the screens of the P800/P900 mobile phones. Thus only a small proportion can be seen at a time. As users can navigate freely around the entire circle and decide to stop anywhere, there is a large amount of expressions to choose from.

We first did a user study of the colors, shapes and animations before they were combined and evaluated together with the affective gestures – as described below. The results confirmed that our aim to let people express themselves differently was possible and viable – without becoming completely random and confusing.

USER STUDY

Our main aim with setting up a qualitative study of eMoto was to see if our idea of capturing the underlying dimen-



Figure 3: The Affective expressions (the animations can be seen on www.sics.se/~petra/animations)

Scenarios	
The racist doorman	You write to tell a friend that you and your other friend could not get into the bar because of a racist doorman.
The perfect job	You write to tell your boyfriend that you got the job you applied for even though there were over a thousand other applicants.
The ex-boyfriend	You write to tell a friend that your boyfriend who you love so much has dumped you.
The hammock	You write to a friend who is at work telling her that you are relaxing in the hammock.

Table 1: Scenarios

sions of emotional gestures was enough to make users emotionally involved in the sense defined by our affective loop idea.

We recruited the subjects through putting up notes around Kista, a working area outside Stockholm, asking for female subjects between 25 and 35 who were frequent mobile phone and SMS (Short Messaging Service) users. 18 subjects signed up for the user study; six master students, two PhD students, four working with PR and marketing, five software developers and one journalist, $24 < 28,6 < 35$ years old. 12 subjects had mobile phones with MMS functionality and 7 subjects had a camera on their mobile phone. Each subject was given two movie tickets in reward for the one hour they spent in the study.

The study started with a questionnaire to determine subjects' mobile phone and computer usage, and also some of their personality. To capture users' first intuitive ideas of what gestures to use for various emotions users' first practical task was to perform gestures holding the modified stylus expressing the emotions angry, excited, satisfied and sad. The system did not give any feedback at this point. Then users were placed in a more realistic setting where they were presented with four scenarios, summarized in Table 1, to which they were asked to find suitable affective expressions. Finally, the subjects got to answer a second questionnaire, this time about their experiences with eMoto.

RESULTS

The results are structured into two parts. First we discuss the success of the emotional gestures as such. Second, we present the results that have to do with the affective loop, that is, the subjects' emotional involvement when combining the gestures with the affective expressions.

Affective gestures

If we compare the characteristics of movements implemented in eMoto (see Figure 2) the gestures have nearly the same characteristics as most subjects 'naturally' came up with when asked to improvise with the stylus, see Table 2. Thus, our initial analysis of emotional body language seems to have led us in the right direction and the interpretation of

Emotion	#	Most common gesture
Angry	6	Repeated hard striking
	6	A pressure so hard that it became impossible to hold the arm still
Excited	12	Wavy movement high up in the air
Sad	11	An immobile hanging arm
Satisfied	11	Just holding the stylus gently

Table 2: Most common gestures used by the 18 subjects when interacting without feedback

gestures vis-à-vis the actual artifact (the extended stylus) was able to carry the same kinds of behavior.

For the more realistic task interacting with the prototype, all subjects interpreted the scenarios, 'the racist doorman', 'the perfect job', 'the ex boyfriend' and 'the hammock', as emotions very similar to respectively angry, happy, sad and content. Users got more emotionally involved with this task, probably because they were imagining actually being in that scenario. Thus, in one sense, the gestures subjects performed here (presented in Table 3) might be considered to be even more 'natural' than the gestures in the first task.

A difference between the gestures, as described in Table 1 and 2, is that all gestures in the latter are 'sustained'. That is, subjects had to keep on doing the same gesture over and over in order to get the system to continue to move in the circle towards the expression they wanted. As discussed in the introduction, if users have to keep on doing a gesture for too long, we risk losing their emotional involvement. On the other hand, the gesture must not be too fast, especially not for emotions with less arousal, such as sadness. Thus, our timing needs to be slightly altered to better capture different emotional experiences.

Emotionally involved in an affective loop

Most of the subjects got more relaxed and found the study more enjoyable when they got to do the gestures to express emotions in the scenarios. Figure 4 shows that the users not only got emotionally engaged with the gestures, but also that their whole appearance changed, in particular their facial expression. The first picture shows a subject engaged with 'the racist doorman' scenario. She not only had a stern facial expression and bit her teeth together really hard, but she also uttered (all citations are translated from Swedish by the authors):

"Now I'm really pissed and it's night time and we were gonna

Scenario	#	Most common gesture
The racist doorman	15	Hard shaking
The perfect job	12	Wavy moments high up in the air
The ex-boyfriend	13	Holding it still with a medium hard pressure
The hammock	8	Lose swinging movements
	5	Just holding the stylus gently

Table 3: Most common gestures used by the 18 subjects when interacting with the prototype



Figure 4: Subjects involved in the four scenarios; ‘the racist doorman’, ‘the perfect job’, ‘the ex-boyfriend’, and ‘the hammock’

have fun together and...

The second picture shows a subject engaged with ‘the perfect job’ scenario. This subject waved her hand in the air and smiled. In the third picture a subject engaged in ‘the ex boyfriend’ scenario expressed depression both in her face and in how she just hang her arm down with a very loose grip on the stylus. Finally, in the last picture the subject was neutral and she just held the stylus in her hand for ‘the hammock’ scenario. A video analysis, based on the authors’ interpretation of the subjects’ usage, their facial expression and their general appearance, was conducted to summarize the subjects’ emotional involvement when interacting with the scenarios. 12 subjects got engaged with ‘the racist doorman’, 15 with ‘the perfect job’, 14 with ‘the ex-boyfriend’ and 16 with ‘the hammock’ scenario.

A small group of subjects (6 subjects) had a more difficult time than the rest of the subjects to relax and be engaged with the prototype and the scenarios.

In the final questionnaire the first question was about using gestures to express emotions. When comparing the answers to this question with the results from the video analysis it became even more apparent that there were two groups of users. 12 subjects felt relaxed when using their body language:

“Cool! It really feels like I’m communicating the emotions I’ve got without being aware of them.”

Six subjects were very uncomfortable in doing so:

“Hard! Partly because you have so different strength and partly because it’s basically hard.”

SUMMARY

The study indicates from the analysis of facial expressions and the users own reports that most of the time they got both physically and emotionally involved. Interesting is probably the need to work further on the duration for each gesture. Some emotions seem to require a fairly long, sustained gesture, while others are better expressed in a quick gesture done once. However, not all of our subjects did get involved with the gestures and affective expressions. The initial questionnaire revealed that this can partly be explained as a mismatch between their personality and the targeted user group for eMoto. In general, some users might be more open to physical, bodily expressions than others.

Again, further studies are needed to disentangle whether this is the reason behind this difference.

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