Utilizing Emoticons on Mobile Devices within ESM studies to Measure Emotions in the Field

Alexander Meschtscherjakov
ICT&S Center, University of Salzburg
Sigmund-Haffner Gasse 18
5020 Salzburg, Austria
++4366280444813
alexander.meschtscherjakov@sbg.ac.at

Astrid Weiss
ICT&S Center, University of Salzburg
Sigmund-Haffner Gasse 18
5020 Salzburg, Austria
++4366280444812
astrid.weiss@sbg.ac.at

Thomas Scherndl
ICT&S Center, University of Salzburg
Sigmund-Haffner Gasse 18
5020 Salzburg, Austria
++4366280444813
thomas.scherndl@sbg.ac.at

ABSTRACT

Assessing emotions in situ while people are using technology is a difficult endeavor. Several assumptions on the concept of emotion exist in the research field of HCI and similarly several methodological approaches how to measure them. In this position paper we propose the usage of emoticons on mobile devices within experience sampling method (ESM) studies to measure emotions in-situ while the mobile device is used. Since ESM studies often requires high efforts form the participant in terms of being interrupted several times a day it is especially important for ESM studies to have a means to be able to capture quick emotional user states and responses. We present a set of five emoticons, which cover two dimensions of emotions (strength and arousal) within one scale. To our conviction these emoticons allow an intuitive option for users to state their emotions on a mobile device during an ESM study. Using a case study, we investigated the feasibility of emoticons as answer categories for questions aiming at emotional states and feelings. We found that besides the space-saving aspect of the emoticons, which is an important aspect in conducting mobile studies on small displays, findings were not biased and participants had a positive user experience towards these question types. Furthermore, the usability of the emoticons was evaluated.

Categories and Subject Descriptors

H.5.2 [**Information Interfaces and Presentation**]: User Interfaces: valuation/methodology

General Terms

Measurement, Design.

Keywords

Emotions, emoticons, experience sampling method, mobile devices, user experience.

1. INTRODUCTION

HCI research shows increased interest in investigating the influence of emotions on the user during product usage. Emotions are the key aspect of any experience as they influence people's actions, expectations and future evaluations. Emotional factors have to be integrated in HCI to assess complex interaction experiences [9].

However, measuring emotions is difficult. It is even more difficult to measure emotions of users during interactions triggered by these interactions, since these interactions always take place in specific contexts. These specific contexts often have a big influence on the user's emotions. Emotions do not occur in a vacuum: Emotional responses emerge in a context and are reflected within an ongoing action and interpretation process. When it comes to mobile devices it is even more difficult, since the mobile context is an ever-changing one. To capture user experience and emotions within various contexts we propose to utilize emoticons during experience sampling method (ESM) [7] studies. ESM is an in-situ method to catch emotions, motivations and cognitive processes when they actually occur.

After giving a short overview on related work on the concept "emotion" we will present our approach to utilize emoticons as emotion measure during experience sampling studies. Thereafter we will describe a case study implementing this methodological approach.

2. RELATED WORK

The field of studying emotion has a long tradition and was observed from different perspectives with a focus on specific objectives. Each perspective has its own assumptions about how to define and construct theories of emotion [2]. A wide spectrum of different approaches does coexist, distinguishing between affect, mood, and emotion. There is growing consensus that affect refers to the general valence of an emotional state, emotion refers to specific types or clusters of feelings that occur in response to particular events, and mood refers to relatively enduring and global states of pleasant or unpleasant feelings [1].

Different methods can be utilized to measure the emotional state of a subject [9]. One promising area is to use body responses as a measure of emotions (e.g. skin conductance response (SCR), skin resistance response (SRR), electrocardiogram (ECG), or the size of pupils). Another approach is to monitor the activities of specific regions of the face (e.g. observation of zygomaticus major and corrugator supercilii). So far all of these approaches are only feasible in laboratory studies. Therefore up to now most in-situ studies used retrospective self reporting measures, like questionnaires and interviews to gain information on emotional responses.

In principle two theoretical approaches of measuring emotion can be distinguished: the categorical approach and the dimensional. The categorical approach by Ekman and Friesen [6] proposes that there are some "fundamental" emotions, where the term

fundamental presents those patterns of responses to the world that evolution has equipped us with, due to their necessity for our survival. All other emotions are somehow derived from this small set of simpler emotions. They postulated the "Big Six" emotions, which are happiness, sadness, fear, surprise, anger, and disgust.

The dimensional model describes emotions in two (or in some cases three) independent dimensions (arousal, pleasure) in a Cartesian Space [10]. Based on these two dimensions, Russell created a 'circumplex of emotions' [11]. In this model, each emotion has a specific location on the circumplex. Emotions therefore are not perceived in categories but in much more complex and fluent manner. They can be measured according to valence and arousal, where valence refers to whether the emotion is positive or negative and arousal refers to the intensity.

To overcome the problem of wording and phrasing to describe emotions, pictorial tools have been developed. They are more likely to capture non-verbal aspects of emotions, are supposed to be less culture dependent, are also applicable to special user groups with restricted possibility to verbalize experiences and emotions such as children, and they allow people to express conflicting emotional responses. Instruments which make use of this approach are the Self-Assessment Manikin (SAM) [2], Emocards [5] or the Product Emotion Measurement Instrument (PrEmo) [4]. The SAM is a non-verbal pictorial assessment technique that separately measures three dimensions of emotions: pleasure, arousal, and dominance. The Emocards consist of 16 cartoon faces with eight distinct emotional expressions (eight male faces and eight female faces). These expressions vary on the basis of the dimensions 'pleasantness' and 'arousal'. A similar instrument is PrEmo, which measures 14 emotions (seven pleasant, and seven unpleasant). Respondents can report their emotions with the use of expressive 14 cartoon animations. In the instrument, each of the 14 measured emotions is portrayed by an animation by means of dynamic facial, and bodily, and vocal expressions.

3. EMOTICONS FOR ESM

Similar to the examples above our approach to measure emotions on mobile devices by means of emoticons is based on the dimensional approach. Contrary to the other approaches one main issue for us was to measure emotions on mobile devices. To use the emoticons during an ESM study we needed an instrument, which

- fits on the relatively small mobile device screen,

- is intuitive, does not need much mental effort for interpretation and

- is capable to be answered with input modalities provided by different mobile devices.

We therefore decided to create a non-verbal self-report measure designed on the basis of commonly known emoticons (see Figure 1). We designed five different emoticons embodying two emotional dimensions: positive and negative emotions (pleasure) and the strength of emotions (arousal). The emoticons were designed following an iterative design procedure.

Figure 1: Emoticons. From left to right: negative and high arousal, negative and low arousal, neutral, positive and low arousal, positive and high arousal.

Contrary to the Emocards and PrEmo, which are arranged in a circle and similar to SAM we decided to arrange our emoticons in a linear order. This order had the advantage of a higher usability on small-scale screens like on mobile devices. It gave us the possibility to suggest arousal not only in the design of the emoticon but also by their arrangement. Similar to Emocards we decided to code emotions with facial expressions, but we did not include male and female faces for the same emotion but used instead emoticons since they are sexual neutral. Contrary to Emocards and PrEmo we did not try to allocate basic emotions to our construct (e.g. 'annoyed', 'euphoric' for emotions with high levels of arousal; 'bored' and 'content' for calm emotions; 'thrilled' for very pleasant, 'horrified' for very unpleasant, and 'surprised' for neither pleasant nor unpleasant).

Similar to the SAM we stayed with the categorical approach. Contrary to the SAM, which measures three dimensions separately (pleasure, arousal, and dominance) we only included two dimensions (pleasure and arousal) and merged them onto one scale. This again has the advantage that it needs very little space on the mobile display and is easy to interpret.

As stated above we used these emoticons to retrieve emotional answers to questions during in-situ studies utilizing ESM. The next section describes a case study the above described emoticons were used to capture users' emotions. Different kinds of questions could be asked to be answered using the emoticons. As an example the user could be asked how he/she feels in a certain moment (e.g. after using a special service). As another example they could be used to ask how satisfied a user is with a certain service. The satisfaction scale can then be visualized by emoticons instead of using answer categories like "very unsatisfied" or "very satisfied".

4. CASE STUDY
4.1 Study Setting

To investigate the feasibility of the emoticons approach a case study was conducted in the framework of a bigger field study on emotional attachment to mobile devices in May 2007. As mentioned before the field study used the experience sampling method (time triggered) and was organized as follows:

1. Notification: Notification was done through a short message service (SMS). The user got an SMS whenever he/she needed to answer a questionnaire. This was done based on a predefined timesheet.

2. Delivery: The SMS used for notification contained a link to a webpage, which displayed the questions.

3. Capturing: Users' responses were captured via a webpage submission into a database.

The study lasted for one week (including a weekend). Participants received seven notifications per day, where each sample consisted

of four questions. As time frame for the notification we defined 9:00 until 20:00 during weekdays, and between 10:00 and 21:00 during the weekend. The time-triggered sampling was scheduled for about every second hour. This means, that each participant received a total of 196 questions. Each question sample combined the same question forms, which were the following once: (1) yes/no questions, (2) multiple answer questions, (3) rating questions and (4) emoticons. In the following some example questions are mentioned, which had to be answered by means of emoticons (an example for the visualization on the mobile phone display can be found in Figure 2).

- How do you feel after being available for this person?
- How do you feel about customizing your mobile phone with additional services?
- How do you feel now that it was possible to have had a conversation?

Figure 2: A typical question during the ESM study.

Three different topics were assessed by means of the emoticons approach: usage environment, the mobile device itself and the user. As the ESM study was time triggered the same question had to be answered by the participants several times on different days and times.

Twenty people participated in our study (8 female and 12 male). Their age ranged from 26 to 52 years. Gender was counter-balanced and all participants were experienced in using smart phones with Internet connection.

4.2 Results

For reasons of statistical analysis the emoticons were coded numerically from -2 (very unhappy) to +2 (very happy) in this study. Although a lot of information concerning our main research questions could be derived from the data analyzing the emoticons results in correlation with the ESM logging data influence factors, like day time, used service etc., we report here only results concerning the usability and acceptance of the emoticons. For more detailed research findings concerning usage and emotional attachment toward mobile devices, we recommend to read the full technical report [8].

Our first concern was whether the emoticons could depict the full range of emotions during our field study and help the participants to formulate their current feelings. Indeed, we found that participants really utilized the full range of emoticons indicating that there was no or only minor bias grounded in social acceptability (see Table 1). These results go along with the general finding that participants reported significantly more often

positive situations than negative ones, therefore resulting in a generally positive rating.

Table 1: Distribution of responses (in percent) for different questions

Question	-2	-1	0	1	2
How do you feel after being available?	1.4	4.2	42.3	26.8	25.4
How do you feel after using the device?	2.8	5.6	36.1	36.1	19.4

Additionally to the variability over different situations and participants, individual participants' ratings also differed over time, situation and context, suggesting that our emoticons were sensitive to changes in participants' feelings. These results show a certain amount of face validity, as feelings at work during a situation which were perceived as very stressful were rated worse than situations at home which were rated as relaxing.

Figure 3 gives an example how the response behavior of the participants changed on the question: "How do you feel right now while using your mobile phone".
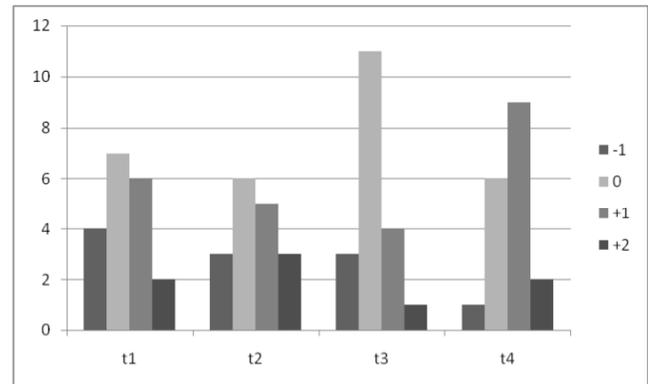

Figure 3: Change in response behavior

Thirdly, we concentrated on the mean answering times of the questions using emoticons to assess momentary feelings and found no difference towards other question types as other multiple or single choice items (for emoticon question: average answering time was 31.64 sec with a standard deviation of 18.22; for a single choice question with similar length: 34.23 sec with a standard deviation of 12.45). We interpret this finding that participants could answer the questions concerning their feelings as adequately and fast as questions concerning more rationale and cognitive topics.

At last, a final interview with all the study participants revealed that they appreciated the emoticons approach and also approved of its intuitiveness. One participant suggested to add an answer category 'have no feelings right now', which indicates that the middle emoticon was correctly interpreted as 'neutral feeling', instead of 'no feeling'. Nevertheless it seems to be quite unlikely that participants had no feelings at all.

To conclude, we suggest that the emoticon approach is suited for assessing emotion in situ, because it is intuitive, easy to understand and handle for the user and space-saving. The obtained results can be coded in different ways to concentrate on the two axis strength of emotion (positive vs. negative) and arousal

(strong vs. weak), therefore allowing several approaches of research.

5. SUMMARY AND OUTLOOK

In this position paper we propose the usage of emoticons to assess emotions arising from the contextual usage of mobile devices in situ when they occur. Based on two dimensions (pleasure and arousal) five emoticons were used in a linear order to provide mobile phone users with a self-reporting tool to state their current emotion. A first case study could prove that the emoticons did not bias the answer behavior into one direction and are suitable to investigate different research contexts. A final interview with the case study participants revealed that participants experienced the emotions as intuitive and easy to answer on a mobile phone.

Our next step will be to focus more on the changing of emotional states and thus using these emoticons in a long-term study to investigate if they cannot only be used to measure the current emotional state of the user, but also indicate the development of an emotional attachment. This could be a valuable insight to derive influence factors for emotional attachment in the three different proposed contexts, e.g. phone services that get rated more positively the more often they are used. Another refinement of our approach will be to use context information as a trigger for delivering ESM questionnaires. This will make it possible to research the influence of specific contextual parameters to emotional responses.

6. REFERENCES

[1] Andersen, P. A., Guerro, L. K. 1998. Handbook of Communication and Emotion: Research, Theory. Applications and Contexts. Academic Press. California, USA,

[2] Bradley, M., Lang, P.J. 1994. Measuring emotion — the self-assessment mannequin and the semantic differential, J. Behav. Ther. Exp. Psychiatry 25, pp. 49–59.

[3] Cornelius, R. R. 1996. The science of emotion: research and tradition in the psychology of emotions. Prentice-Hall, Upper Saddle River, NJ,

[4] Desmet, P.M.A., Hekkert, P., Jacobs, J.J. 2000. When a car makes you smile: Development and application of an instrument to measure product emotions. In: S.J. Hoch and R.J. Meyer (Eds.), Advances in Consumer Research, 27 (pp. 111-117). Provo, UT: Association for Consumer Research.

[5] Desmet, P.M.A., Overbeeke, C.J., Tax, S.J.E.T. 2002. "Designing products with added emotional value: development and application of an approach for research through design", The Design Journal, Vol. 4 No.1, pp.32-47.

[6] Ekman, P., Friesen, W. V. 1971. Expression and the nature of emotion. In K. Scherer and P. Ekman (Eds.), Approaches to emotion.

[7] Larson, R., & Csikszentmihalyi, M. 1983. The experience sampling method. In H. T. Reiss (Ed.), Naturalistic approaches to studying social interaction. New directions for methodology of social and behavioral sciences (pp. 41-56). San Francisco: Jossey-Bass.

[8] Meschtscherjakov, A., Obrist, M., Mirlacher, T., Lankes, M., and Tscheligi, M. 2008. Evaluating the emotional attachment to mobile devices & services. Tech. rep., HCI & Usability Unit, ICT&S Center, University of Salzburg,

[9] Minge, M. 2005. Methoden zur Erhebung emotionaler Aspekte bei der Interaktion mit technischen Systemen. Diploma Thesis, Berlin.

[10] Russell, J. A., Fernandez-Dols, J. .M. 1997. The Psychology of Facial Expression. Cambridge University Press, Cambridge.

[11] Russell, J.A. 1980. 'A circumplex model of affect'. Journal of Personality and Social Psychology, 39, 1161-1178.