

Comparison of Subjectively Experienced Emotions and Dispositions in Man-Machine and Man-Man Scenarios

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Abstract:

The authors of this study take the scientific position that of the major technologies of the future will be companion systems. This study examines which emotions and dispositions are relevant in this regard. It assesses which emotions and dispositions in the experienced scenarios of man-machine interactions are retroactively reflected in comparison with man-man interaction. The sample consisted of N=145 participants, which were divided into two groups. The first group described positive, and the second group negative scenarios man-machine and man-man interaction. Subsequently, the participants evaluated their respective scenarios with the help of 94 adjectives relating to emotions and dispositions. The correlations of the occurrence of emotions and dispositions in the man-man vs. man-machine interactions are very high. However, adjectives that are particularly relevant for man-man or man-machine interactions could also be identified. The results speak for a high similarity in the reproduction of subjectively experienced emotions and dispositions between man and machine in the emotional realm. Even though the scenarios did not describe any interactions of visionary companion systems, this is an indication that the interaction of the user with a companion system will be similar to man-man interactions.

1 Introduction

The ability to adapt cognitive technical systems to individual users is a significant characteristic of companion systems (CS). Which emotions and dispositions (E&Ds), however, are relevant with regard to interactions with CS? The variance source in the E&D is based on the characteristics of the context (where and for what purpose is a companion used), the characteristics of the human being (is the person motivated and in a good mood?), and the interaction between the human being and its companion system (is the interaction fun or is it frustrating?). The more technical cognitive capabilities a companion system possesses, the better it will be able to handle the complex emotion and disposition signals. The complexity advantage does not, however, answer the general question about the relevant E&D itself.

Since we do not know in what different ways E&D in interactions between man and machine and in interactions between human beings are experienced, this study investigated the difference between subjective E&D attributions in these two forms of interaction.

Theoretical and empirical reviews that cite the presence of emotion in the interaction between man-computer (e.g.: [Pr97], [PB08], [HBK], [Nb10]) and man-robot (e.g.: [Sh10]) usually refer to a mostly intuition-based E&D spectrum. There are many empirical approaches that automatically identify the intuitive classes of E&D based on prosody, semantics, and psychobiology parameters. There is less literature about studies that have investigated the presence of E&D in man-machine interactions [SFB08] (e.g. man-cell phone, man-GPS, man-household appliances, etc.). We are especially not aware of any studies that have empirically evaluated the presence of E&D in man-machine and compared it with man-man interactions. Consequently, this comparison and/or connection is to be the objective of this study.

2 Methodology

The overall sample consisted of N = 152 probands. Seven probands had to be excluded, because they had not filled out the questionnaires completely (N = 145 remained). The average age was 20.6 years. The sample was divided into two groups. Two "interaction worksheets" [Wc11] were handed out to the members of each group. The first group (N = 69) was asked to write down one scenario with a positive man-man interaction and also one with a positive man-machine interaction. The second group (N = 76) described a scenario with a negative man-man and/or man-machine interaction. The experiment took a total of 30 minutes.

The instructions differed as follows:

Group 1:

1. In our daily lives, we often have direct contact with other people; we meet friends, sit in meetings with our colleagues, ride next to strangers in public transportation, have sales staff give us advice in a store, etc.

Think back to the past seven days: What **people** did you have contact with? Choose a relatively **positive** situation that you still recall quite well. It can be a rather inconsequential or also an extremely important situation - that aspect is not important. What matters is that it involved one or several people, and that you still remember that moment quite well.

Example: "Late one evening on my way home, a group of Japanese approached me. They were apparently lost and asked me for directions. Fortunately, I knew the hotel they were looking for and took them there. They seemed very happy and thanked me."

2. In our daily lives, we often use technology; we work on the computer, purchase a ticket at a ticket machine, toast a slice of bread, send a text message, have a GPS guide us through an unfamiliar city, etc.

Think back to the past seven days: What **technology devices** did you use? Choose a relatively **positive** instance that you still recall quite well. It can be a rather inconsequential or also an extremely important situation - that aspect is not important. What matters is that it involved using a technology device, and that you still remember that moment quite well.

Example: "I wanted to buy a ticket at a ticket machine. The instructions were easy to follow. I purchased the ticket and still had enough time to leisurely walk to the platform and board the train."

Group 2:

3. In our daily lives, we often have direct contact with other people; we meet friends, sit in meetings with our colleagues, ride next to strangers in public transportation, have sales staff give us advice in a store, etc.

Think back to the past seven days: What **people** did you have contact with? Please select a situation that you perceived as somewhat **negative** and that you still recall quite well. It can be a rather inconsequential or also an extremely important situation - that aspect is not important. What matters is that it involved one or several people, and that you still remember that moment quite well.

Example: "My father told me that he might be suffering from a serious illness and that the doctors would be running more tests in the next few days to find out more."

4. In our daily lives, we often use technology: we work on the computer, purchase a ticket at a ticket machine, toast a slice of bread, send a text message, have a GPS guide us through an unfamiliar city, etc.

Think back to the past **seven days**: What **technology devices** did you use? Choose a rather **negative** situation that you still recall quite well. It can be a rather inconsequential or also an extremely important situation - that aspect is not important. What matters is that it involved using a technology device, and that you still remember that moment quite well.

Example: "I tried to buy a ticket at a ticket machine, but it took me a long time to follow the instructions and I missed my train because of it."

Afterwards, the emotional content of the scenarios was rated by using 94 emotional and dispositional adjectives and a Likert scale ranging from 1 (does not apply) to 6 (applies). The adjectives were extracted as part of a pilot study and reviewed by two experts [Wc11]. The following emotional adjectives were used for the rating process: aggravated, aggrieved, amused, angry, annoyed, anxious, ashamed, astonished, attentive, attracted, awkward, bored, calm, cared, certain, cheerful, cherished, concerned, confident, confused, curious, desperate, disappointed, discouraged, disgusted, disinterested, displeased, distracted, disturbed, eager, embarrassed, enraged, euphoric, extremely happy, fascinated, frustrated, grateful, guilty, happy, heartbroken, helpless, horrified, impatient, indispensable, inferior, inhibited, interested, irritable, laid-back, listless, miserable, motivated, nauseated, neglected, nervous, not challenged enough, offended, optimistic, overstrained, panic, perplexed, pessimistic, pleasant, pleased, proud, rejected, relaxed, relieved, reluctant, remorseful, sad, satisfied, scared, self-confident, serene, skeptic, superfluous, superior, surprised, tense, threatened, tickled, uneasy, unhappy, unmotivated, unpleasant, unsafe, unsatisfied, unsettled, unwell, useful, well, worried, wrathful.

3 Results

To measure the positive and negative scenarios, we used U-tests to compare the man-man and man-machine interactions. The correlation for positive scenarios between man-machine and man-man is $r = .92$ ($p < .001$) and for negative scenarios $r = .86$ ($p < .001$).

Figure 1 shows the correlation between man-man and man-machine for the positive scenarios. An extremely significant difference ($p < .001$) was found for the following emotional adjectives: amused, attracted, bored, cheerful, cherished, embarrassed, happy, interested, extremely happy, serene, tickled, useful and well. Figure 2 shows the correlation between man-man and man-machine for the negative scenarios. An extremely significant difference ($p < .001$) was found for the following adjectives: aggrieved, ashamed, embarrassed, guilty, impatient, inhibited, miserable, nauseated, offended, rejected, remorseful, sad, scared, superfluous, unpleasant, unsettled, unwell.

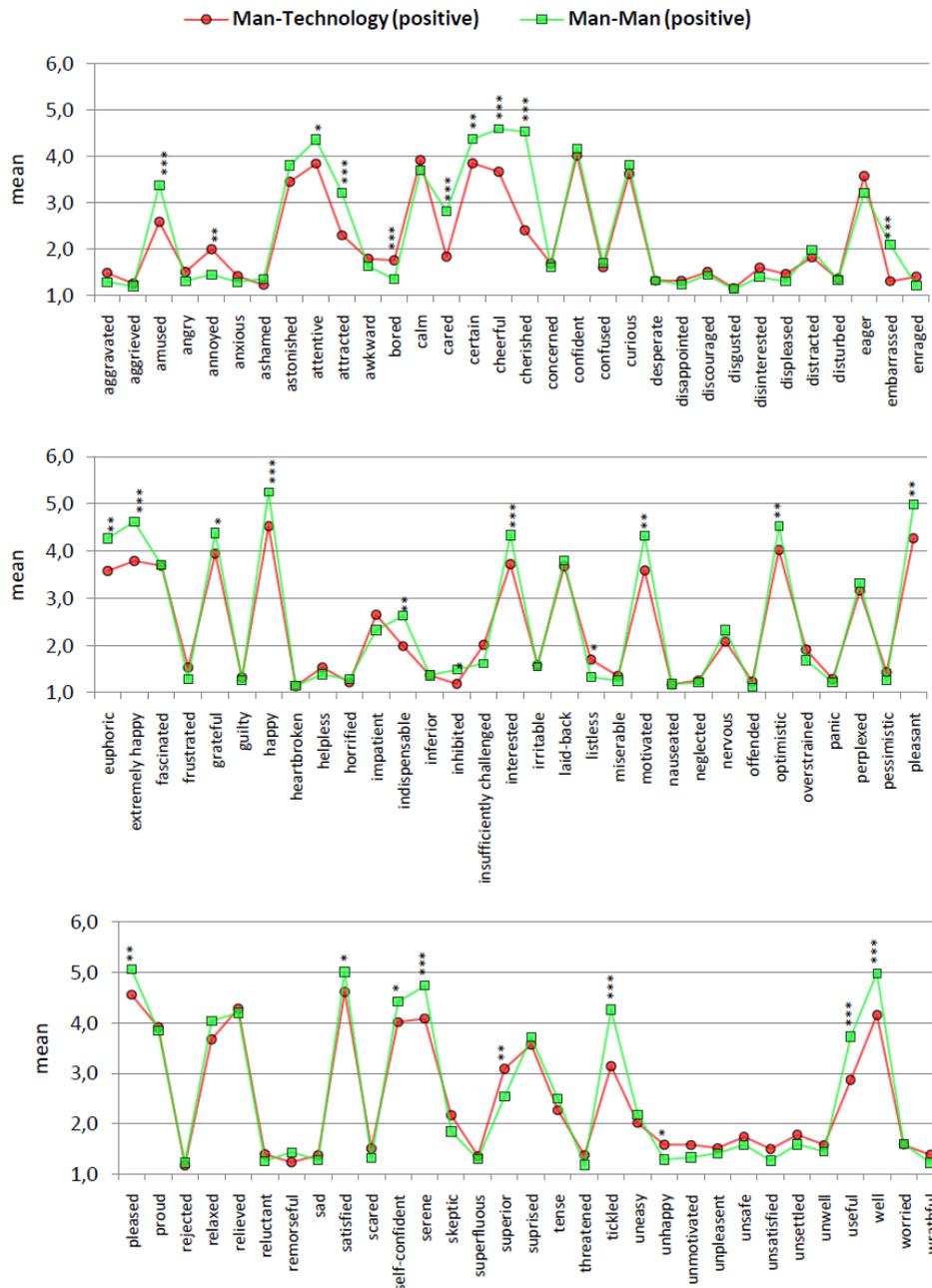


Fig. 1: Comparison of scenarios with a positive man-machine interaction to those with a positive man-man interaction;
 $p < .05^*$, $p < .01^{**}$, $p < .001^{***}$

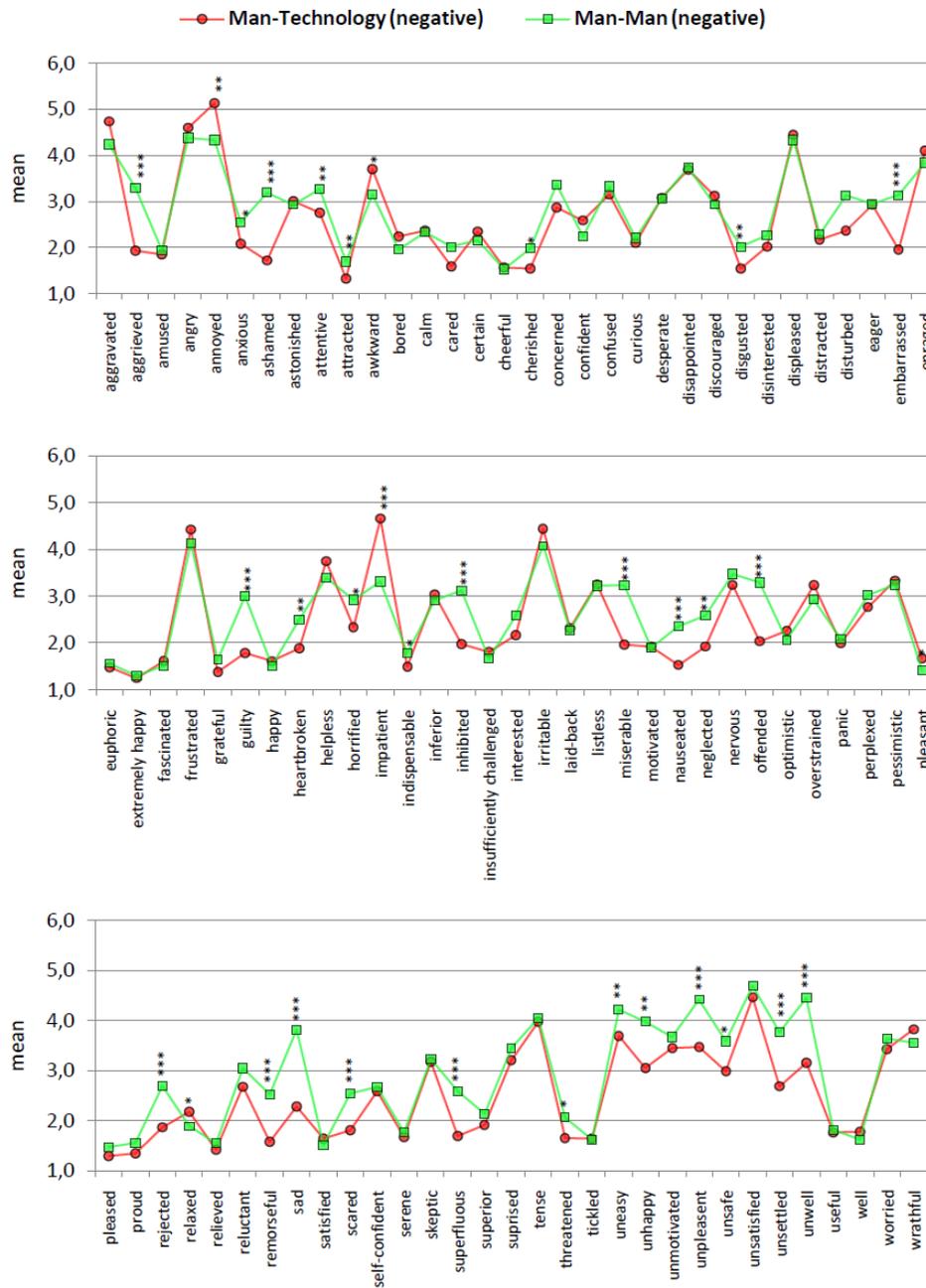


Fig. 2: Comparison of the scenarios with a negative man-machine interaction to those with a negative man-man interaction; p < .05*, p < .01**, p < .001***

4 Discussion

Man-Companion Interaction

Significant differences were found regarding the reflection of E&D between man-machine and man-man interactions. For the man-machine interactions, the adjectives “embarrassed”, “offended”, and “remorseful” were rated as highly significant less existing. The correlations indicate, however, that the forms of interaction for man-man and man-machine are surprisingly similar (especially with regard to positive scenarios). In cases where significant differences were identified in the process of comparing the forms of interaction, the main difference is higher emotional content in the man-man interactions.

It is important to note that we did not test visionary companion interactions for their E&D orientation. The results indicate, however, that a direct interaction of the user with a companion system will not be identical to a man-man interaction, but that it will show clear similarities. This similarity is probably not due to humanoid design, but the structural similarities of communication as well as information transfer/processing. Therefore, emotion models (such as the component process model [Sc03]) can quite easily be applied to the man-companion interaction.

Automatic Emotion Recognition

The results therefore do not support the statement that only a few E&D in man-machine interactions are relevant in comparison to man-man interactions. That means that the focus on the classification of emotional states can be very similar in both interaction contexts.

With regard to the aforementioned limitations of this study, we are planning to develop case vignettes that describe the potential companion interactions. The presented interaction questionnaire (Wc11) will also be used for this purpose. We also plan to use the questionnaire on the technology affinity for electronic devices (TA-EG [Kk09]) to develop a questionnaire on the technology affinity for CS.

5 Outlooks

Since, according to Bowlby [Bj99], emotional experiences are closely connected with the attachment styles of man-man relationships, it is very likely that acceptance and trust placed in CS are closely related to the presence of E&D in the interaction. We therefore plan to measure trust in and acceptance of companion systems in a qualitative and quantitative manner, and to check (1) these for the presence of E&D in companion scenarios and (2) the attachment styles of the man-man interaction in a correlative manner.

Our goal is to manifest the different user typologies with regard to the trust in and acceptance of companion systems in connection with the presence of E&D.

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Literature

- [Bj99] Bowlby, J.: Attachment and Loss (vol. 1) (2nd ed.). New York: Basic Books, 1999, 1969.
- [HBK03] Hassenzahl, M., Burmester M., Koller, F.: AttrakDiff: Ein Fragebogen zur Messungen wahrgenommener hedonischer und pragmatischer Qualität. In Ziegler J. & Szwillius G. (Eds.), Mensch & Computer. Interaktion in Bewegung (pp. 187-196). Stuttgart, Leipzig: B.G. Teubner, 2003.
- [Kk09] Karrer, K., Glaser, C., Clemens, C. & Bruder, C.: Technikaffinität erfassen – der Fragebogen TA-EG. In A. Lichtenstein, C. Stöbel und C. Clemens (Hrsg.), Der Mensch im Mittelpunkt technischer Systeme. 8. Berliner Werkstatt Mensch-Maschine-Systeme (ZMMS Spektrum, Reihe 22, Nr. 29, S. 196-201). Düsseldorf: VDI Verlag GmbH, 2009.
- [Pr97] Picard, R.W.: Affective Computing. Cambridge, MA, The MIT Press, 1997.
- [PB08] Peter, C.; Beale, R.: Affect and Emotion in Human-Computer Interaction. Springer, Berlin Heidelberg, 2008.
- [Sk03] Scherer, K.R.: Introduction: Cognitive Components of Emotion. In Davidson, R.J., Scherer, K.R., Goldsmith, H.H. (Eds.) Handbook of Affective Sciences (pp. 563-571). Oxford University Press, Oxford, 2003.
- [Sh10] Turkle, S.: In good company? On the threshold of robotic Companions. In: Wilks, Y. (ed.), Close Engagements with Artificial Companions: Key social, psychological, ethical and design issues, p. 3-10, 2010.
- [SFB08] Stemaszewska, H.; Fields, B.; Blandford, A.: Emotion and technology: an empirical study. In: Peter, C.; Beale, R.; Crane, E.; Axelrod, L.; Blyth, G.: Emotion in HCI: Joint Proceedings of the 2005, 2006, and 2007 International Workshops, Stuttgart, S. 48-53.
- [Nb10] Bee N., Andre E., Vogt T., Gebhard P.: The use of affective and attentive cues in an empathic computer-based Companions. In: Wilks, Y. (ed.), Close Engagements with Artificial Companions: Key social, psychological, ethical and design issues, pp. 202-219, 2010.
- [Wc11] Publication in preparation (2011).