

Humanizing Nonhumans: The Role of Emotions in Human-Robot Interaction

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Overview

This poster presents an experiment that investigated the effect of a robot emotion display (vs. none) on Human-Robot Interaction and participants' tendency to anthropomorphize the robot.

Introduction

Researchers engaged in the development and advancement of socially interactive robots have emphasized the importance of emotional expression in robotic characters.

Endowing robots with emotions helps facilitate Human-Robot Interaction (HRI) by making HRI more natural and meaningful (Breazeal, 2003; Hegel et al., 2006). Furthermore, a robot's emotional response provides feedback to the user by indicating the robot's internal state, goals or intent (Leite et al., 2008). On the other hand, Castellano et al. (2009) argued that a robot's sensitivity to the user's affect constitutes an essential prerequisite for displaying socially intelligent behavior. Previous research has also shown that synchrony of mimic display affects cooperation within dyads and is a basis for liking (Hegel et al., 2006).

We were thus interested in the role of emotion display and its effect on anthropomorphic perceptions of the robot. We tested this in a HRI scenario, replicating and extending Hegel et al. (2006) by using a new robot.

Anthropomorphism

Despite the fact that anthropomorphism is a longstanding concept that has sparked the interest of philosophers and roboticists alike, Epley et al. (2007) were the first to shed light on the psychological determinants and consequences of anthropomorphism (see also Epley et al., 2008; Waytz et al. (in press)).

According to these authors, "imbuing the imagined or real behavior of nonhuman agents with humanlike characteristics, motivations, intentions and, emotions is the essence of anthropomorphism" (pp. 864- 865).

Hypotheses

We tested the following hypotheses:

- Participants would ascribe more
 - ✓ primary and secondary emotions
 - ✓ intentionality
 - ✓ humanlikeness of the robot's response
 - ✓ likeability
 - ✓ perceived closeness
 - ✓ ability to recognize the emotional content of speech
 to the robot when it displayed cross-modal motor mimicry vs. a neutral response.
- The HRI with an emotionally responsive vs. neutral iCat would be rated as more pleasant.

Method

Participants

Participants in the study were $N = 51$ students (32 females and 19 males) recruited on campus of the University of Bielefeld, Germany. Age range was from 15 to 28 years ($M = 22.92$ yrs., $SD = 2.62$).

Procedure

Participants interacted with the iCat (Philips Research Eindhoven), a desktop user-interface robot that is used as a research platform.



Figure 1. The iCat. Figure 2. Happiness. Figure 3. Fear.

The iCat has 13 motors to create and control facial expressions and body movements. In our scenario, participants read passages of a fairy-tale with vital emotional expression, so that the iCat would be able to classify the emotions from speech signals. In response, the iCat either expressed congruent emotions (see Figures 2 & 3) or a neutral response (e.g., nodding, blinking, fixating the participant's script). Participants observed the robot's reaction after finishing each sentence (Fig. 4).

Method (continued)

Figure 4 shows a picture of the experimental setting.

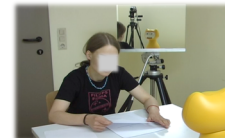


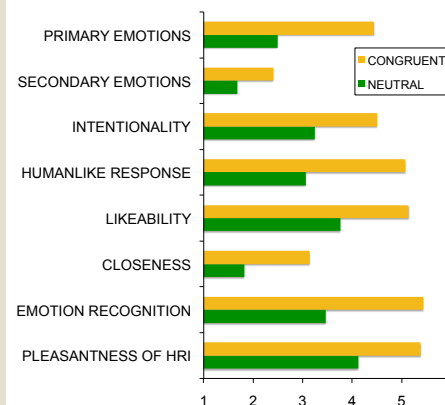
Figure 4. The experimental set-up

Dependent Variables (DVs)

After the interaction, participants indicated to what extent the iCat would be capable of experiencing 10 primary and 10 secondary emotions (e.g., pain, surprise, love, hope). Furthermore, participants assessed the robot's intentionality, the humanlikeness of its response, perceived likeability and closeness to the iCat, and its ability to recognize emotions. Finally, they reported perceived pleasantness of the HRI. Responses were given on 7-point Likert scales.

Results

Figure 5. Mean ratings of dependent variables as a function of experimental condition (response: congruent vs. neutral).



Results (continued)

Figure 5 illustrates that the pattern of means was in the predicted direction for all dependent variables.

Results of *t*-Tests that were run to compare experimental conditions showed that mean differences between conditions were statistically significant in all - except for two - instances. With regard to secondary emotions and perceived pleasantness of HRI, mean differences were only marginally significant ($p = .06$).

Conclusions

The results of the experiment show that participants anthropomorphized the iCat on various dimensions. Importantly, the degree to which the iCat was anthropomorphized was affected by its ability to express emotional states. Congruent emotional responses, as displayed through cross-modal motor mimicry, significantly affected participants' attribution of emotions and other ("typically human") attributes, e.g.:

- ✓ intentionality
- ✓ capability to recognize emotions
- ✓ humanlikeness of displayed reaction
- ✓ closeness and likeability

These findings highlight the role of animation and humanlike emotion display in social robots as significant factors that contribute to a smooth and pleasant Human-Robot Interaction.

References

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