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Assignment 4

I think it would be interesting to examine the role of empathy and overall emotional activation as it pertains to deep engagement in human-robot interaction. I would propose an experimental setup involving a simple caregiving interaction with an expressive humanoid robot, such as the Leonardo robot that we work with in the Robotic Life group here at the Media Lab. The goal of the experiment would be to evaluate whether or not emotional expressivity on the part of the robot increases the measured level of emotional expressivity in the human, and whether or not this in turn correlates with an increase in the self-reported level of engagement.

In a simple caregiving interaction, the human and robot could interact with a number of toy objects, for example a bottle, ball, and stuffed animal, laying in the space between them. The robot could point to different objects that it "wants," and the human's job would be to bring those objects over to the robot for it to play with. It would be interesting to compare three different experimental conditions, with a number of subjects participating in each condition. In the first condition, the robot would offer no emotional feedback. In the second condition, the robot would respond with "appropriate" emotional feedback, such as smiling when it receives the toy that it wants, frowning and fussing if it receives the wrong toy, and getting frustrated or upset if the human ignores it or takes too long to respond. In the third condition, the robot would generate these same emotional signals, except at random or inappropriate points in the interaction.

Our main hypothesis would be that the human's emotional expressivity would be greatest in the appropriate feedback condition, and that this would correlate with an increased level of self-reported engagement. To evaluate this hypothesis, we would need to collect a number of different types of data from the human. Level of engagement could be measured after the interaction via a questionnaire. Measuring emotional expressivity during the interaction is obviously trickier, but one established method for doing this is to take video of the human's face and have a human judge code the video for facial expressions, most likely using Ekman's facial action coding system. We could also measure the overall level of emotional arousal using the galvanic skin response and a Galvactivator-type device.

Given these data sources, we could also evaluate a number of interesting sub-hypotheses. For instance, we might hypothesize that the robot's facial expressions would better predict the human's facial expressions in the appropriate feedback case. That is, it would be more likely for the human to smile after the robot smiles, frown after the robot frowns, and so on. Looking at the galvanic arousal data, we might expect the human's physiological response to be more in-sync with the robot's facial expressions in the appropriate feedback condition than in the random condition. Positive support for these hypotheses could strengthen the argument that empathy, or at least coordinated emotional expressivity, helps to encourage deep engagement.

Instructor Comments:

This experiment holds some promise. Are there other ways of sensing the human response? I am very doubtful that a questionaire in this situation would be of much use. I wonder if you could request that the human talk through what they are feeling sensing as it is happening. Does anticipation/reflection play a role here? What about human learning?