Purpose and Protocol for the Study Collaboration with a robot

Purpose of Study:

To test the implementation of a theory of Affective Emotional Collaboration wherein the robot computes its assessment of the human’s emotions as part of its decision making about what to do next in the collaboration. The study will gain insight into whether the subsequent robot decisions improve the collaboration in terms of efficiency, user satisfaction, and user understanding of the robot’s behavior.

Protocol of the study:

After the participant is consented in a separate room, the experimenter will seat the participant in front of the robot. The robot is a Kuka Youbot arm. The participant will have next to him/her a computer screen with an interface for choosing utterances to say to the robot. The robot and the user will have disks in from of them to manipulate in doing the required task.

The required task is to be performed together between the robot and the participant. The experimenter will explain the task goals and the purpose of the various disks. The experimenter will also explain how to use the computer screen interface. Then the experimenter will leave the experiment space and move to the other space (depicted in the figure below as a wall, although it will actually be a separate location). The participant and robot will be visible via a video camera, which will capture their activities, and also allow the experimented to see if an unexpected problem occurs. The robot and participant will undertake and complete the task. When the participant believes the task is done (or 1/2 hour has passed), the participant will signal that the task is complete.



When the required task is complete, the experimenter will return to the experiment room and provide the participant with an online questionnaire (see attached). After the participant completes the questionnaire, the experimenter will ask the participant some additional informal questions (see attached). The participant will be paid, and then the participant be free to go.

Physical safety:

The power of KUKA youBot arm is limited to 80 W. According to ISO 10218:2006 this allows for operating in human-robot collaborative mode without any additional safety measures. However, a kill switch will reside with the experimenter on the other side of the "wall". The experimenter will be watching the entire interaction, and can operate the kill switch in the case of an unexpected emergency.

QUESTIONS:

**Pre-study questions.** These questions are to assess the basic emotional style and personality of the participant and will be used to determine if participants differ in their interactions given their emotional style and personality.

Please see the 2 attached documents in which the questions appear on pages 2-3 (Berkeley Expressivity Questionnaire) and on pages 3-4 (Big Five Personality Questions). See the document Affective Style Questionnaire for a third set of questions.

**Post-study questions**

The first set below are intended to assess how the participant experienced the collaboration with the robot.

**Questionnaire:**

Please answer the following questions about the robot and your interaction with it:

Write an ‘X’ on each line (on one of the dots):

How close do you feel to the robot?

Not at all • • • • • • • Very close

close

How satisfied are you with the robott?

not at all • • • • • • • very satisfied

How much would you like to continue working with the robot?

Not at all • • • • • • • Very much

How much do you trust the robot?

not at all • • • • • • • very much

How much do you like the robot?

not at all • • • • • • • very much

Was the robot repetitive?

not at all • • • • • • • very repetitious

How easy was talking to the robot?

easy • • • • • • • difficult

How interesting was the robot?

boring • • • • • • • interesting

Please rate the following statements on a scale of 1-7, where 1 is complete disagreement and 7 is complete agreement.

The robot does not understand what we are trying to accomplish.

1 2 3 4 5 6 7

Disagree Agree

I believe the time that the robot and I are spending together is not spent efficiently.

1 2 3 4 5 6 7

Disagree Agree

I find what I am doing with the robot confusing.

1 2 3 4 5 6 7

Disagree Agree

The robot perceives accurately what my goals are.

1 2 3 4 5 6 7

Disagree Agree

I understand the robot, and I think it understands me, at least in the best way it can.

1 2 3 4 5 6 7

Disagree Agree

The robot and I are working towards mutually agreed-upon goals.

1 2 3 4 5 6 7

Disagree Agree

I am confident in the robot's ability to help me.

1 2 3 4 5 6 7

Disagree Agree

I feel that the robot, in its own unique ways, is genuinely concerned about me.

1 2 3 4 5 6 7

Disagree Agree

The robot and I collaborate on setting goals for us to work on.

1 2 3 4 5 6 7

Disagree Agree

The robot does not understand what I am trying to accomplish.

1 2 3 4 5 6 7

Disagree Agree

I find what the robot and I are doing is unrelated to my goals.

1 2 3 4 5 6 7

Disagree Agree

The robot and I agree on what is important for us to work on.

1 2 3 4 5 6 7

Disagree Agree

The robot understands some of my feelings and takes them into account in our collaboration.

1 2 3 4 5 6 7

Disagree Agree

The robot is sometimes confused about what I feel about our activities.

1 2 3 4 5 6 7

Disagree Agree

The robot does not understand how I feel during our collaboration.

1 2 3 4 5 6 7

Disagree Agree

I trust the robot to perform appropriately in our collaboration.

1 2 3 4 5 6 7

Disagree Agree

I trust the robot to assess my feelings appropriately in our collaboration.

1 2 3 4 5 6 7

Disagree Agree

I am satisfied with the outcome of our collaboration.

1 2 3 4 5 6 7

Disagree Agree

I believe that the robot and I achieved the goals we set.

1 2 3 4 5 6 7

Disagree Agree

**The second set** are questions to be asked face-to-face questions asked by the experimenter to determine if the participant had any additional experiences that are relevant to the experiment.

1. Do you think you have satisfied the robot as a good collaborator? Why?

2. Are you satisfied with the robot's collaborative behaviors? Why?

3. What robot behaviors did you find helpful during the collaboration?

4. What decisions do you think the robot could made better?

5. To what extent did you find yourself in a collaboration rather than competition with the robot?