Andrew Brooks

Project Exercises

Week 2

My system is a humanoid robot that encourages people to play physical exercise games with it. The goal of the system is to compel the human to engage in the play interaction in their own time, when they are not under the watchful eye of their nurse or guardian. The target demographic would be people who need to do simple exercises, such as patients with physical disabilities or children with developmental problems.

The system should be relational because an interaction with something that recognizes you and has a relationship with you can be much more compelling than a "canned" interaction. It brings multiple motivational avenues into play -- for example, as well as simply providing an interaction that is enjoyable while it lasts; a relational system could employ tactics such as guilt to convince the human to perform the desired task, or to remind the human what was most enjoyable about past interactions, in order to tailor the motivation.

The aspects of this system that would be relational are tailoring the exercise regimen to the particular human, keeping track of progress levels in order to give positive feedback over time, and tailoring the language the system uses in order to match the preferences and language level of the human. It can be evaluated by whether the human continues to preferentially interact with the system even when not being forced to do so. It could also be compared with a placebo version that has fewer relational aspects, if a large subject pool was available.

Week 3

I think the type of relationship that would be best for this system would be a combination of child-to-child peer relationship and parent-to-child care giving relationship. In the first place, the human should interact with the robot in the sense of friends playing together. The robot should be able to offer advice to the human, but it should be in the sense of a concerned comrade, not an authority figure. If the robot were to attempt to exert authority, such as demanding that the human do something, I think the relationship would break down quickly as the human realizes that the robot has no real authority. However, interacting on a peer level would still allow the robot to use coercive mechanisms such as guilt, because it could for example pretend its feelings were hurt if the human did not want to play with it.

However, I think it is not enough simply to have the peer relationship, because even for an impaired human it will be clear that the robot's capabilities are not at a human level. So some extremely motivating interactions might be achieved by taking advantage of this reverse disparity in capabilities, and having the human act as the robot's caretaker. The human could be encouraged to improve their own performance if it was also improving

the robot's performance at the same time. And it could give a feeling of empowerment to someone having physical difficulties if they felt that they could have a positive effect on the robot as well as themselves.

The application therefore benefits from the relationship by providing a more deep motivation for engagement with the robot. Even if the interaction itself is somewhat tedious, it is more motivational to perform it with a system that the human has a relationship with, rather than something which can be viewed as a simple toy that is unaffected by the human's involvement. The cost of participating is the same (time and energy), but the benefits can be perceived as much more (strengthening a relationship, improving the performance of the human-robot team as well as just the human).

The relationship should be established through realistic dialog and appropriate memory structures of the human involvement. The robot should know about why the human has to do the exercises, and the state of the human's progress. This is also necessary to maintain the relationship over time, the human must feel like each interaction is an incremental development from the one before. If consecutive interactions are exactly the same the illusion will break down. Therefore the robot should also be able to inject variation into the play that is not strictly related to the exercise, as progress in the exercises may be too slow to drive incremental interaction change on its own.

Week 4

In class four methods were identified to measure and evaluate systems such as relational machines:

1. Self-report questionnaire
2. Self-report interview
3. Behavioral
4. Physiological

While ultimately the physiological measure will be of crucial importance in evaluating my system, I do not anticipate tackling this in the short term. I therefore envisage using the first three techniques. The protocol will be as follows:

- Subjects will participate in several short sessions with the robot - these

can take place within one visit, say three ten-minute sessions within an hour. Subjects will be split into two groups: one will be told they are attempting to improve their own physical performance, and the other will be told they are attempting to improve both their own performance and that of the robot.

- After each session, subjects will answer a short questionnaire that attempts

to gauge their level of investment in the interaction. Things like whether they feel that the robot is motivating them to continue, whether they feel that the robot is assisting their own performance, whether they see an improvement in the robot's performance.

- At the end of the visit, subjects will have a self-report interview on their experiences. Did they feel that they could relate to the robot and the robot could relate to them? Did they feel that they were working with the robot or detached from it? How did various aspects make them feel? What did they and didn't they like about the interaction? What did they find confusing?

- The system will also collect behavioral measures during the interaction.

In particular, it will keep track of the person's performance over time at imitating the robot. The subjects in this study will be fully able, and thus capable of imitating the robot with quite a high degree of fidelity from the beginning. However, a fall-off in accuracy would be a good negative indicator, that the subject is getting bored, fatigued or not taking the interaction seriously. The system will also measure the number of exercises performed in each session block. This will not be a fixed number, so individuals who are enjoying the interaction or finding it easy will be able to perform more exercises in the same time period. This would not be able to be measured so directly in a short-term study of actual patients, since the number of exercises they can perform is affected by the severity of their condition.