Report: The Visionnair project at UCL, Virtual Reality Lab

19/2-2/2/2015

Miriam Reiner

Human robot non symbolic interaction: the issue of trust.

One of the major issues in human robot interaction, especially in contexts such as collaborative tasks, teaching/training, ageing and robotic support of humans, is the issue of trust. When dependent with life on a robotic system, human find it difficult to trust the motor acts of a robot. The robot is perceived as a system that might brake – just as any other technological system that humans interact with. People find it hard to avoid raising issues such as what happens if the control system of the robot fails. Cars break, the cappuccino machine breaks, and it is hard for human to fully trust a robotic system not to get out of control and exert damaging forces to the human body, rather act as helpers. Even more crucial is the case in which one has to rely on robot decision making that might affect personal life. For instance, will humans cross a street when a robot controls the traffic?

The new humanoid robots such as the robothespian are planned for social tasks, and human-robot interaction is crucial for such tasks. Developing trust in the humanoid would be a central issue in developing the optimal systems for humanoid robots and human interaction.

The central issue in these experiments was identifying conditions of trust between a humoinoid robot and humans.

It has been repeatedly shown that humans develop a sense of trust within less than 30 seconds. Furthermore, fMRI studies show that trust evolves much earlier – at the level of 100-500 miliseconds. The process is automated, independent, and unlike what we tend to believe is not based on a logical inferential procedure. We are unaware of the process of developing trust, but aware of the outcome – whether we trust or not. What determines whether we trust the other?

Turns out that we tend to trust more people who do not avoid eye contact, show attentional cues such as follow with gaze and head our acts, and mimic our acts. Mimicry is perceived as a way of flattering. We are flattered when somebody mimics us, since we perceive that mimicking would be associated with social status and appreciation.

In the design of the experiment, we planned two conditions of interaction between the human and the robothespian:

1. The robothespian follows the human gestures by 'looking' at the gesturing hand, and mimicking the movement. i.e. the head and gaze follow the hand, and the appropriate hand is raised in an attempt to mimic the human.
2. The robothespian ignores human acts. Stares blankly, motions are random – i.e. not correlated to the human gestures, and overall the robothespian displays no cue to show and attention to the human acts. Nor do these acts correlate with any environmental cues.

To design the above was coded the dynamics so fit following+mimicking, and random responses.

We ran a first few tests on ourselves to design the optimal interaction model, and found the optimal, natural pattern of 'interactive dance' -- see the video below – the interaction resembles a 'dance in a duo' .

The experiment was designed according to the following steps:

1. Participants need to be ignorant of previous interaction with robots.
2. After explaining to participants that 'this addresses issues related to human-robot interaction', they are asked to explain to the robot the directions of walking from the CS dept to the British museum. They use gestures to indicate the directions. They also engage negation gestures (do not go right) and statements and gestures of warnings (be careful when you cross the street).
3. 15 participants will be engaged in each of the conditions above. A total of 30 'naïve' subjects in the domain of robotics.
4. After completion of the task, participants are asked whether they would cross a heavy traffic street when the robot provides the instructions when to cross the street, and controls the traffic.
5. In addition participants are asked to provide feedback on the following.
    a. a free impression of the experiment;
    b. their attitudes towards the robothespian; a list of tasks that they believe the robothespian would best at in the future; what human tasks can be completed better/or same, by collaborating with a robothespian.

   Each of the responses below provides TACIT impressions and attitudes about their trust in robots. For instance, when participants list only routine processes that do not relate to humans (e.g. packaging), it suggests that the participants do not trust the robotic system in cooperative tasks.

This provides a framework for an experiment that we hope to continue with and conduct a full experiment.