Master Thesis

Proposal

Investigating factors in appearance and behaviour of virtual agents that impact its perceived level of cooperativness and trustworthiness in game scenarios

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1 The project

Social interaction isn't only between humans. With the introduction of virtual and artifical entities we now have more interaction partners and according to [2], trust is the basis for all social interacion, including those with artifical entities. So what influences how much we trust a virtual entity or character? What impacts our willingness to cooperate with them?

This project will be about implementing a game scenario in Unity where different factors of appearance and behaviour of a virtual character can be manipulated. This will be used to investigate how these factors impact users perception of the virtual character in terms of trustworthiness and the users willingness to cooperate with the virtual agent.

The game will be one that supports trust and cooperation and one example is "Gamble"[6] and another is the "Trust Game"[1]. The game scenario have a possibility of being explored in Virtual Reality (VR), Augmented Reality (AR) or with the use of the 4k-screen in the Visualization Studio at KTH. The preliminary time plan is divided into 60-40 (implementation-user study).

2 Research question

"How does different factors in appearance or behaviour in virtual characters impact their perceived level of trustworthiness and cooperativiness in game scenarios?"

2.1 Connection to research

When interacting with a virtual agent, it's very likely that its appearance and behaviour influences and impacts the interaction. In many cases, it's important to establish an acceptibility and trust between the human and the virtual agent.

This is also true when it comes to social robots, especially within life and welfare. Interaction with robots that are used in handicapped assistance, physical therapy, autism therapy or search-and-rescue requires trust and cooperation to be established between human and robot.[4]

There's also the problem of misplacing trust. If appearance and behaviour plays a big role in why we trust someone or something, this could be misused and we could end up placing trust in systems that are not competent or trustworthy. The paper [3] explores how authentic and fake smiles affect trustworthiness and cooperativeness. They say there's potential gain that can be achieved by cooperation but that there's a risk of being exploited by cheaters who take advantage of one's own cooperation. It's therefore valuable to be able to spot partners who are likely to cooperate.

In [7] they explore how the facial width in male participants affect trustworthiness and cooperation. They found that men with greater facial width were more likely to exploit trust of others and that participants were less likely to trust male counterparts with wide, rather than narrow faces.

Not only facial features impact how virtual agents are perceived. In [5], a virtual agent is introduced as a quizmaster in a mathematical game. They show that emptathic responses in the form of body gestures and varying the linguistic style of the virtual agent can influence the interaction and significantly decrease user stress.

2.2 Examination method

The game scenario implemented in Unity will be the basis for the user study and the user study will focus on answering the research question.

Factors such as weight, height, gender, facial features or behvaioural factors are examples of things that can be manipulated in the game. The perceived level of trustworthiness and cooperativeness can be measured by user reports or user actions (see how often the user chooses to cooperate with certain virtual characters in relation to others).

2.3 Hypothesis

I believe that changing certain attributes of appearance and the behaviour of the virtual agent will impact how users percieves it in terms of trustworthiness and how willing the users are to cooperate with it.

2.4 Evaluation

The evalutation project is both connected to how well the research question is answered but also to how well the game scenario is implemented and to what degree the virtual character interacts with the user.

3 Resources at KTH

The practical parts will be carried out at KTH and supervised by Christopher Peters. There is possiblity of utilizing the 4k-screen in the Visualization Studio at KTH as well as their Oculus Rift head-mounted gear. Chris is supervising a few students working with related projects that I can contact to discuss with.

4 Related courses

I have previously taken the courses: **Computer Game Design, Human Perception, Multimodal Interaction and Interfaces, Computer Graphics and Interaction** and **Evaluation Methods in Human-Computer Interaction**. I have also taken several programming courses.

I ensure that I have completed all courses for the bachelor's degree and at least 60 hp on advanced level including the course **Theory of Methodology of Science in Human-Computer Interaction DH2610**.

I have one remaining course left on advanced level: **Advanced, Individual Course in Human-Computer Interaction DH2610** on 6hp. I have finished roughly half the course at this point and my plan is to complete it before the end of period 3. I will work with the course on evenings/weekends.

References

[1] Trust game. `http://www.econport.org/econport/request?page=man_tfr_experiments_trustgame`. Hämtad: 2016-01-20.

[2] Alfarez Abdul-Rahman and Stephen Hailes. Supporting trust in virtual communities. In *Proceedings of the 33rd Hawaii International Conference on System Sciences*, 2000.

[3] Eva Krumhuber, Antony S. R. Manstead, Darren Cosker, Dave Marshall, Paul L. Rosin, and Arvid Kappas. Facial dynamics as indicators of trustworthiness and cooperate behavior. *Emotion*, 7(4):730–735, 2007.

[4] Maya B. Mathur and David B. Reichling. An uncanny game of trust: Social trustworthiness of robots inferred from subtle anthropomorphic facial cues. In *HRI '09 Proceedings of the 4th ACM/IEEE international conference on Human robot interaction*, pages 313–314, 2009.

[5] Helmut Prendinger, Junichiro Mori, and Mitsuru Ishizuka. Using human physiology to evaluate subtle expressivity of a virtual quizmaster in a mathematical game. *International Journal of Human-Computer Studies*, pages 231–245, 2005.

[6] Matthias Rhem and Michael Wissner. Gamble: A multiuser game with an embodied converstational agent. *Entertainment Computing (ICEC)*, pages 180–191, 2005.

[7] M. Stirrat and D.I. Perett. Valid facial cues to cooperation and trust: Male facial width and trustworthiness. *Psychological Science*, 21(3):349–354, 2010.