

When the Interface is the User's Face: Ideas for Research and Applications

Ian Li, Jodi Forlizzi, Anind Dey, Sara Kiesler
Human Computer Interaction Institute
Carnegie Mellon University
5000 Forbes Ave, Pittsburgh, PA 15213
{ianl, forlizzi, anind.dey, kiesler}@cs.cmu.edu

INTRODUCTION

There has been an interest in research on exploring the use of faces as interfaces [2,10,11]. These projects show that using faces can help interfaces seem more credible to the user [10], help with learning [2], and make the user feel more engaged and excited [11]. However, only a few researchers have looked at using one's own face as an interface [10]. Using one's own face has several benefits. Facial resemblance has been shown to have positive effects in social interaction and can lead to trust [4] and influence [1]. From the cocktail party phenomenon and scanning for one's own face in a photograph, we know that one's own face can be recognized immediately. Practically, the face of the user is immediately available and that may alleviate the need to design agents or to use celebrity faces which can be difficult to obtain and can be prohibitively expensive.

Self-representational (SR) agents are a relatively unexplored research topic. In 2005, we conducted an exploratory study that examined the preference for, and performance with, agents that looked like the self that provided motivational information. In this paper, we briefly present that study, and provide some discussion about the role and benefits of agents that look like oneself. We will describe several ideas that can guide research into SR agents. Finally, we will describe our ideas for applications.

EXPERIMENT

Our research group is exploring the use of computer-based agents to provide feedback to users. Computers record plenty of information about people, such as phone records, purchasing habits, physiological information, etc. Valuable information can be inferred from the collected information and can be provided back to the user to increase awareness or as advice. But what is the best way to provide the inferred information?

We investigated an argument derived from Nass and his colleagues that people would find change-advice more credible from one's own video recording compared to a video recording of someone else [10]. Instead of video recordings, we created a face creation tool that will enable users to make agents that resemble themselves. Our study showed that users found agents that resembled themselves more credible. However, there was a divergence between

the user's self-reports and their *actual* advice-taking. When interacting with the agents, users were more likely to change their choices only when the experimenter created the agents who looked like themselves.

The consequences of this research are as follows. First, the resemblance of the agent to the user and who created the agent has an effect on how the advice will be received. More work need to be done to tease out the interaction between these two variables. Second, research into self-representational agents need to take into account both self-reports and behavioral information. Interacting with agents that look like oneself may be so novel to people that their actual behavior may not reflect their self-reports. Finally, who creates the facial representation has an effect on how people will interact with an agent. Our results show that if we are going to allow users to make faces for their agents, it would be better if we allow them to make an agent that resemble themselves instead of someone else. In addition observations of participants using the face-creation tool revealed that more interface features need to be developed to help users with different artistic abilities create agents that resemble themselves.

In the following sections, we discuss other ideas beyond our experiment that can be explored with self-representational agents. We also speculate on the future applications that can leverage the benefits of SR agents.

IDEAS TO EXPLORE DURING THE WORKSHOP

Facial similarity has several dimensions that can be explored. Here, we present an overview of topics for discussion during the workshop:

Form

The similarity of an agent to the user can be manipulated to control how influential it is. Bailenson et al. found that faces of politicians were more influential when the faces were manipulated to look more like the user [1]. What would be the effect of a face that is completely similar to the user vs. an agent that is barely similar?

We can also manipulate the realism of the face; from a photographic replica to a caricature of the face. Research by Gooch et al. has shown that on learning tasks people learn

more when using caricatures of faces compared to when photographs were used [6].

Another question is whether using a static picture of the user would be sufficient as a representation of an agent. Or does it need to be animated? If the agent were animated, should it have mannerisms similar to the user? If so, then research will need to be performed on the effect of similarity of behavior.

Our experiment had users create faces for their agents. We can also explore the automatic creation of self-representational agents. Morishima [9] and Graf et al. [7] have created methods to automatically create faces. What would happen if we use their tools so that users can make agents with their own face? Without the variable of having created the face would we get the same benefit from self-representational agents?

Interaction

When the agent looks like the user, it creates strong implications for how users might interact with a system. Should the agent refer to himself or the user? Should users be able to share their computer agents' faces?

Agents that look like us might make information more distinctive. Anecdotally, we know that our ears hear a faraway conversation when one of the speakers is saying our name; and when looking at a large group photo, we will first scan for our face.

When agents look like us, we might change our behavior in interacting with a complex system. How would we act towards an agent that looks like us? Koda and Maes [8] found that users rated interfaces with static and animated faces to be more engaging and entertaining than functionally-equivalent interfaces without a face. Sproull et al. [11] compared interfaces with human representations vs. other representations (e.g. an animal image or cartoon) and found that users were more likely to be cooperative with the interface agent with a human face. How would these different interfaces compare to when the interface is of the user's face?

Advice, motivation, and trust

There is also a need to research the effect of using one's own face as a feedback interface. Should the agent provide advice or motivation? Advice is providing feedback to change the behavior of the user. Motivation on the other hand is feedback that encourages the user to keep doing what they are doing. Would self-representational agents be good at providing both kinds of feedback? If not, what aspects of self-representational agents make them better at providing one kind of feedback over another?

How does trust affect the reception of the feedback? It has been shown that facial similarity leads to trust [4], but the research has focused on other humans that look like the user? Would a computer represented as the user's face have the same effect?

We can also turn the information flow around where the user is providing information to the computer. Would the user be more honest if the agent soliciting information looks like themselves? Would the user trust the computer to keep the information confidential?

How about if the computer asks questions about what he/she did? For example, imagine an interface for an exercise and diet system that would ask the user questions such as: How much did you exercise today? Did you eat three healthy meals? Would users be more honest if the agent asking them looked like themselves?

Objective self-awareness

Objective self-awareness says that when a person is aware of himself, he will automatically compare himself to an unattainable standard which leads to negative affect [5]. However, most research with objective self-awareness has induced the phenomena using mirrors. Will this happen with autonomous agents represented as one's self?

Idealization

Also, when creating agents that resemble oneself are people creating a version of their real self or would they idealize their agent? Would users imbue the agents that they created with characteristics that they wish they had? The exploration of idealization of self can be compared with interaction with agents that use faces of celebrities. The cost of using faces of celebrities is so expensive that exploring their advantage over one's own face needs to be done to warrant their use.

IDEAS FOR APPLICATIONS

There are also a number of applications that we think can benefit from using agents that resemble the user. We know anecdotally from the cocktail party syndrome and scanning for one's face in a photograph that one's own face is very salient. Thus, a reminder system with alerts that are critical can benefit from having agents that resemble the user.

The soothing effect of interacting with someone that looks familiar or resembles oneself can be leveraged to create therapeutic agents. Self-representational agents can provide advice and motivational information to users who will be receptive to interacting with someone that looks like them.

Amy Baylor has been researching agents to aid with learning. She has been looking at using pedagogical agents that break social stereotypes [2], e.g., using casual-looking agents to improve the teaching of science and mathematics. Can we leverage the benefits of self-representational agents to teach? How would SR agents compare with other representations of pedagogical agents?

CONCLUSION

We have discussed current research with interfaces that use human faces and revealed that there is little work on agents that look like the user. We provided reasons why self-representational agents might be useful. We described an

experiment that we conducted and discussed future directions to extend the study. We also outlined other opportunities for research with explorations of aspects of faces, considerations for interaction design, development of agent-creation tools, and questions about various psychological effects such as objective self-awareness and idealization. Finally, we describe opportunities in making applications that leverages the advantages of self-representational agents. We believe that there is plenty of interesting research that can be explored with interfaces that resemble the user.

REFERENCES

1. Bailenson, J.N., Garland, P., Iyengar, S., & Yee, N. Transformed Facial Similarity as a Political Cue: A Preliminary Investigation. *Political Psychology*, 2005. (In press)
2. Baylor, A. L. & Plant, E. A. (July, 2005) *Pedagogical agents as social models for engineering: The influence of appearance on female choice*. Proceedings of AI-ED (Artificial Intelligence in Education), Amsterdam.
3. Cassell, J., Pelachaud, C., Badler, N., Steedman, M., Achorn, B., Becket, T., Douville, B., Prevost, S. and Stone, M.: Animated Conversation: Rule-based Generation of Facial Expressions, Gesture & Spoken Intonation for Multiple Conversational Agents. In: Proceedings of *SIGGRAPH '94*, 1994.
4. DeBruine, L.M. Facial resemblance enhances trust. *Proc Biological Sciences*, Vol. 269, No. 1498. (7 July 2002), pp. 1307-1312.
5. Duval, T.S. and Wicklund, R.A. *A theory of objective self-awareness*. Academic Press, New York, 1972.
6. Gooch, B. Reinhard, E., & Gooch, A. Human Facial Illustrations: Creation and Psychophysical Evaluation. *ACM Trans. Graph.*, Vol. 23, No. 1. (January 2004), pp. 27-44.
7. Graf H, Casotto E, Ezzat T. Face analysis for synthesis of photorealistic talking heads. *Proceedings of International Conference on Automatic Face and Gesture Recognition* (2000).
8. Koda, T and Maes, P. Agents with Faces: The Effects of Personification of Agents. In Proc. *CHI 1996*, ACM Press (1996), 239-245.
9. Morishima S. Face analysis and synthesis. *Signal Processing Magazine*, IEEE, Vol. 18, No. 3. (2001), pp. 26-34.
10. Nass, C., Kim, E.-Y., and Lee, E.-J. When My Face is the Interface: An Experimental Comparison of Interacting with One's Own Face or Someone Else's Face. In Proc. *CHI 1998*, ACM Press (1998), 148-154.
11. Sproull, L., Subramani, M., Kiesler, S., Walker, J.H., and Waters, K. When the Interface is a Face. *Human Computer Interaction*, 11 (1996), 97-124.