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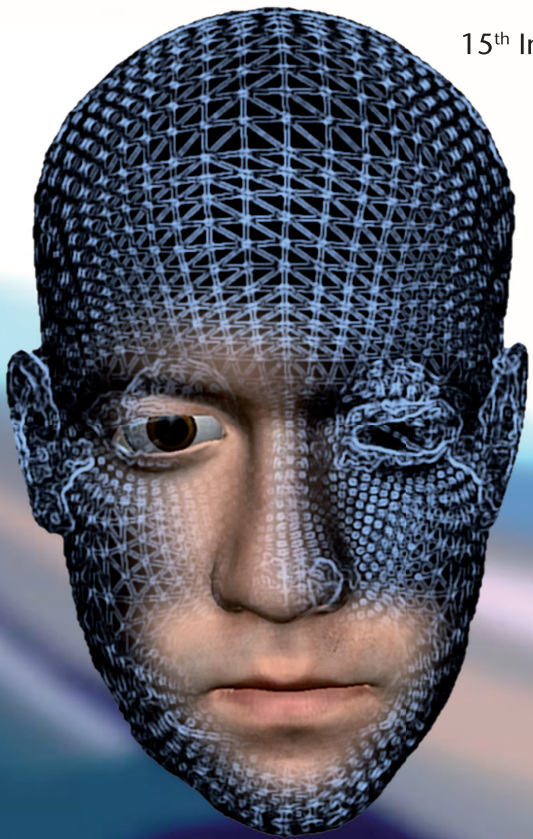

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Mimicry and facial similarity: Making avatars more persuasive

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Abstract. The more avatars are being perceived as likable and trustworthy, the more successful they will be in persuading people to change their attitudes and behavior. Research has shown that both mimicry and facial similarity may increase likability and trustworthiness of avatars. In this paper, we will provide a short guide on how to implement mimicry and facial similarity cues in your own research, using Vizard and FaceGen. Links to resource files are included, so that any interested researcher can easily adopt these techniques to make their own avatars more persuasive.

Keywords. Mimicry; Facial similiarity; Liking; Trust; Morphing; Vizard; FaceGen

Introduction

Persuasive technology refers to a class of technologies intentionally designed to change a person's attitude or behavior (Fogg, 2003; IJsselsteijn, de Kort, Midden, Eggen, & van den Hoven, 2006). Technologies that mimic human social behaviors, such as humanoid robots or computer-generated social agents, can be extremely powerful in their persuasive abilities. In particular, avatars[1] are being used in persuasive technology research. The more these avatars are being perceived as likable and trustworthy, the more successful they will be in persuading people to change their attitudes and behavior.

In this paper, two techniques to increase an avatar's persuasiveness are presented: mimicry and facial similarity. First, relevant theory for both techniques will be reviewed briefly, then, both techniques will be explained in detail. Resource files are freely available to make these tools more readily accessible to (social) scientists (Fox, Arena, & Bailenson, 2009).

Theory of mimicry

Humans mimic each other unconsciously on a variety of behaviors (see Chartrand & van Baaren, 2009, for an extensive overview). In *human-human* interactions, mimicry has been shown to increase liking (Chartrand & Bargh, 1999) and trust (Maddux, Mullen, & Galinsky, 2008).

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[1] In the strictest sense, a virtual human representation controlled by a human is called an avatar, and one controlled by an algorithm is called an agent. However, the techniques described in this paper can also be applied to an agent.

Furthermore, in *human-avatar* interactions, mimicking avatars are more persuasive and perceived as more likable (Bailenson & Yee, 2005), and as more likable and trustworthy (Verberne, Ham, Ponnada, & Midden, 2013) than their non-mimicking counterparts. Thus, mimicry is one effective technique to increase the persuasiveness of avatars.

Theory of facial similiarity

People are fast in drawing trait impressions based on human faces (Willis & Todorov, 2006). Positive effects have been shown when faces were morphed to become facially similar to participants. Studies using morphed *photos of humans* show that facially similar humans are evaluated more positively (Bailenson, Iyengar, Yee, & Collins, 2008) and more trustworthy (DeBruine, 2002) than facially dissimilar humans. Furthermore, studies using morphed *3D heads of avatars* demonstrate that facially similar avatars are more persuasive (Ratan & Bailenson, 2007), and more trustworthy (Verosky & Todorov, 2010) than facially dissimilar avatars. Therefore, facial similarity is another effective technique to increase the persuasiveness of avatars.

Methods

Making your avatar mimic

In this paper, we focus on the mimicry procedure by Bailenson and Yee (2005), that implements mimicry of head movements. In their paper, Bailenson and Yee used the tracker information from a head-mounted display worn by the participant to capture participant's head movements. These movements were then subsequently used by a virtual human to mimic the participant. To enable your avatar to use this kind of mimicry, you need three things: 1. hardware to track a participant's head orientation (an orientation tracker), 2. an algorithm to use the head movements for mimicry, and 3. software to present your avatar.

Using the Vizard Virtual Reality Toolkit from Worldviz (http://www.worldviz.com), and a script created by the first author, any researcher can easily implement the mimicry procedure of Bailenson & Yee (2005). The script (Mimicry with delay 2.0.py) can be downloaded from https://sites.google.com/site/frankverberne/vizard. When running the script, an orientation tracker measures three orientation dimensions (the yaw, pitch, and roll) of the head of a participant 60 times per second. These values are stored in a list, for four seconds. After four seconds, an avatar appears, and in the mimicry condition it copies the yaw, pitch, and roll of the head of the participant exactly four seconds ago. The delay of mimicry is a variable that can be changed. All movements made by the participant are saved, to be used in the recorded condition. In the recorded condition, the avatar moves its head based on the recordings of the previous participant. Therefore, the head movements of the avatar are still human, but not a copy of the movements of the current participant.

Making your avatar facially similar

To make your avatar facially similar to a participant, you need three things: 1. photo(s)[2] of the participant, 2. software to create a morphed 3D head of the participant, and 3. software to present your facially similar avatar. In this paper, we focus on how to create a 3D head that is facially similar to a participant, using photos and FaceGen modeler from Singular Inversion Inc (http://www.facegen.com).

Using FaceGen and the resource files (From_FaceGen_to_Vizard.zip) available for download on https://sites.google.com/site/frankverberne/vizard, any researcher can easily create an avatar that is facially similar to a participant. In the example below, we will demonstrate the steps to

[2] In the example below, we only use a frontal photo. However, also using left and right profile photos of the face of the participant will increase the quality of the end result.

morph the digital face of Subject1 with that of Andrew[3] with a morphing percentage of 50%[4]. These steps are discussed in more detail in the manual that is included in the resource files.

Photos should be taken of Subject1 following the guidelines on http://facegen.com/modeller35_help.htm#photofit. When taking high quality frontal color pictures of the face, make sure you that Subject1 has a neutral expression, is not wearing glasses, and does not have hair covering his/her face (facial hair is ok). The next (optional) step is to mirror the picture, as people are most familiar with their own mirror reflection (Kircher et al., 2001).

Then, use the Photofit option of FaceGen to create a 3D model of the face of Subject1 (Subject1.fg). Simply load the frontal photo, and assign the feature points to let FaceGen know where the eyes, nose, ears, mouth, and chin are located. After some time, you will have the digital face of Subject1 (see Figure 1 for an example). However, this digital face is a virtual replica of the participant's real face. If we want a face that looks similar to the participant, we have to morph[5] it with another face. We are now finished with FaceGen for the moment, so close it for now.

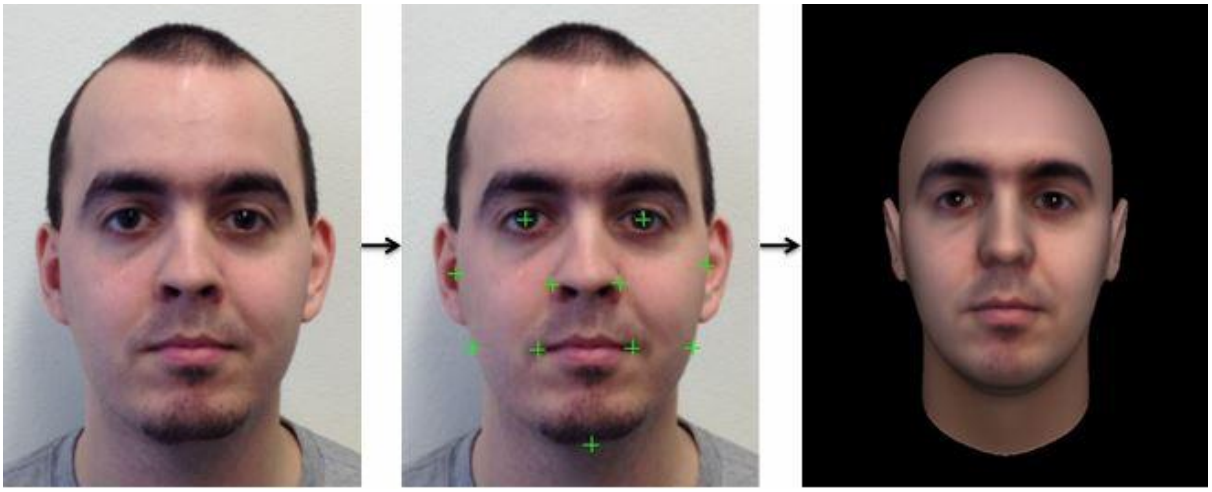

Figure 1. Example of how to apply feature points (middle) to a frontal photo of the first author (left) to create a FaceGen face (right).

To get the best morphing result, we need to blend the detail textures of the faces we are going to morph. A detail texture contains face details like freckles, wrinkles, and scars. Using the batch file in the resources files, you can create the detail texture of Subject1.fg. Then, you have to blend this detail texture with the detail texture of Andrew.fg (detail_Andrew.jpg) with 50%. The resulting detail texture should be placed in the folder C:\Users\USERNAME\appData\Roaming\FaceGen\Modeller3\Detail\. Note: the newly created detail texture will only appear in the detail texture list of FaceGen when it is restarted after placing the detail texture in the correct folder.

[3] Andrew is an example photofit face that comes with FaceGen, and can be seen as the rightmost face in Figure 2.

[4] Although several morphing percentages have been used in the literature, we have chosen for a morphing percentage of 50% (based on Verosky & Todorov, 2010). This means that the resulting end face will contain 50% of the face of Subject1, and 50% of the face of Andrew. If you choose a different morphing percentage, you can alter the steps below accordingly. The higher the morphing percentage, the higher the potential gain in persuasiveness. However, when morphing becomes too apparent to the participant, it could feel like being manipulated and therefore *decrease* an avatar's persuasiveness.

[5] An alternative way to create a face that looks similar to the participant is to use the Genetic option of FaceGen. Using this option, you can create random faces similar to the current face, with an adjustable randomness factor. However, when using one face to morph all participant faces with, a researcher has more experimental control over the morphing process. Therefore, we have chosen for this morphing procedure using the Tween option.

Now, open FaceGen again and open Subject1.fg. This time, use the Tween option of FaceGen and load Andrew.fg as the target. Highlight either the slider of Symmetry S(hape) or C(olor), and press PageDown five times to morph both faces with 50% (see Figure 2). Now, select the detail texture created in the previous step from the detail texture list. You now have a virtual face that is facially similar to Subject1, to be used in software to present your avatar.

Figure 2. The result of a 50% blend (middle) of the FaceGen face of Figure 1 (left) and Andrew (right).

Conclusion

In this paper, the techniques for creating a mimicking and facially similar avatar have been discussed. The purpose of this paper was to provide (social) scientists an easy way to implement mimicry and facial similarity in their avatars to make them more persuasive. Resource files are freely available to do so with little effort. Both techniques will be demonstrated during the conference. In the demonstration, the face of one attendee will be morphed in real time with Andrew, and the result will be used to make a mimicking avatar.

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