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Cross-Cultural Study of Expressive Avatars*

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Abstract

Avatars play an important role in international online communities. While certain simple expressions, such as facial emotional expressions are cultural independent, more complex expressions might not be. Therefore we conducted a cross-cultural study to investigate the influence of the users' cultural background (Japanese or Dutch) on their perception of avatar's expressions in terms of perceived arousal and valence. A significant gender difference was found for valence. Women and in particular Japanese women rated the expressions more positive.

Keywords: cross-culture, avatars, expressions, animations, arousal, valence

1 Introduction

Internet forums and their resulting online communities are currently becoming increasingly important (Rheingold (2002); OSDN (2004)) and help people to share problems and to organize activities. At the same time the communication in today's forums is restricted to text messages, which offers only a fraction of the information available in face-to-face conversation. This results in frequent misinterpretations especially if the messages involve irony. The widespread usage of emoticons :-) demonstrates that pure textual information lacks natural communication channels. To overcome these restrictions virtual representations of the participants, so called avatars, are being developed (Damer (1997)) The embodiment of the participants through avatars enables the participants to use body language and facial expressions in their messages. Previous studies show that avatars can play an important role in cross-cultural communication (Isbister et al. (2000); O'Neill-Brown (1997)).

The facial expression of emotions has been shown to be cultural independent (Ekman and Friesen (1971)) but some avatars , such as in TelMeA (Takahashi et al. (2003)) or Flirtboard (Krenn et al. (2004)) use more complex expressions which might be perceived differently by users with different cultural backgrounds. These complex expressions can consist of a series of movements of all components of the avatar. It might, for example, simultaneously smile and jump up and down before it waves it hands to the user. Since the internet is available in many countries it is very likely that users with diverse backgrounds will communicate which each other in these forums.

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We therefore conducted a study that investigated the influence of the user's cultural background on how he/she perceives the avatar's complex expressions.

The repertoires of avatars are not limited to emotional expression, but also include conversational and social cues, such nodding and spatial distance between avatars. Therefore a general two dimensional model of valence and arousal (Schlossberg (1952); Hendrix et al. (2000)) appears to be best suited to model the user's perception of the expressions.

Much work has been done on cultural research and particularly Hofstede's (Hofstede (1984)) four constructs (power distance, uncertainty avoidance, individualism, and masculinity) has been the foundation of much comparisons between cultures. A precise definition of culture and differences between cultures is not in the focus of this study. However, we are certain that the Japanese and Dutch cultures differ significantly enough to function as a factor in our experiment.

2 Methodology

To have a sufficient sample of animations a professional Japanese designer created thirty expressions of two different avatars. The animations of the two avatars were almost identical. Figure 1 shows the waving animation for both avatars.

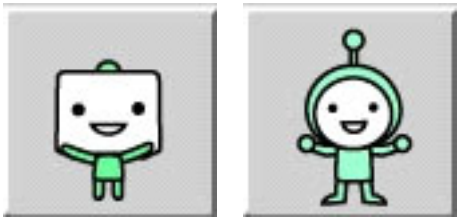

Figure 1: Example stimuli of the two avatars.

Figure 2 shows the most intense expressions of the square avatar's animations. The animations are numbered according to the order in the experiment.

2.1 Design

A 30 (animation) x 2 (avatar) x 2 (culture) within/between subjects experiment was conducted in which animations (see Figure 2) and avatars (see Figure 1) were the within factors and culture the between factor. The exact same experiment was once conducted at ATR, Kyoto, Japan and once at the Eindhoven University of Technology, The Netherlands.

2.2 Participants

In the Japanese experiment 13 men and 14 women ranging from 18 to 25 years of age participated. Participants of the Dutch experiment consisted of 16 men and 11 women ranging from 18 to 51 years of age. All participants were university students or university employees. The participants received a financial recompense for their participation.

2.3 Measurements

The participants were asked to rate the arousal and valence of the animation on six 5-point scales. The scales were anchored with a pair of antonymous words in Japanese or Dutch language. The approximate translation into English is as follows:

Arousal

- rough behavior – gentle behavior
- excited behavior – calm behavior

Figure 2: The 30 animations of the square character

- aware behavior – numb behavior

Valence

- cooperative behavior– counter-cooperative behavior
- behavior of agreement– behavior of disagreement
- permitting behavior– denying behavior

The score of arousal and valence for each animation was calculated by calculating the mean of the three answers to the arousal or valence questions.

2.4 Process

The animations and the questionnaire were presented on a computer screen in front of the participants. After a training session the participants had the opportunity to ask questions about the process of the experiment before they would begin with the experiment. The 60 stimuli were presented in random order and the participants could replay the animation as often as they wanted by pressing the "replay" button (see Figure 3). They had to mark each scale before they could press the "okay" button to continue to the next stimuli. The whole process took one hour.

3 Results

A 30 (animation) x 2 (avatar) x 2 (culture) x 2 (gender) repeated measures ANOVA was conducted. The animations had a significant effect on arousal ($F(29, 1450) = 79.51, p < .001$) and valence ($F(29, 1450) = 104.79, p < .001$). The arousal ($F(1, 50) = 9.162, p < .004$) ratings differed significantly between the round and square avatar. This difference is most likely based on the

Figure 3: The experimental setup.

slight difference of the two avatar's animations. Culture had no significant influence on arousal or valence. Gender had a significant influence on valence ($F(1, 50) = 6.712, p = .013$) and there was a significant interaction effect between culture and gender ($F(1, 50) = 4.398, p = .041$) on valence. Figure 4 shows the means of arousal and valence grouped by the independent variables culture and gender.

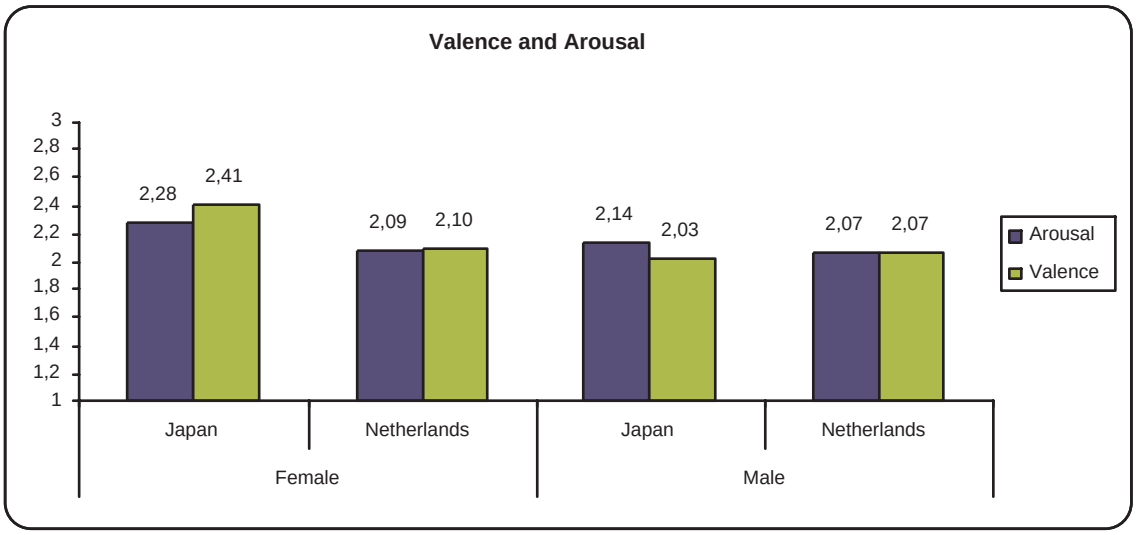

Figure 4: Mean arousal and valence across all animations and avatars

Women rated ($m = 2.136$) the animations significantly higher ($t(53) = -2.624, p = .012$) on valence than men ($m = 1.969$). The Japanese women rated the animations highest ($m = 2.41$) on valence. The animations themselves had the biggest influence on valence and arousal. Certain animations show influence of the culture (see Figure 5 and Figure 6).

Even though no overall influence of culture on the perception of animations could be found, perceptions of certain animations were affected by it. The perception of symbolic and iconic expressions is affected because they carry a specific meaning. Deep bowing, like in animation 26,

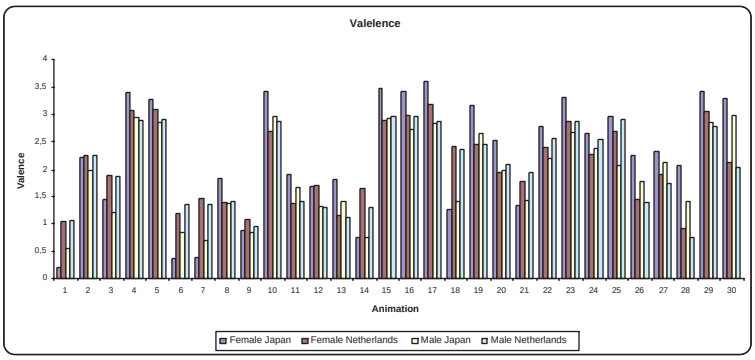

Figure 5: Valence per animation

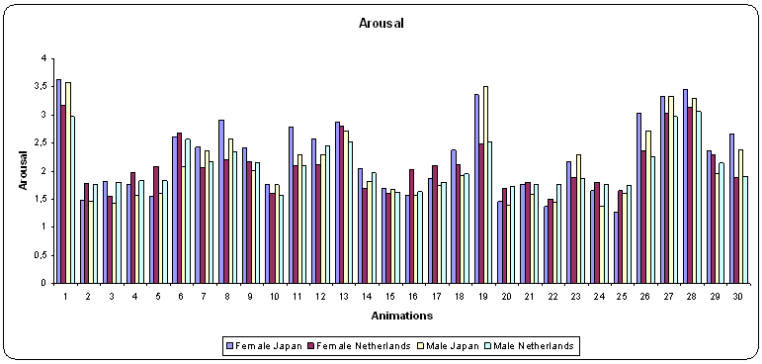

Figure 6: Arousal per animation

is an appropriate form of apologizing in Japan but is uncommon in the Netherlands. However, a deep bow is an extreme expression in Japan and therefore the Japanese participants rated it significantly higher on arousal ($t(53) = 3.813, p < .001$). The same social display rules also explain the difference in arousal for animation 19. Jumping from joy is only performed in Japan under extreme joyful conditions. Therefore Japanese participants rated animation 19 significantly higher on arousal than Dutch participants ($t(53) = 6.5, p < .001$).

Animation 30 is a symbolic expression of "yearning", a Japanese concept for feeling good and being ashamed of it (see Figure 7). This specific concept is not known in the Netherlands and therefore it was rated not as positive by the Dutch as by the Japanese ($t(53) = 5.849, p < .001$).

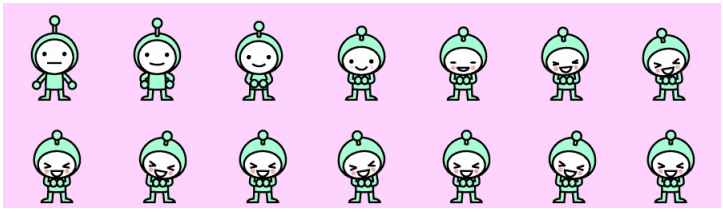

Figure 7: animation 30

Another culture-related difference can be observed in animation 18. Putting oneself forward is inappropriate in Japan and is therefore rated significantly lower on valence by Japanese ($t(53) = 6.563, p < .001$). Dutch participants possibly interpreted it simply as contempt.

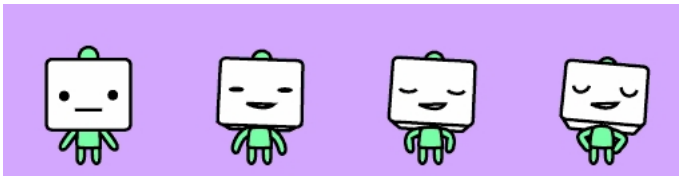

Figure 8: animation 18

4 Conclusions

We conducted a cross-cultural study on how users perceive the expressions of avatars. The animations themselves had the strongest influence. The 30 animations of both avatars were almost identical, but even the small differences resulted in significantly different perceptions. These difference is likely to be even stronger for more diverse avatars, such as a monkey and an elephant. Due to their physiology they will have to express the same meaning in different ways. Developers need to be aware of these differences and evaluate their designs.

Even though we did not find an overall significant influence of culture on the perception of the animations we could identify certain animations that are perceived differently. This differences can be explained by the different display rules in the two cultures. Expressing emotions is only performed in Japan under extreme situations whereas it is more common in the Netherlands. Furthermore certain symbolic expressions refer to concepts that are only known in one culture. The Japanese "yearning" or "bowing" expressions are good examples. The cultural difference concerning bowing is, of course, well documented in most travel guides to Japan.

The gender of the participants had significant influence on the perception of the animations. Particularly Japanese women rated the animations more positive on the valence scale. This important result defines our further research directions. What avatars do users prefer to represent themselves? Should the avatars have a clearly defined gender or is a neutral design better?

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