

# Corpus-based analysis of users' emotional strategies to convince virtual characters

Magalie Ochs<sup>1</sup> and Rui Prada<sup>2</sup>

<sup>1</sup>CNRS-LTICI, Télécom ParisTech, Paris, France, magalie.ochs@telecom-paristech.fr

<sup>2</sup>INESC-ID and IST-Technical University of Lisbon, Portugal, rui.prada@gaiips.inesc-id.pt

## Abstract

Most of the research in Affective Computing focuses on the emotions *felt* by the users during human-machine interaction. In this paper, we explore the users' emotions, not necessarily felt, but deliberately expressed to try to achieve a specific goal: to convince a virtual character. A video game in the virtual environment Second Life has been developed to collect data on the users' emotional strategies to convince in human-machine negotiation. The analysis of the resulting corpus highlights different emotional strategies of the users depending on their personality.

## 1. Introduction

During interpersonal interaction, people may express emotions different from their felt emotions to follow some sociocultural norms or to try to achieve specific goals (Ekman and Friesen, 1975). Recent research in Human and Social Sciences has highlighted the *emotional gaming* phenomena (Andrade and Ho, 2008). To *game emotion* means to strategically modify the expression of a current felt emotion to try to influence someone else's behavior. For instance, people sometimes use specific expressions of emotion to convince someone else in a negotiation (Andrade and Ho, 2008; VanKleef, 2007; Liand and Roloff, 2006).

In this paper, we focus on the *emotional gaming* of users for the purpose of influencing virtual characters' opinion during a negotiation in a virtual environment. To collect information on the users' emotional strategies in human-machine negotiation, we have developed a video game in the virtual environment *Second Life*. Several users have interacted with different emotional virtual characters with the goal to convince them using emotions. The analysis of the resulting corpus has enabled us to highlight users' emotional strategies during negotiation and some correlations with their personality.

The paper is structured as follows. In the next section, existing works in Human and Social Sciences related to the emotional strategies during interpersonal negotiation are presented. In Section 3, we introduce the video game, called *the virtual negotiation place*, developed in Second Life to collect information on users' emotional strategies to convince virtual characters. The method to collect the corpus and the results of the analysis are presented and discussed Section 4. We conclude Section 5.

## 2. Theoretical Background: Emotional Strategies in Interpersonal Negotiation

Recent research in Human and Social Sciences has shown that one's expression of emotion may influence other's decision in a negotiation process (Andrade and Ho, 2008; VanKleef, 2007; Liand and Roloff, 2006). During interpersonal interaction, people sometimes game emotions (i.e. express emotions not necessarily felt) to try to change the course of a negotiation. Several studies have highlighted

that both *happy* and *anger* emotion expression have beneficial effects on negotiation. On one hand, people may strategically choose to express *happiness* and suppress sadness and anger to others to elicit liking from them (Clark et al., 1996). Indeed, as shown in (Knutson, 1996), people are perceived likable when they express joy. In the context of a negotiation, positive emotion can signal cooperativeness and trustworthiness and may elicit cooperation, trust, and concession from others (Liand and Roloff, 2006). On the other hand, *anger* expression of emotion impresses the other party as aggressive and competitive. People who express anger are perceived as more dominant but less likable (Knutson, 1996). But, people with low power are strongly affected by their opponent's emotions (anger emotion), whereas those with high power are unaffected (VanKleef et al., 2006). Finally, people with low power concede more to an angry persuader than to a happy one (VanKleef et al., 2006). Moreover, as highlighted in (Liand and Roloff, 2006), a congruence between what the receiver expects and what the persuader expresses can lead to a successful negotiation. People generally expect that their emotional expression evokes complementary and similar emotional responses in others (Keltner and Kring, 1998; Morris and Keltner, 2000). For instance, anger should evoke fear or guilt (low-power emotions (Liand and Roloff, 2006)), distress should evoke empathy, etc.

Based on the research in Human and Social Sciences presented, we consider three emotional strategies during a negotiation: (1) the expression of joy, (2) the expression of anger, and (3) the expression of congruent emotion. In order to identify how users use emotions during a negotiation with virtual characters in a virtual environment, we have developed a *virtual negotiation space* with different emotional virtual characters in the environment *Second Life*.

## 3. Virtual Negotiation Space

The virtual negotiation space has been created in the 3D on line virtual world *Second Life* (Linden-Lab, 2003). Second Life is a free networked multi-user world-like environment in which users are represented as avatars that can communicate with others and interact with objects in the virtual environment. The virtual negotiation space has been created as a game environment. The user, through his avatar



Figure 1: Virtual characters in the virtual negotiation space. From the left to the right: the emotional persuasive virtual character, the random emotional virtual character, and the non-emotional virtual character.

in Second Life, has to convince virtual characters to give him the boxes they have. At the beginning of the game, the user meet a first virtual character which explains the goal of the game. To convince the virtual characters, the user has to chat, through the chat channel, with the characters. The virtual character explicitly advises the user to use emotion to try to persuade the other virtual characters. To express emotion, the user directly types the type of the emotion at the end of the sentence. He can use three types of emotion: *anger*, *sadness*, and *happy*.

In order to analyze the users' emotional strategies depending on the interaction with different emotional virtual characters, the virtual negotiation space has been populated with three different virtual characters: (1) an *emotional persuasive* virtual character, (2) a *random emotional* virtual character, and (3) a *non-emotional* virtual character (Figure 2). Each of these virtual characters has been programmed to response to user's messages. They are endowed with a sentences database containing predefined responses depending on the character' opinion (for instance, "I do not want to give this box" or "I should not keep this box"). The virtual characters are not able to analyze the user's message but response automatically given their opinion. The virtual characters do not use specific arguments to convince. The *random emotional* virtual character expresses randomly the emotion of anger, sadness or joy. The *non-emotional* character does not express any emotion during the interaction with the user. Only the emotional persuasive virtual character takes into account the user's emotions to choose the emotion to express. Indeed, the *emotional persuasive* virtual character is endowed with a model of emotional strategies based on the research in Human and Social Sciences presented above (Section 2). The emotional persuasive character expresses anger in response to the user's expression of sadness. If the user expresses anger, the virtual character displays an empathic message (such as "You look sad, I'm sorry for you") with an expression of sadness. In response to the user's expression of joy or neutral emotion, the virtual character expresses joy (Ochs and Predinger, 2010). In Second Life, the emotional virtual characters that we have developed express emotions in two ways: their facial expressions and an object attached to their chest called *EmoHeart*. *EmoHeart* appears when the virtual characters express emotions, and its texture depends on the type of the expressed emotion (Figure 2). *EmoHeart* (Neviarouskaya et al., 2009) provides an additional chan-

nel for visualizing emotions in a vivid way while the facial expression of emotion in Second Life may be elusive. To express empathy, the emotional persuasive virtual character uses additionally predefined sentences, such as "You look sad, I'm sorry for you".



Figure 2: Examples of virtual characters' facial expressions and EmoHeart textures

## 4. Collection of the users' emotional strategies corpus

### 4.1. Method

**Participants.** We have asked 17 subjects (three women, fourteen men) to play the game. The subjects' ages ranged between 21 and 30 years old. They have in average few experience using Second Life (in average 2 on a Likert scale of 7 points), some experience with computer games (in average 5 on a Likert scale of 7 points), and with virtual environments in general (in average 4 on a Likert scale of 7 points). The participants were mainly French (12 on 17) with 2 Brazilian, 2 African, and 1 Malaysian.

**Procedure.** The participants have played the game in our research institute. We have presented the study to the user as a game test. Given the link between emotions and personality (Revelle and Scherer, 2009; Salovey et al., 2000), we aimed at analyzing the impact of personality on the user's emotional strategies. Consequently, at the beginning of the test, we asked the participants to fill a personality test to assess the big five personality factors (extroversion, agreeableness, conscientiousness, emotional stability, and intellect) and their emotional intelligence (Goldberg et al., 2006). Then, each participant has interacted with the three virtual characters presented above (emotional persuasive, random emotional, and non-emotional): all participants interact with all character types.

The goal was to convince the characters to give their box to the user. For each interaction with a virtual character, four dialog turns occur. A dialog turn corresponds to an exchange of messages from the user to the virtual character and from the virtual character to the user. After the four dialog turns, the virtual character stops the conversation. For each participant, we have predefined if, at the end, the virtual characters agree to give the box or not. The order of the characters in which the user interacts with and the final opinions of virtual characters (pros or cons) have been counterbalanced to avoid an effect of the order of the characters or of the final opinions of them on the results. The subjects have received 1000 Japanese yen at the end of the test for their participation.

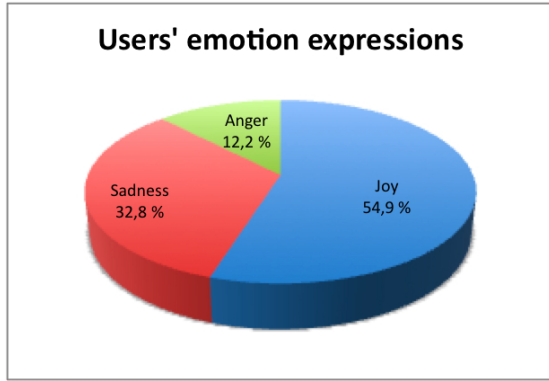


Figure 3: Global repartition of the users' emotion expressions

**Corpus description.** To analyze the emotions used by the participants to try to convince the virtual characters, we have recorded in a file the sentences exchanged between the users and the virtual characters. During the recording, the sentences have been automatically annotated by the type of the speaker (user id, persuasive virtual character, random virtual character, or non-emotional virtual character) and the emotion expressed by the speaker (anger, sadness, joy, or neutral). The resulting corpus is composed of 418 annotated sentences (209 of the users and 209 of the virtual agents). It is composed of 172 expressions of joy (112 of the users and 60 of the agents), 98 expressions of sadness (67 of the users and 31 of the agents), 75 expressions of anger (25 of the users and 50 of the agents), and of 73 neutral expressions (5 of the users and 68 of the agents).

Next section presents a deeper analysis and discussion of these results.

## 4.2. Results

**Emotion types expressed by the users during a negotiation with virtual characters.** First of all, we have analyzed the types of emotion that the participants have used during their interactions with the virtual characters. In general, as illustrated Figure 3, they have mainly used joy, sometimes sadness, and few times anger. The expressed emotion depends on the participants' personality and emotional intelligence. To highlight the relation between participants' emotion expressions and their personality, we have computed the Pearson correlation coefficient. In the paper, we report the medium ( $0.3 < c < 0.5$ ) and large ( $0.5 \leq c < 1$ ) correlations. A positive (respectively negative) medium correlation is noted "+" (respectively "-"). A large correlation is noted "++" for positive correlation and "--" for negative correlation (n.s. means no significant correlation) (Table 1).

In Table 1, The medium correlation for the extroversion personality factor shows that the more the user is extroverted the more he uses joy emotion and the less he uses sadness to convince the virtual characters. Similarly, the emotional stability and intellect personality factor of user are positively correlated to the expression of joy and negatively correlated to the expression of sadness. The conscientiousness factor seems correlated to the expression of joy

	Joy	Sadness	Anger
<i>extroversion</i>	+	-	n.s.
<i>agreeableness</i>	n.s.	n.s.	n.s.
<i>conscientiousness</i>	+	n.s.	-
<i>emotional stability</i>	+	-	n.s.
<i>intellect</i>	+	-	n.s.
<i>emotional intelligence</i>	++	-	--

Table 1: Correlation between the personality factors and the expression of emotion

and anger, leading a user with a high value of conscientiousness to express more joy and less anger to convince. The agreeableness factor seems to not have an impact on the types of expressed emotion. Finally, the results reveal a large correlation between emotional intelligence and emotion expressions: the more the user is emotionally intelligent, the more he expresses joy and the less he displays anger and sadness.

**Users' emotional reactions to virtual characters' emotion expression in a negotiation.** We also have analyzed the types of emotions used by the participants in response to virtual character's emotions. In order to identify significant differences, we have performed a T-test to compare the frequency the participants used each emotion type in response to the emotions displayed by the virtual characters.

Concerning the emotion expressed by the participants in response to the *joy expression* of a virtual character, the results reveal significant differences: the participants have expressed significantly more joy than sadness ( $p < 0.05$ ) and anger ( $p < 0.01$ ). Large positive correlations appear between the expression of joy in response to joy and the extroversion personality factor, the emotional stability factor and the emotional intelligence of the user ( $c \geq 0.5$ ): the more the user is extroverted, emotional stable or emotionally intelligent, the more he expresses joy in response to a characters' expression of joy.

Concerning the emotional response to a characters' *expression of sadness*, the participants have expressed significantly more joy than anger ( $p < 0.05$ ), and sadness than anger ( $p < 0.01$ ). However, no significant difference between joy and sadness appears. The expression of joy and sadness in response to a virtual expression of sadness is correlated with the intellect personality factor (large,  $c \geq 0.5$ ): the more the user has a high value for the intellect personality factor, the more he expresses joy and the less he expresses sadness in response to sadness. Medium positive correlation appears between joy expression and extroversion personality factor whereas a medium negative correlation exists between anger expression and user's emotional intelligence.

Concerning the emotion expressed by the participants in response virtual characters' *anger expression*, no significant difference appears between the types of emotion used. However, the results reveal correlations with personality factors: the more an user is extroverted or emotional stable the less he expresses sadness in response to anger (respectively large and medium negative correlation), and the more the user is emotional intelligent the less he displays anger

in response to anger (medium negative correlation).

Finally, the results of the T-test reveal an effect of the emotion type expressed by the characters on the emotional response of the user. In response to joy, participants have used significantly more joy than in response to sadness ( $p < 0.01$ ) or anger ( $p < 0.05$ ); and in response to anger, the participants have significantly preferred to use anger than in response to sadness ( $p < 0.05$ ).

**Users' emotional strategies to convince virtual characters.** We have analyzed the sequences of emotional expressions of the participants in order to try to highlight their emotional strategy to convince. A T-test has been performed to evaluate the effect of the number of dialog turns occurred on the type of emotion expressed. We have particularly analyzed the influence of participants' emotional intelligence on their strategy considering that the more the user is emotional intelligent, the better is the strategy. Concerning the emotion of *joy*, participants have significantly more expressed this emotion at the first dialog turn, than at the second, third or fourth one ( $p < 0.01$ ). The users' emotional intelligence seems also to have an influence: the more the user is emotionally intelligent the more he expresses joy at the second dialog turn (medium correlation) and at the third one (large correlation). Concerning *sadness*, participants have significantly less expressed sadness at the first dialog turn than at the second ( $p < 0.01$ ), third ( $p < 0.05$ ) or fourth one ( $p < 0.01$ ). Medium negative correlations appear with the emotional intelligence: the more participants are emotional intelligent the less they have expressed sadness at the first or second dialog turns. The *anger* expression have been significantly more used at the end of the dialog (third or fourth dialog turn) than at the beginning (first or second dialog turn) ( $p < 0.05$ ). Moreover, the more the participants are emotional intelligent, the less they expressed anger at the end of the dialog (large correlation for the third dialog turn and medium one for the fourth dialog turn). A medium positive correlation appears for the first dialog turn, showing that the more the participants are emotionally intelligent the more they have displayed anger at the first dialog turn.

In general, the T-test reveals that the participants have significantly more expressed joy at the first dialog turn than sadness or anger ( $p < 0.01$ ). At the second dialog turn, joy is significantly more displayed than anger ( $p < 0.01$ ), and, similarly, sadness is significantly used more than anger ( $p < 0.01$ ).

### 4.3. Discussion

First of all, the analysis of the corpus shows that the main emotional strategy used by the users (and particularly the emotional intelligent users) to try to convince a virtual character is the expression of *joy*. However, the users' emotional strategy depends on the emotion expressed by the virtual character. The users prefer displaying an emotion of joy in response to the virtual character's expression of joy. In response to sadness, depending on their personality (and more particularly the intellect factor), the user displays either sadness or joy. When the virtual character expresses anger, the user tends to display more anger than when the virtual character expresses an emotion of sadness. How-

ever, maybe because of the few number of anger expressions, we cannot conclude that the user displays more anger in response to the virtual character's anger expression than sadness or joy. The personality of the user (his extroversion, emotional stability and emotional intelligence) may provide information on the user's emotional strategy facing virtual character's anger expression.

The analysis of the sequence of expressed emotions reveals that the users generally start with the expression of a positive emotion (*joy*) at the beginning of the negotiation and express negative emotion (*sadness* or *anger*) at the end. On the contrary, it seems that emotional intelligent users prefer to display negative emotion (and in particular *anger*) at the beginning and to finish by expressing a positive emotion. In conclusion, the corpus-based analysis of users' emotional strategies during a negotiation with virtual characters highlights the types of emotion used to convince depending on the users' personality factors<sup>1</sup> The next step is to use these results to model the emotional strategies of virtual characters with different personalities.

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## 5. References

- B.E Andrade and T. Ho. 2008. Gaming emotions. Technical report, Experimental Social Science Laboratory.
- M.S. Clark, S.p. Pataki, and V.H. Carver, 1996. *Knowledge structures in close relationships*, chapter Some thoughts and findings on self-representation of emotions in relationships. Lawrence Erlbaum.
- Paul Ekman and W.V. Friesen. 1975. *Unmasking the face. A guide to recognizing emotions from facial clues*. Prentice Hall Trade.
- L. R. Goldberg, J. A. Johnson, H. W. Eber, R. Hogan, M. C. Ashton, C. R. Cloninger, and H. C. Gough. 2006. The international personality item pool and the future of public-domain personality measures. *Journal of Research in Personality*, 40(84-96).
- Dacher Keltner and Ann M. Kring. 1998. Emotion, social function, and psychopathology. *Review of General Psychology*.
- B. Knutson. 1996. Facial expressions of emotion influence interpersonal trait inferences. *Journal of Non-verbal Behavior*, 20(165-182).
- S. Liand and M.E Roloff, 2006. *From Communication to Presence: Cognition, Emotions and Culture towards the Ultimate Communicative Experience*, chapter Strategic Emotion in Negotiation: Cognition, Emotion, and Culture. IOS Press.
- Linden-Lab. 2003. Second life. [www.secondlife.com](http://www.secondlife.com).
- Michael W. Morris and Dacher Keltner, 2000. *Research in Organizational Behavior*, chapter How emotions work:

<sup>1</sup>It's difficult to compare the obtained results with the literature on the emotions used during interpersonal negotiation (Section 2) which focuses on the types of emotion without considering the personality of the individual. Moreover, our context, very specific since the users have to type emotions, differs from natural interpersonal interactions.

- the social functions of emotional expression in negotiations. Elsevier.
- A. Neviarouskaya, H. Prendinger, and Ishizuka M. 2009. Emoheart: Automation of expressive communication of emotions in second life. In *International Conference on Online Communities and Social Computing*.
- M. Ochs and H. Predinger. 2010. A virtual character's emotional persuasiveness. In *International Conference on Kansei Engineering and Emotion Research (KEER)*.
- W. Revelle and K. R. Scherer, 2009. *The Oxford companion to emotion and the affective sciences*, chapter Personality and emotion. Oxford University Press, Oxford.
- P. Salovey, B. Bedell, J. Detweiler, and J. Mayer. 2000. Current directions in emotional intelligence research. In M Lewis and J.M. Haviland-Jones, editors, *Handbook of Emotions*, pages 504–520. Guilford Press.
- G.A. Vankleef, C. DeDreu, D. Pietroni, and A. Manstead. 2006. Power and emotion in negotiation: Power moderates the interpersonal effects of anger and happiness on concession making. *European Journal of Social Psychology*.
- G.A. VanKleef. 2007. Emotion in conflict and negotiation: Introducing the emotions as social information (easi) model. In *IACM*.