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User Engagement and Preferences in Information-Giving Chat with Virtual Agents

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Abstract. We have performed a perceptive study that shows the existence of positive correlations between the user’s preferences for an artwork (a physical object) and the user’s engagement during the discussion of this object with a virtual agent. This finding encourages the development of agent dialogue strategies that personalise the topic of conversation in information-giving chat according to the user’s preferences.

1 Introduction

Engagement is crucial in human-agent interaction as it is a prerequisite for the interaction to go on, and thus a prerequisite for the agent to deliver its messages and/or to complete the objective of the interaction [4]. We consider engagement as “*the value that a participant in an interaction attributes to the goal of being together with the other participant(s) and of continuing the interaction*” [16].

Previous research has demonstrated that a personalisation according to user preferences may contribute to, amongst others, an optimisation of user experience in game playing [18], an improvement in customer relationships [11] and an enhancement of learning efficiency and experience [8]. In this study we explore if in non-task oriented human-agent interaction, an agent’s personalisation according to the user’s preferences can influence the user’s engagement. Specifically, we will verify if the user’s preference for a physical object (artwork) plays a role in the user’s level of engagement during the discussion around this object with a virtual agent. The outcome of this perceptive study will be used to develop dialogue strategies for the virtual agent aiming at enhancing user engagement in human-agent interaction.

In the following two sections we define the type of interaction we look at and introduce the notion of preferences. In section 4 we present our methodology and in section 5 our results. In section 6 we conclude and discuss our findings.

2 Information-Giving Chat

The current research is conducted in the context of the French project ‘Avatar 1:1’ that aims at developing a human-sized virtual agent playing the role of a

visitor in a museum. The agent’s task is to engage human users in one-to-one face-to-face interaction about the museum and some of its artworks with the objective to give the visitors information about these subjects. The choice of the exact subject is secondary: what matters is that some amount of cultural information is transferred, as described also in [10]. We refer to this type of interaction as an *information-giving chat* [10] (as opposed to *information-seeking chat* [21]). Like information-seeking chat [21], information-giving chat has a more exploratory and less task-oriented nature but is more structured than general free conversation [10].

Our aim is to explore if a personalisation of the topic of conversation based on the user’s preferences of artworks (explained in Section 3) is likely to enhance the user’s engagement, thereby augmenting the interaction time and thus the agent’s opportunities to transfer cultural information.

3 Preferences

We interpret a preference according to the definition of Scherer [20] as “*a relatively stable evaluative judgement in the sense of liking or disliking a stimulus*”. Preferences are everywhere in our daily lives [13] and the development of personalised content based on preferences increases in multiple domains of human-computer interaction, such as e-commerce, news reading and computer games [18].

In the domain of non-task oriented human-virtual agent interaction, user personalisation is also increasing. Variables taken into account include the user’s affective state [17][7][14], emotions [15], appearance [15], expressions of appreciation [5] and politeness and formality [9]. In the present work we will verify if we should augment this list with user preferences that are directly linked to the topic of conversation. Our goal is namely, to explore if a personalised topic of conversation according to the user’s preferences regarding physical objects is likely to enhance the user’s engagement.

Some previously built virtual agent systems give their users the opportunity to directly select or reject the topics of interaction [3][12], thereby already adapting the interaction to some notion of user preference. However, these preferences only represent a choice of the user for certain information. The systems do not take into account the user preferences that may underlie the user’s choice. In our work we will verify if the user’s preferences towards the physical objects under discussion play a role in the user’s interest for the discussion and his/her engagement. This will give us indications for the development and usefulness of dialogue strategies aiming at agent initiated topic selection.

4 Methodology

In order to find out if the user’s preference for a museum object (artwork) plays a role in the user’s level of engagement during the discussion of this artwork with a virtual agent we performed a perceptive study: We asked human participants

one by one to visit a small improvised museum, talk with a virtual agent called Leonard, and fill in a questionnaire. Below we briefly discuss each of these steps.



Fig. 1. The improvised museum.



Fig. 2. The ‘statue’ between the agent and the user.

4.1 Museum

Since the project’s avatar Leonard is not yet installed in the museum, we simulated a small museum in our laboratory; We exhibited 4 pictures of existing artworks in a first room and gave each participant as much time as he/she needed to observe the artworks, just as they would do in a regular museum (Fig. 1). The artworks are shown in Appendix A and were chosen as to vary in style and type of affect they might evoke: a photo of the exhibition of *Balloon Dog* by Jeff Koons, and printed images of the paintings *The Kiss* by Gustav Klimt, *Composition A* by Piet Mondrian, and *The Anatomy Lesson of Dr. Frederick Ruysch* by Jan Van Neck. When the participant indicated that he/she finished looking at the artworks we explained that the visit would continue in the next room and that there he/she will talk with Leonard, a virtual character who also visits the museum. We placed another artwork between the screen of the virtual agent and the user that serves as a first conversation topic (Fig. 2): a picture of a statue named *Soldier drawing his Bow*, by Jacques Bousseau (Appendix A).

4.2 Virtual Agent and Interaction

A technical limit for interacting with Leonard is that at the moment we do not dispose of reliable speech recognition and natural language understanding modules. To resolve these issues we used a Wizard of Oz: we predefined keywords with which the participants needed to formulate their reaction (Fig. 3) and then transmitted the user’s choice for that keyword to the agent. The keywords represent branches in the agent’s predefined dialogue tree, meaning that the use of each keyword can lead to a particular predefined agent response. The dialogue tree is developed by using the hierarchical task network Disco for Games [19].



Fig. 3. Leonard and the keywords that are needed to talk with it.



Fig. 4. The setting of the interaction.

When the participant entered the room Leonard started the interaction. Leonard has the appearance of a cartoon-like version of a man of about 70 years old, is displayed on a 75-inch vertically placed screen, and speaks French. The user was recorded with two kinects and one camera (Fig. 2).

In the first couple of turns Leonard presented itself and asked for the name and region of the user. This small talk phase (in the sense of [2]) serves to let the user get used to the character and the way of interacting [2]).

After the small talk phase Leonard started talking about the artwork in front of it (Fig. 2) as a way to open the conversation about the artworks. Then, the agent switched to discuss the other artworks of the improvised museum. For every artwork Leonard provided some information about the object, asked what the participant thinks of it, and optionally expressed its own opinion (as described in [6]). The order in which the 4 artworks from the first room were discussed was random and changed among the participants. After the discussion of all artworks Leonard closed the conversation. Depending on the user utterance lengths the entire interaction took between 6 and 10 minutes.

4.3 Questionnaire

Directly after the interaction the participants were presented a questionnaire.

To estimate the user’s level of *engagement* during the different phases of the interaction we used the definition of Poggi et al. [16] (see introduction), by asking Q1) *to what extent the user wants to be together with Leonard* and Q2) *to what extent the user wants to continue the interaction* during the different discussion phases. The different discussion phases for which these questions were asked were: the small talk phase (name and region), and each separate discussion around an artwork. All the questions needed to be answered on a 7 point scale ranging from *not at all* to *extremely*. We also asked Q3) *to what extent the user was interested* in the discussion during the different phases.

In order to estimate the *preferences* of the users we asked the participants Q4) to what extent they like the different artworks (according to Scherer’s definition [20], see section 3) and Q5) to what extent they find them interesting.

5 Results

33 participants took part in the study (13 female, aged 19-58, all proficient in French). Analyses of the data show that the participants’ degrees of liking an artwork is significantly, positively correlated to the users’ engagement during the discussion of that artwork with Leonard (Kendall Tau tests). This is the case for both of the aspects of engagement we looked at: wanting to be together with Leonard (Q1, $p < 0.001$, $\tau = 0.50$) and wanting to continue the interaction (Q2, $p < 0.001$, $\tau = 0.52$). These results are obtained by taking, for all the participants, and all the 4 (in random order discussed) artworks from the first room, the participants’ degree of liking the artwork (Q4), and comparing this with the scores that the participants attributed to their engagement during the corresponding discussion phases of all these artworks.

In the same way as above, a positive correlation is found between the extent to which the users found an artwork *interesting* (Q5) and their level of both engagement measurements during the discussion of this artwork ($p < 0.001$, Q1: $\tau = 0.45$, Q2: $\tau = 0.54$). The users’ liking and interest for an artwork are also positively correlated to the extent to which the participants found the discussion of the artwork interesting (Q3) ($p < 0.001$, liking Q4: $\tau = 0.56$; interest Q5: $\tau = 0.49$).

For all of the above results, possible effects of novelty [14] are outbalanced by the random order in which the artworks were discussed. The discussion of the artwork that is located between the agent and the user (Fig. 2) and that is always discussed first, before the in random order discussed museum objects, does not lead to a significant different level of engagement or interest in the discussion than the other artworks (Kruskal-Wallis).

6 Conclusion & Discussion

The results of the perceptive study show that the user’s liking (i.e. preference, see section 4.3) and interest of a museum artwork are significantly, positively correlated with the user’s engagement and interest during the discussion of this artwork with a virtual agent. We can therefore confirm our hypothesis that the user’s preferences of the physical object (artwork) under discussion play a role in the user’s level of engagement in non-task oriented human-agent interaction. This conclusion is illustrated by comments from the participants: “*This (answer) shows that wanting to stay with Leonard depends on how much I find the topic interesting.*” “*Talking about a work that I don’t like is not pleasant and makes me less involved in the interaction.*”

From this finding we can derive that one of the agent’s dialogue strategies that is likely to favour user engagement in information-giving chat is personalising the topic of conversation according to the user’s preferences regarding the underlying objects. The other way around, the revealed positive correlations also indicate that by detecting a level of user engagement during the interaction we can obtain indications with respect to the user’s preference towards the current topic of conversation and its underlying object. These two conclusions have lead us to develop an agent model that tries to enhance the user’s engagement by personalising the topic of the interaction, as described in [10].

We found no significantly different level of engagement or interest during the discussion of the object that was physically present during the interaction in comparison with the objects that were located in another room. This means that this study does not give us reasons to suspect that the physical presence of an object is required in order to engage the user.

In the future we plan to verify to what extent, and how exactly, a personalisation *within* the discussion phase of an artwork (object) may influence the user’s engagement. The fact that the correlations we found have r -values around 0.50, confirms the expectation that there are more variables than just the topic of the interaction that influence the user’s engagement. We would also like to consider what the consequences are of adapting the topic of conversation to the user preferences on the entire interaction and the overall engagement level of the user.

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References

1. Ardissono, L., Kuflik, T. and Petrelli, D.: Personalization in cultural heritage: the road travelled and the one ahead. *User modeling and user-adapted interaction*, 22(1-2) 73–99 (2012)
2. Bickmore, T., and Cassell, J.: Small talk and conversational storytelling in embodied conversational interface agents. *AAAI fall symposium on narrative intelligence*, 87–92 (1999)
3. Bickmore, T., Pfeifer, L., and Schulman, D.: Relational agents improve engagement and learning in science museum visitors. *Intelligent Virtual Agents*, 55–67 (2011)
4. Bickmore, T., Schulman, D., and Yin, L.: Maintaining engagement in long-term interventions with relational agents. *Applied Artificial Intelligence* 24(6), 648–666 (2010)
5. Campano, S., Glas, N., Langlet, C., Clavel, C., Pelachaud, C.: Aligement par production d’Hétéro-Répétitions chez un ACA. *Workshop Affects, Compagnons Artificiels, Interaction*, 18–23 (2014)

6. Campano, S., Langlet, C., Glas, N., Clavel, C., Pelachaud, C.: An ECA expressing appreciations. *Workshop on Engagement in Human Computer Interaction, Forthcoming* (2015)
7. Castellano, G., Paiva, A., Kappas, A., Aylett, R., Hastie, H., Barendregt, W., Hastie, H. and Bull, S.: Towards empathic virtual and robotic tutors. *Artificial Intelligence in Education*, 733–736 (2013)
8. Cha, H. J., Kim, Y. S., Park, S. H., Yoon, T. B., Jung, Y. M. and Lee, J. H.: Learning styles diagnosis based on user interface behaviors for the customization of learning interfaces in an intelligent tutoring system. *Intelligent tutoring systems*, 513–524 (2006)
9. De Jong, M., Theune, M., and Hofs, D.: Politeness and alignment in dialogues with a virtual guide. *Proceedings of the 7th international joint conference on Autonomous agents and multiagent systems* (1), 207–214 (2008)
10. Glas, N., Prepin, K., Pelachaud, C.: Engagement driven topic selection for an information-giving agent. *Proceedings of the 19th workshop on the Semantics and Pragmatics of Dialogue, Forthcoming* (2015).
11. Jiang, B., Pei, J., Lin, X., Cheung, D.W. and Han, J.: Mining preferences from superior and inferior examples. *Proceedings of the 14th ACM SIGKDD international conference on Knowledge discovery and data mining*, 390–398 (2008)
12. Kopp, S., Gesellensetter, L., Krmer, N. C., and Wachsmuth, I.: A conversational agent as museum guide-design and evaluation of a real-world application. *Intelligent Virtual Agents*, 329–343 (2005)
13. Kießling, W.: Foundations of preferences in database systems. *Proceedings of the 28th international conference on Very Large Data Bases*, 311–322 (2002)
14. Leite, I., Castellano, G., Pereira, A., Martinho, C., and Paiva, A.: Empathic Robots for Long-term Interaction. *International Journal of Social Robotics*, 1–13 (2014).
15. Paiva, A., Dias, J., Sobral, D., Aylett, R., Sobreperez, P., Woods, S., Zoll, C. and Hall, L.: Caring for agents and agents that care: Building empathic relations with synthetic agents. *Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems* (1) 194–201 (2004)
16. Poggi, I.: Mind, hands, face and body: a goal and belief view of multimodal communication. *Weidler* (2007)
17. Prendinger, H., and Ishizuka, M.: The empathic companion: A character-based interface that addresses users’ affective states. *Applied Artificial Intelligence* 19(3-4) 267-285 (2005)
18. Yannakakis, G.N. and Togelius, J.: Experience-driven procedural content generation. *IEEE Transactions on Affective Computing*, 2(3) 147–161 (2011)
19. Rich, C. and Sidner, C.L.: Using collaborative discourse theory to partially automate dialogue tree authoring. *Intelligent Virtual Agents*, 327-340 (2012)
20. Scherer, K.R.: What are emotions? And how can they be measured? *Social science information*, 44(4), 695–729 (2005)
21. Stede, M., and Schlangen, D.: Information-seeking chat: Dialogues driven by topic-structure. *Proceedings of the 8th Workshop on Semantics and Pragmatics of Dialogue, CATALOG 04* (2004)

Appendix A: The artworks of the improvised museum



(a) *Soldier drawing his Bow* – Jacques Bousseau



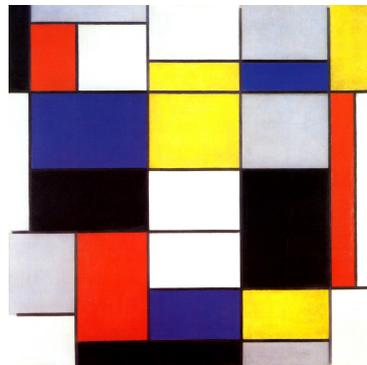
(b) *Balloon Dog* – Jeff Koons



(c) *The Anatomy Lesson of Dr. Frederick Ruysch* – Jan Van Neck



(d) *The Kiss* – Gustav Klimt



(e) *Composition A* – Piet Mondrian

Fig. 5. The artworks from the improvised museum. Artwork a. was located between the user and the agent. The others were exhibited in another room that was visited before the interaction.