Personalising the Dialogue of Relational Agents for First-Time Users

Extended Abstract

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ABSTRACT

Relational agents who personalise their message to individual users need to learn about the user first. In the context of an agent who personalises the inclusion of 10 relational cues in its dialogue, we explore training the agent based on first time user's responses to a single example of each cue prior to the session with the virtual advisor. We designed a between subjects study with three groups: Empathic (all relational cues); Neutral (no relational cues) and Adaptive (only helpful cues included). We found that in the Adaptive group, students received what they found helpful more often than in the other two groups. Analysis of the discrepancy between what user's found helpful and what they received was least in the Adaptive group and greatest in the Neutral group.

KEYWORDS

Intelligent Virtual Agents; Human-Agent Interaction; Relational Agents; Virtual Advisor; Personalisation; Empathic Dialogue

1 INTRODUCTION

Relational agents are "computational artifacts designed to build long-term, social-emotional relationships with their users" [2]. One way this can be achieved through verbal communication is the use of relational cues. These cues include expression of empathy but also other verbal cues, such as continuity of behaviours (greeting, farewells), inclusive pronouns and humor [1]. We focus on adaption of the relational agent's dialogue based on the user's perception of the helpfulness of these cues. In our study users interact with a personalised relational agent, a virtual advisor, who provides study tips to the user to help them reduce their study stress. In this paper we present our approach for providing an empathic response by

personalizing a virtual advisor's conversation to an individual the agent has never met before. Previous studies we have conducted with more than 380 participants revealed that users do not always find all relational cues helpful [3]. Thus the dialogues of Adaptive Advisor are modified to include or exclude relational cues based on individual preferences.

2 METHODOLOGY

Our study aimed to evaluate the value of adapting the relational cues used by a relational agent according to the user's preferences for use of these cues in a helping context. The 10 relational cues (RCs) include: Social Dialogue (RC1); Meta-Relational Dialogue (RC2); Empathic Feedback (RC3); Humor (RC4); Continuity Behaviors (RC5); Self-Disclosure (RC6); Mutual/Sharing knowledge (RC7); Solidarity and rapport- mirroring (RC8); Politeness (RC9); Inclusive Pronouns (RC10) [1].

For each of the 10 RCs, we created a neutral and an empathic sentence, where the empathic sentence included the specific RC. For example, for RC2 one of the empathic sentences is "Let's talk about socializing which is good for our mental health.", the neutral sentence is "Socializing is good for your mental health." Before interaction, the user was presented with the neutral and empathic sentence and asked which one they considered to be more helpful. Depending on the participant's responses, the adaptive agent will modify its dialogue to select sentences that are either neutral or empathic (i.e. contains an RC) based on whether the user found that RC helpful.

To compare the helpfulness of our adaptive agent, we also included an empathic agent and a neutral agent which does not adapt. The Empathic group received all of the relational cues, while the Neutral group did not receive any relational cues. A total of 111 students completed participation in our study: 37, 34, 40 in the empathic, neutral and adaptive groups, respectively. The study was approved by the Macquarie University's Human Research Ethics Committee. Psychology students recruited using the Psychology pool received half an hour course credit for choosing to participate.

After interaction with the agent, participants were asked again whether they found the neutral or empathic sentence more helpful for each of the 10 RCs. This allowed us to compare the whether their preferences changed after they experienced the agent and received

Table 1: Total frequency (out of N=111) for RCs identified as helpful: S1-survey1, S2=survey2, diff=S1-S2

RC	Survey sample sentence	S1	S2	Diff
Social Dialogue	I hope you enjoyed your break. Ok, let's talk about more tips	75	63	12
Meta-relational	Let's talk about socializing which is good for our mental health	74	77	-3
Empathic	I think you will feel less stress after I give you some study tips	51	63	-12
Humour	Sometimes we can get stuck. Look at me stuck inside this machine	54	54	0
Continuity behaviours	Hey, my name is Sarah. I'm very happy to meet you	84	84	0
Self disclosure	I want to tell you some tips I've learnt from personal experience	78	80	-2
Mutual knowledge	Did you also know that 60 min during the day is equivalent of 90 min study at night?	54	58	-4
Mirroring	Same as me.	n	n	n
Politeness	I hope you don't mind me asking, but do you exercise regularly?	63	60	3
Inclusive pronouns	Together we can embrace difference!	79	70	9

Table 2: Matches between the RCs received & found helpful

Group	0-3	%	4-7	%	8-10	%	Total	Matches
Empathic	4	12	12	35	18	53	34	234
Neutral	22	59	14	38	1	3	37	126
Adaptive	1	3	12	30	27	68	40	326
Total	27	24	38	34	46	41	111	

the sentence in context. This allows us to determine whether our approach to eliciting their response to a single example is enough to appropriately adapt the relational agent's dialogue.

3 RESULTS

Table 1 presents the relational cues statements used in the surveys and the total number of times each was identified as helpful in survey1 (S1) and survey2 (S2). The table also shows the difference between the number of RCs before and after interactions.

We calculated the match between what students received and what they said would be helpful. As the Empathic group received all the cues and the Neutral group received none of the cues, matches for Empathic are when they found a cue helpful and matches for Neutral were when they did not find a cue helpful. For Adaptive a match was when they received or did not receive a cue in accordance with whether they found the cue helpful or not.

We calculated the number of matches and discrepancies in the responses to Survey1 and Survey2 in each group. The number of total matches in Adaptive group is higher than Empathic and Neutral group. Neutral group has the least total number of matches. Table 2 presents a summary in each category for number of matching cues. In the Adaptive group, 39 out of 40 students found over 3 of the RCs they received helpful. In Empathic group only 4 students found less than 4 RCs helpful. However, in the Neutral group 22 students did not find more than 3 RCs helpful. In total, the number of times the relational cues were found helpful are 326, 234 and 126 in the Adaptive, Empathic, and Neutral groups, respectively.

4 DISCUSSION

Our results comparing responses between survey 1 and 2 show that there was some change between responses to the relational cue

examples before and after meeting Sarah but the differences for most people were not significant. In total, in the Adaptive group there are no significant differences in what students found helpful before and after interaction for 18 out of 20 RCs. This shows that using this approach, there would be less discrepancies in what the user received and found helpful in the adaptive dialogue. However, this does not negate the possibility of asking users for their perceptions of RC examples in context (i.e. during their conversation with Sarah), potentially enabling the user to establish more rapport through the increased time spent in conversation and perhaps providing a better context within which to select their preferences and confirm if the statement was actually helpful.

5 CONCLUSION AND FUTURE WORK

An alternative to populating user preferences from a survey is to have the virtual advisor ask the user. This might also improve rapport as more time would be spent with the character. In our study we wanted to test if presenting examples of the relational cues was enough to provide an accurate prediction of whether they found this type of cue helpful in general.

In the personalised dialogue, students found the RCs they received more helpful than the other groups (and matching with preferences), while neutral conversation had the greatest number of discrepancies. The result shows that students found the RCs least helpful when they did not experience them (i.e. Neutral group) and they found them most helpful when the conversation is personalised in the Adaptive group.

We envisage that the process of asking the preferences at the start would be similar to a voice recognition system training itself on the user's voice. The relational agent could introduce itself and explain they are new in this role, or they have learnt from experience that everyone is an individual and has different preferred ways of being spoken to, and ask the user to respond to an example of the 10 cues. Future work could also analyse if some cues are more likely to be preferred together. If an unexpected response was received, one or more alternative examples could be provided to confirm the preference.

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