Toward a construction of the politeness theory adaptable to HAI research

-On going evaluation of conversational agents considering gender bias-

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ABSTRACT

This research discusses how conversational agents and humans build relationships based on the politeness theory. It also discusses the results of our experiment so far. In the experiment, the users evaluate utterances from the agents. It also includes user's attitude toward the gender appearance of the agent. We have examined psychological effects to the users due to the differences of the expression in first-time meeting conversation based on the politeness theory. In our previous study, it was observed that the sense of talking with the machine was reducing when an agent uttered jokes. This research have improved the experiment method. Gender appearance of agents are employed and utterances from the agents are evaluated real-time. In order for the improving, we have created three of the new agents. In the HAI (Human-Agent Interaction) researches, it has not been clear how the differences of the expressions by agents would affect the way of building relationships with humans. Related previous studies have not discussed sufficiently the way of building relationships through first-time meeting conversation between agents and humans, although several researches applied to the politeness theory for utterance design of agents. Our new experiment contribute to the way of building relationships between humans and agents.

KEYWORDS

Human-Agent Interaction, Politeness Theory, Conversational agent

1 INTRODUCTION

In recent years, the attention to research and development of conversational agents which becomes user's communication partner and building relationships that can be said as a partner is increasing.

We verified the psychological effects of jokes to the user by a conversational agent based on the Brown & Levinson's politeness theory which shows effective strategies to construct good relationships with other parties in human conversation [1]. As a result of the verification, the agent was able to reduce the sense of talking to the machine by speaking a joke [2, 3]. This effect is useful for improving the relationship between users and agents. Furthermore, by continuing to verify the effect of each politeness strategy used by an agent as in our approach, it is possible to construct a politeness theory adaptable to HAI research.

However, the evaluation was different depending on the gender of the participants, suggesting the possibility of gender bias. In addition, since participants evaluated the whole impression after the agent finished all utterances, it is a problem that the effect of each utterance of the agent is not clarified.

Therefore, in this paper, based on past experimental results, consider experiments to evaluate each utterance of agents considering gender bias.

2 POLITENESS THEORY

The "politeness" [1] is a language behavior to build a good relationship with a partner. Let S be the speaker and H the listener in the conversation between the two parties [1]. In general, S and H have a desire (face) about interpersonal relationship, and S acts not to infringe H's face. If H has a negative face to S (desire to leave), negative politeness strategies (NPS) is used. On the other hand, when H has a positive face (wanting to get along with S, desire to approach), positive politeness strategies (PPS) are used. NPS has ten kinds of strategies such as apologizing and showing respect. PPS has fifteen kinds of strategies such as showing sympathy to the partner and saying a joke.

3 EXPERIMENT AND RESULTS

3.1 Experimental set up

The purpose of this experiment is to verify the effect when an agent uses a joke which is a kind of PPS at the first meeting talk scene [2, 3]. Agent uses life-like agent [4] and text agent shown in figure 1.

First of all, we teach experiment participants " to watch each video as if you are interacting with the agent" and "to imagine their response to the agent". An experiment participants watches two videos uttered by the agent using NPS or PPS in consecutive manner, with only one condition of life-like agent condition or text agent condition. Both videos have a length of about three minutes. After the videos watching ends, the participants reply to the questionnaire. After answering all the items, the experiment ends.

The experiment participants were thirty-six undergraduate students and graduate students (twenty males and sixteen females). Out of thirty-six subjects, eighteen subjects (ten males and eight females) were participated with inter-subject plan of life-like condition and text agent condition.

3.2 Experimental results

Compare the evaluation values of male participants and female participants about the evaluation item "I felt like talking with the machine". Figure 2 shows the results of comparison between male participants and female participants on the average value of evaluation for PPS under life-like agent conditions. Significant difference ($p < 0.05$) was found as a result of Mann-Whitney's U test. Figure 3 shows the results of comparing the average value of evaluation for PPS under text agent condition between male participants and female participants. As a result of Mann-Whitney's U test, no significant difference was found.

4 DISCUSSIONS

Experimental results showed that the results differed depending on the gender of participants in the case of life-like agent condition.

(a) Life-like agent [4]. (b) Text agent.

Figure 1: Agents [2, 3].

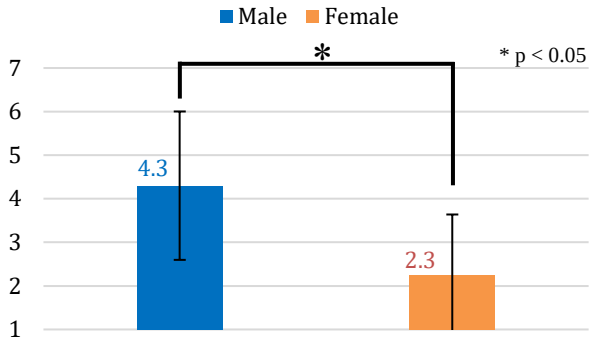

Figure 2: Comparison of evaluation for life-like agent by gender [2].

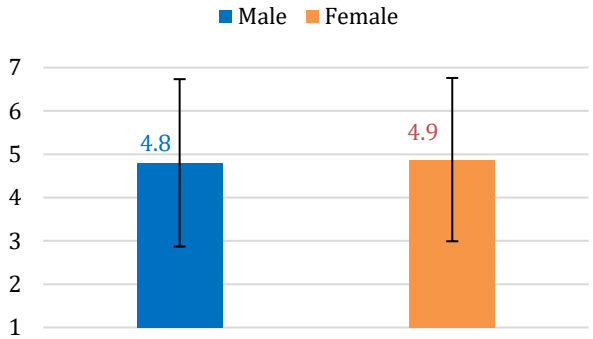

Figure 3: Comparison of evaluation for text agent by gender [2].

(a) Male. (b) Female. (c) Robot.

Figure 4: Three of the new agents.

As a cause of such a result, it is conceivable that only female agent was used in this experiment.

Therefore, we created three new agents. These agents are shown in figure 4. In order to cope with the gender of participants, we created one agent for female and male one. Furthermore, we created an agent for a humanoid robot that can not judge gender. Women and men's agents were created as those wearing ordinary clothes that look like young people in their twenty generations and are not determined to have a social position. By conducting the same experiment as in Chapter 3 using these agent and text agent, it is possible to evaluate with gender bias in mind.

Also, in this experiment, we evaluated the impression of the whole utterance of the agent, so the effect of each utterance of the agent is not clarified. Therefore, it becomes possible to clarify effective utterances for building relationships with users by designing experiments in which participants can evaluate each utterance while listening to agent's utterance. Specifically, during the experiment, it is conceivable that participants evaluate using the keyboard or the dial type input device every time the agent speaks.

5 CONCLUSIONS

In this paper, we aimed at constructing a politeness theory adaptable to HAI research, and based on the results of previous experiments, we conducted experiments that take gender bias into account when subjective evaluations of conversation agents are conducted. We created agents of male agents and female agents to respond to the gender of experiment participants, and agents of humanoid robots that can not judge gender. We also examined the experimental setting that can evaluate each utterance of the agent. As a result of examination, it is thought that it becomes possible by putting a keyboard or dial type input device at the hand of the participant during the experiment, and evaluating the utterance every time the agent speaks. In the future, we plan to conduct an evaluation experiment using agents we created.

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REFERENCES

[1] P. Brown and S. C. Levinson: Politeness: Some universals in language usage, Cambridge University Press, 1987
[2] T. Miyamoto, D. Katagami, Y. Shigemitsu, M. Usami, T. Tanaka, H. Kanamori: The effect of differences in linguistic behavior by conversational agents based on politeness strategies for development relationship with humans – Psychological effects of joke at the first meeting –, Journal of Japan Society for Fuzzy Theory and Intelligent Informatics, Vol. 30, No. 5, pp.753-765, 2018
[3] T. Miyamoto, D. Katagami and Y. Shigemitsu: Improving relationships based on positive politeness between humans and life-like agents, Proceedings of the 2017 HAI Conference on Human-Agent Interaction, ACM, pp.451-455, 2017
[4] Nagoya Institute of Technology: MMDAgent, http://www.mmdagent.jp/