

The Effect of Subjective Speech on Product Recommendation Virtual Agent

Tetsuya Matsui

Seikei university
Musashino-shi, Tokyo
t-matsui@st.seikei.ac.jp

Seiji Yamada

National Institute of Informatics, The Graduate University
for Advanced Studies (SOKENDAI)
Chiyoda-ku, Tokyo
seiji@nii.ac.jp

ABSTRACT

In this paper, we verify the effect of a VH's objective and subjective speech. We hypothesized that the effect of objective and subjective speech depends on the topics that a VH speaks about and predicted that subjective speech is effective when a VH speaks about topics that it prefers. To verify this hypothesis, we performed an experiment with two parameters and two levels. One parameter was "persuasion strategy," and the level was "objective" or "subjective." The other parameter was "topic," and the level was "not according with preference" or "according with preference." The result shows that the effect of subjective speech depends on the preferences of a product recommendation virtual agent as perceived by users.

CCS CONCEPTS

• **Human-centered computing** → **HCI theory, concepts, and models**;

KEYWORDS

Virtual Agent, Virtual Human, Product Recommendation Virtual Agent, Persuasion Technology, Recommendation, Anthropomorphic agent

ACM Reference Format:

Tetsuya Matsui and Seiji Yamada. 2019. The Effect of Subjective Speech on Product Recommendation Virtual Agent. In *24th International Conference on Intelligent User Interfaces (IUI '19 Companion)*, March 17–20, 2019, Marina del Rey, CA, USA. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3308557.3308697>

1 INTRODUCTION

In this paper, we focused on the product recommendation virtual agent (PRVA), a virtual agent that persuades users to purchase products [4], and researched its recommendation effect, the effect of increasing the users' buying motivation.

Persuasion technology has been widely researched in the fields of HCI and HAI (Human-agent interaction)[2]. VHs are widely researched as a persuasion technology[3][5][6].

In this paper, we suggest that distinctiveness is important for the effect of PRVAs' persuasion. We defined distinctiveness as distinguishing a persuasion strategy depending on the topic that a PRVA speaks about. In the field of social psychology, much research has shown that distinctiveness is important in communication[1].

In this research, we defined two persuasion strategies: "objective persuasion" and "subjective persuasion." Objective persuasion is

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

IUI '19 Companion, March 17–20, 2019, Marina del Rey, CA, USA

© 2019 Association for Computing Machinery.

ACM ISBN 978-1-4503-6673-1/19/03...\$15.00

<https://doi.org/10.1145/3308557.3308697>

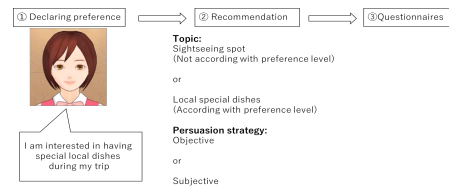


Figure 1: Experimental flow

constructed with only objective sentences, for example, "This store opened in 1995." With this strategy, in the experiment in this paper, a PRVA made recommendations without any facial expressions and gestures. Subjective persuasion is constructed with only normative propositions, i.e., propositions that are composed of subjective sentences, for example, "This dish at this restaurant is very delicious." Also, with this strategy, the PRVA made recommendations with positive facial expressions and eye movements.

Also, we introduced one other parameter, declaring preference. In our experiment, the PRVA declared its preference to a topics before making a recommendation. "I like to eat special local dishes during my trip." This showed the PRVA's preference, and we predicted that participants would feel motivated by this declaration.

2 EXPERIMENTAL DESIGN

We performed the experiment with four conditions, and there were two factors and two levels. The factors were "persuasion strategy" and "topic." "Persuasion strategy" had two levels, "objective" and "subjective." "Topic" had two levels, "not according with preference" and "according with preference." In the experiment, participants watched movies in which the PRVA recommended a trip to Sapporo, a Japanese city. In all conditions, the PRVA declared that "I like to eat special local dishes during my trip." After declaring its preference, it recommended a sightseeing spot in Sapporo with the "not according with preference" level. Also, it recommended special local dishes in Sapporo with the "according with preference" level. Figure ?? shows a snapshot of the PRVA for both the objective and subjective conditions.

Each movie was about 70 seconds long. We executed all movies with MMDAgent, a toolkit for constructing virtual agent conversation systems, by the Nagoya Institute of Technology¹.

All participants answered a question, "How much do you want to buy the products the PRVA recommended?", after watching the movies. The participants answered this question on a seven-point Likert scale, and we used the answers as the scale of the recommendation effect. Figure 1 shows the experimental flow for each trial.

¹<http://www.mmdagent.jp/>

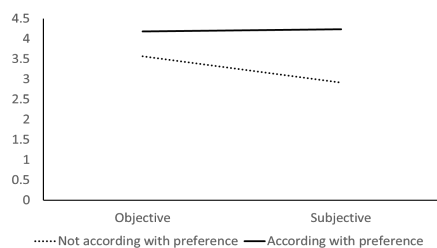


Figure 2: Averages of recommendation effect for each condition

All participants were recruited from Yahoo Crowd Sourcing² and paid 30 yen (about 26 cents) as a reward. All trials were conducted on the Web. We obtained informed consent from all participants.

There were 120 Japanese participants in total. For the “objective-not according with preference” condition, we recruited 55 participants; there were 40 males and 15 females ranging in age from 17 to 62 years for an average of 42.6 (SD = 9.2). For the “objective-according with preference” condition, we recruited 55 participants; there were 38 males and 17 females ranging in age from 21 to 70 years for an average of 43.9 (SD = 11.1). For the “subjective-not according with preference” condition, we recruited 55 participants; there were 33 males and 22 females ranging in age from 22 to 71 years for an average of 42.9 (SD = 11.2). For the “subjective-according with preference” condition, we recruited 55 participants; there were 33 males and 22 females ranging in age from 22 to 64 years for an average of 42.6 (SD = 9.5).

3 RESULT AND DISCUSSION

Figure 2 shows the average of the recommendation effects for each condition. The results of the two-way ANOVA were persuasion strategy: $F(1, 216) = 2.812, p = 0.095$, topic: $F(1, 216) = 29.567, p = 0.000$, and persuasion strategy \times topics: $F(1, 216) = 3.928, p = 0.049$. There were significant differences in interaction; thus, we conducted a simple main effect test. The results were persuasion strategy when topic was “not according with preference”: $F(1, 216) = 6.694, p = 0.010$, persuasion strategy when topic was “according with preference”: $F(1, 216) = 0.046, p = 0.830$, topic when persuasion strategy was “objective”: $F(1, 216) = 5.971, p = 0.015$, and topic when persuasion strategy was “subjective”: $F(1, 216) = 27.524, p = 0.000$.

In Figure 2, there was a significant main effect on “topic” ($p < 0.05$), and the main effect on “persuasion strategy” also approached significance ($p < 0.1$). However, the “topic” main effect was superseded by the “persuasion strategy” \times “topics” interaction.

From sub-effect tests, there were significant simple main effects for persuasion strategy when “topic” was “not according with preference,” “topic” when “persuasion strategy” was “objective,” and “topic” when “persuasion strategy” was “subjective.” The average of the recommendation effect score was the maximum for the “subjective” and “according with preference” conditions. When “topic” was “not according with preference,” the average of the recommendation effect score for the “objective” level was higher than the “subjective” level. Also, this figure shows that the recommendation effect score for the “subjective” and “not according with preference” conditions was significantly lower than the other conditions.

²<https://crowdsourcing.yahoo.co.jp/>

4 CONCLUSION

From results, we concluded that subjective speech reduced the recommendation effect when the PRVA spoke about topics that it did not prefer. Also when the PRVA spoke about topics that it declared a preference for, the subjective recommendations’ negative effect was canceled.

These conclusions suggest methods for designing PRVAs or other virtual agents for persuasion. If it is necessary to construct virtual persuasion agents that have facial expressions and subjective speech, we suggest making the agents declare their preference and speak about topics for which they declared a preference.

ACKNOWLEDGMENTS

This research was partially supported by JSPS KAKENHI “Cognitive Interaction Design” (No. 32626118005).

REFERENCES

- [1] Gerd Bohner, Elisabeth Frank, and Hans-Peter Erb. [n. d.]. Heuristic processing of distinctiveness information in minority and majority influence. *European Journal of Social Psychology* 28, 5 ([n. d.]), 855–860.
- [2] Brian J Fogg. 2002. *Persuasive Technology: Using Computers to Change What We Think and Do*. San Francisco: Morgan Kaufmann.
- [3] Rosanna E Guadagno, Jim Blascovich, Jeremy N Bailenson, and Cade Mccall. 2007. Virtual humans and persuasion: The effects of agency and behavioral realism. *Media Psychology* 10, 1 (2007), 1–22.
- [4] Lingyun Qiu and Izak Benbasat. 2009. Evaluating anthropomorphic product recommendation agents: A social relationship perspective to designing information systems. *Journal of Management Information Systems* 25, 4 (2009), 145–182. <https://doi.org/10.2753/MIS0742-1222250405>
- [5] Peter AM Ruijten, Jaap Ham, and Cees JH Midden. 2014. Investigating the influence of social exclusion on persuasion by a virtual agent. In *International Conference on Persuasive Technology*. 191–200.
- [6] Hiroyuki Tokushige, Takuji Narumi, Sayaka Ono, Yoshitaka Fuwamoto, Tomohiro Tanikawa, and Michitaka Hirose. 2017. Trust Lengthens Decision Time on Unexpected Recommendations in Human-agent Interaction. In *Proceedings of the 5th International Conference on Human Agent Interaction*. 245–252.