

Persuasion through overheard communication by life-like agents

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Abstract

It is important to investigate influence of life-like agents which interact with a user since some studies suggest that life-like agents can “persuade” people, in other words, they have potential to change people’s attitude and behavior. In this study, the influence of overheard communication (OC), one of famous persuasion techniques, by life-like agents toward online shopping Web site users was examined, since the OC by people often changes attitude of receivers. An experiment to compare the effect of OC by two life-like agents (a persuader agent and a persuadee agent) with regular communication by one persuader agent were conducted. The result of this experiment implied that even the OC by life-like agents could promote Web site users’ online shopping purchase likelihood. Moreover, although correlation between participants’ attractiveness toward a persuader agent and purchase likelihood was observed, the OC by life-like agents inhibited influence of participants’ negative impression to a persuader agent. These results suggest the effectiveness of the OC by life-like agents and the new direction of studies of social response to life-like agents, from the viewpoints of presence, gaze, and appearance of life-like agents.

1 Introduction

Recently, there is much argument regarding influence of social interaction between users and communication technology as the communication technology prevails into our everyday life. Among such technology, a life-like agent (embodied conversational agent) [4] has a possibility to interact with a user using rich social cues. Such technology can be utilized to provide a user with means to smoothly interact with computers, as well as abused to direct a user to a wrong way. Moreover, how much influence the communication technology has toward users is still unclear. Research on the communication technology should reveal its possibility and the risk of social influence to users.

In particular, a life-like agent has potential to change a user’s attitude. A life-like agent technology can be one of “interactive computing systems designed to change peo-

ple’s attitudes and behaviors” [6] with its many modalities. From the viewpoint of persuasion, such interactive computing systems can let users improve their unfavorable attitude, or drive users to immoral thoughts. In this study, we approach life-like agent technology from the framework of life-like agents as social actors [12] applying the theories established in persuasion studies [15].

We implemented life-like agents on an online shopping Web site. Recently, in the field of marketing, many online services succeeded in their business with existence of established customers [7]. This existence can be virtually represented by life-like agents, since the life-like agent technology can express social cues and presence with its virtual body [8]. Moreover, people often avoid direct sales promotion in marketing because such promotion is often intrusive [7]. If a life-like agent implemented as a clerk on an online shopping Web site promote its products directly to Web site visitors, they may avoid if the promotion seems intrusive. This intrusiveness derives from not only a clerk agent’s appearance or messages, but its behavior. To improve this problem, we introduce an agent which plays a role of a clerk and another agent which plays a role of a customer. Using a clerk agent and a customer agent enables users to see sales promotion to the customer agent by the clerk agent. This study investigated the influence of a behavior rule shown in this case to users’ attitude, since there was no study which referred to influence of such inter-agent interaction to users’ attitude change.

In this article, first we review the studies of social response toward a computer and a life-like agent, and clarify the problem in the studies of inter-agent interaction. Second, the behavior rule called overheard communication is introduced and applied to inter-agent interaction. Then, through results of a psychological experiment, the influence and potential of overheard communication by life-like agents is discussed.

2 Related Works

2.1 Attribution of Action to Each Life-like Agent

It is possible that users unknowingly accept computers and life-like agents as persuasive social existence, because people tend to react to computers and life-like agents as if they were humans. Many theories of social response to humans proved to be applicable to the relationship between users and computers, and life-like agents as social existence [12]. Especially, if there are several life-like agents on the screen, users should attribute sources of action to each life-like agent [8]. Social influence of human-agent interaction, and users' perception of inter-agent interaction should be considered based on attribution of actions for each life-like agent.

2.2 Persuasion by Life-like Agents

Some studies of life-like agents as "social persuaders" already exist, however, there is still no study which focuses on the social influence of existence of inter-agent interaction. Moon [10] examined the social influence of intimacy between a user and a computer through the exchange of personal information, and she found that such intimacy contributed a user's attitude change. She considered only human-computer interaction, and there is no argument about influence from other social existence. Besides, André et al. [1] claimed the effect of inter-agent interaction in implementation of online car dealer agent system, but they did not argue how effective inter-agent interaction was. Moreover, Katagiri, Takahashi and Takeuchi [8] insisted that authorizing a life-like agent by other agent could grab a user's attention stronger than non-authorizing situation. Their study compared two inter-agent interaction styles, not existence of inter-agent interaction and absence of inter-agent interaction, and they did not mention the social influence by inter-agent interaction. Therefore, the influence of existence of inter-agent interaction toward a user's attitude change was investigated in this study.

2.3 Influence of gaze by a life-like agent

Among social cues that a user should perceive from a life-like agent, where the agent gaze plays a very important role in human-agent interaction. As people pay attention to someone's eyes when interacting with him/her [2], the agent's "eyes" imply social meanings toward the user [12]. Although Reeves and Nass [12] claimed that the agent should gaze the user in front of a display since it would be the "etiquette" which the agent should obey, in some situation, the agent's direct gaze toward the user may seem somehow imposing for him/her. In addition, especially if there is inter-agent interaction, it is natural that two or more agents talk with gazing at each other. For these reasons, the influence of the agent's direction of gaze to distinguish to whom the agent talk was considered.

3 Overheard Communication by Life-like Agents

3.1 Overheard Communication as a Persuasion Technique

Suppose you hear the reputation of a movie in which you are not so much interesting in these two situations:

1. Your friend directly told to you that the movie was very interesting and you *must* watch it (as seen in Figure 1).
2. You overheard that someone told to another one that the movie was very interesting and he/she *must* watch it (as seen in Figure 2).

In some cases, the message from your friend may seem intrusive since your friend *directly* told you such a pushy message in situation 1. On the contrary, in situation 2, you may have interests in the movie because you did not receive someone's message directly and the message did not seem so intrusive. The persuasion style shown in situation 2, that a persuader tell another one the message, without telling the "true" persuadee, is known as *overheard communication* (OC) in persuasion studies [14, 15]. In this study, the persuasion style that a persuader directly tell the persuadee the message, represented in situation 1, is called *regular communication* (RC). In addition, a life-like agent which behaves as a persuader is called a *persuader agent* (previously mentioned as a "clerk agent"), and a *persuadee agent* (previously mentioned as a "customer agent") represents a life-like agent persuaded by a persuader agent in the situation of OC by life-like agents.

Why does OC function well? There should be two reasons:

- When people make a decision about something, they may often take others' action and opinion into account [5]. For example, when people go to an amusement park, many of them should avoid riding a ride with no other visitors. In this case, the existence of other visitors should be a criterion whether the ride in this amusement park is enjoyable or not. Such decision-making influenced by others' behavior is seen in many other situations since the others' behavior often works as one of important norm among people.
- In persuasive communication, where a persuader gazes when persuading others should affect the persuadees' attitude change [2]. If a persuader talks to persuadees without gazing them, they should not be able to regard a persuader's message that this message is to persuade them. Then, how much persuadees change their attitude should depend on where a persuader is gazing when he/she persuades.

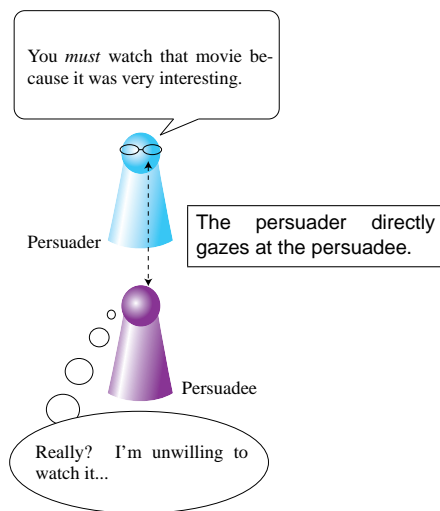


Figure 1. An example of regular communication

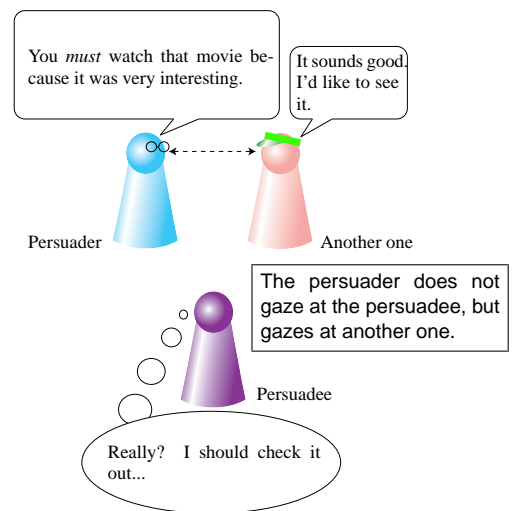


Figure 2. An example of overheard communication

3.2 Application to Life-like Agents

Considering the influence of human-agent interaction and inter-agent interaction, and the effect of OC-style persuasive communication, we implemented OC by life-like agents in the following manner:

- Let both the persuader agent and the persuadee agent appear on the screen, because users will perceive that two distinguishable social actors exist and each of them behave at their own thought.
- The persuader agent always tell the persuadee agent a message, because users will perceive the message of the persuader agent with distinguishing whom the persuader agent tell the message by where the persuader agent gazes.

4 Psychological Experiment

4.1 Experimental Design and Prediction

In this study, we suppose two conditions for the psychological experiment. When a persuader agent explains characteristics of items, in the RC condition, it gazes toward a user in front of the screen; on the other hand, it gazes toward a persuadee agent in the OC condition. Considering the argument above, the OC by two life-like agents should promote a user's attitude change more than the RC by a life-like agent. Additionally, the OC by a persuader agent should emphasize its attractiveness, and expertness and reliability of information which it provides more than the RC by it. Then, considering these hypotheses above, the following predictions should be determined:

- P1** Participants in the OC condition will evaluate the purchase likelihood of items higher than those in the RC condition.
- P2** Participants in the OC condition will evaluate the persuader agent's attractiveness and reliability of information which it provides higher than those in the RC condition.

4.2 Procedure

Valid experimental data were collected from 24 Japanese participants (19 males and 5 females). The participants consisted of undergraduate students, graduate students, and office workers. Their age ranged from 19 to 29. They were randomly assigned to either RC condition or OC condition. Each condition contained equal participants. They had been using PC, e-mail, and WWW for 3 years at least, and 21 participants had used online shopping services at least once.

Participants are offered to look at the explanation of items by a persuader agent on an online shopping WWW site with a note PC (Sony VAIO PCG-SR9G/K, 10.4" XGA display, OS: Windows2000). In the RC condition, the persuader agent introduced items directly gazing at participants (Figure 4); in the OC condition, a persuadee agent appeared on the screen and the persuader agent introduced items gazing at the persuadee agent (Figure 5). The same item explanation phrases by the persuader agent were used in both condition. To preserve natural conversation context, the persuadee agent gave short responses to the persuader agent for each item explanation phrase in the OC condition. As introduction of each item ended, participants



Figure 3. Interface to present an item and ask purchase likelihood of the item used in the experiment



Figure 4. Explanation of characteristics of an item in IC condition



Figure 5. Explanation of characteristics of an item in OC condition

answered how much he/she want to purchase this item by a 10-point likert scale. The evaluation of purchase likelihood for the items which the participants had already possessed were omitted for analysis. The price of the items was considered so that the participant could afford to buy the item if he/she wanted it.

The behavior of the agents were implemented with Microsoft Agent via JScript on Microsoft Internet Explorer, and the answers of participants were collected via CGI written in Ruby. For all participants, the agent “James¹” played a role of the persuader, and the agent “Cosmy²” played a role of the persuadee. These agents did not change their roles among participants, and the other agents with different appearance were not used in this experiment. This is because it is difficult to handle what difference in char-

¹This agent is available at <http://www.cantoche.com/english/gallery/msagent.htm>.

²This agent is available at <http://www2.mic.atr.co.jp/agent/>.

acteristics of the agent’s appearance would influence in the experiment if the different agent appearances were used. Instead, after the evaluation of purchase likelihood for 15 items, participants answered the questionnaire about attractiveness of the persuader agent. The attractiveness was evaluated on a 10-point likert scale for four adjectives: kind, friendly, useful, and likable. Also, participants were asked to answer the question with a 10-point scale about expertness (extensiveness, expertness), and reliability (reliable, objective, fair) of the goods information that the persuader agent offered. About the choice of these adjectives, we considered the result of other studies [9, 10]. After reporting the impression of this experiment, participants were debriefed, thanked for their participation, and dismissed. It took around 30 minutes to finish the experiment for each participant.

4.3 Result of Experiment

Mean and standard deviation values of all variables in this experiment were shown in Table 1.

Table 1. Mean (standard deviation in parentheses) values of measured variables for each condition and results of statistical tests

	RC cond. (<i>n</i> = 12)	OC cond. (<i>n</i> = 12)	<i>t</i> -value (d.f. = 22)	Effect Size (<i>ES</i>)
Purchase likelihood scores	4.127 (1.348)	5.421 (0.664)	2.984**★	1.166
Attractiveness of the persuader agent	5.729 (1.760)	6.521 (1.694)	1.123	0.439
Expertness of the goods information	5.167 (1.710)	6.000 (1.989)	1.101	0.430
Reliability of the goods information	4.944 (1.613)	5.472 (1.696)	0.781	0.305

★ For the significant difference of variances between the two conditions, the *t*-value by Welch test was shown here (d.f. = 16.04).
 **: $p < .01$

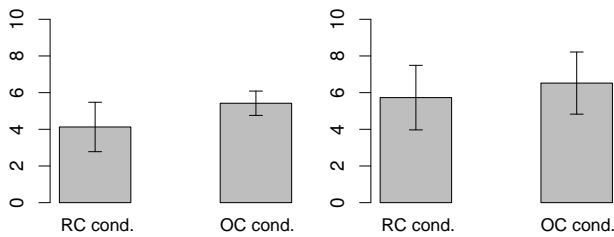


Figure 6. Mean value of purchase likelihood scores

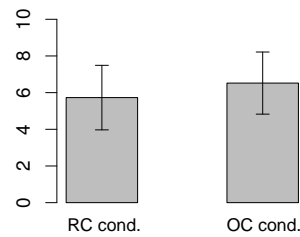


Figure 7. Mean value of attractiveness scores

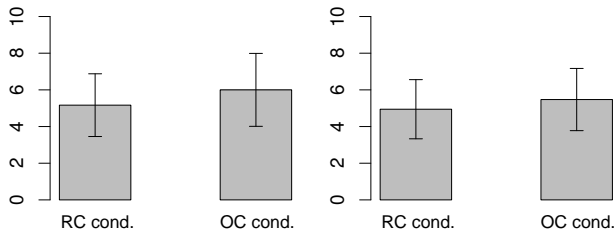


Figure 8. Mean value of expertness scores

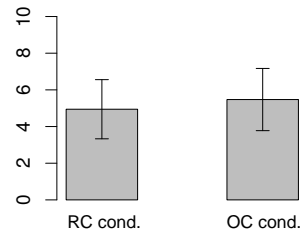


Figure 9. Mean value of reliability scores

First of all, as Figure 6 indicates, the mean value of purchase likelihood scores in OC condition was significantly higher than that of RC condition. Since the difference of variance between these two variables was significant ($F(11, 11) = 4.124$, two-tailed $p < .05$), Welch test was applied to confirming the significant difference between the mean values of them. As a result, the significant difference between them observed ($t(16.04) = 2.984$, two-tailed $p < .01$, $ES = 1.166$). Thus, the result supported the prediction **P1**.

However, there was no significant difference between the two condition in the scores regarding impression toward the persuader agent and the goods information. De-

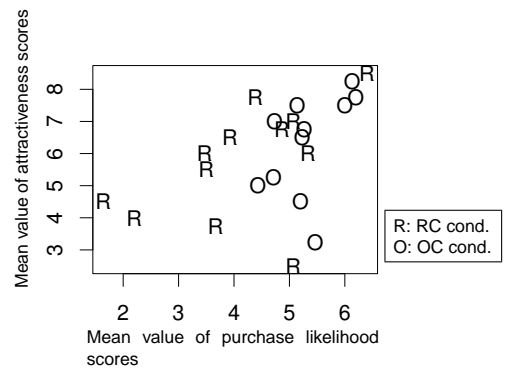


Figure 10. Correlation between purchase likelihood scores and attractiveness scores

spite Figure 7–9 represents all of these scores (attractiveness, expertness, and reliability) in the OC condition exceeded those in the RC condition, according to the result of two-tailed *t*-tests, significant difference between the two conditions did not appear in these three scores, as shown in Table 1. Then, the prediction **P2** was rejected by the result.

Nevertheless, between the score of attractiveness and the score of purchase likelihood for each participant, there was a significant positive correlation. A scatter diagram in Figure 10 indicated positive correlations between these two scores with respect to each condition. The values of Pearson’s product-moment correlation coefficient and the significance test of these values proved there were significant correlations between the two scores for each condition (in RC condition, $r = .505$, $t(10) = 1.851$, two-tailed $p < .10$, and in OC condition, $r = .615$, $t(10) = 2.463$, two-tailed $p < .05$).

5 Discussion

5.1 The Influence of OC by Life-like Agents

The result shown in section 4.3 suggested that the OC induced a user’s purchase likelihood of products on online shopping Web site more than the RC. This result implied

that life-like agents could play a role of a clerk and another customer virtually. To analyze why the OC by life-like agents succeeded in the experiment, there seem to be two reasons, as expected:

1. In the OC, the persuader agent gazed at the persuadee agent when explaining feature of items and never gazed at the user.
2. In the OC, the persuadee agent existed on the screen.

The gaze of the persuader agent could be perceived as a important social cue to participants. In fact, one participant in OC condition reported: "It is good to see the conversation between two agents from the viewpoint of a stranger, since it may feel annoying if one agent directly talks to me." In addition, the existence of the persuadee agent could serve as a criterion for participants to consider whether they should buy the items or not. There were two participants who answered that he/she took the behavior of the persuadee agent into consideration. This fact suggests that the influence of the existence of the persuadee agent could not be ignored.

As for the impression of a persuader agent, there was no significant difference between the OC condition and the RC condition in three scores of impression. However, the scores of attractiveness is significantly correlated with the scores of purchase likelihood. This result indicated the influence of physical appearance of a persuader agent because we used the persuader agent with same appearance in both the RC condition and the OC condition. Fogg [6] argued physical appearance of life-like agents as a important factor of persuasion of a user by life-like agents, and some participants answered that the persuader agents used in this experiment looked "too strong" or "not so cute." However, considering Figure 10, participants' negative evaluation of attractiveness of the persuader agent was affected to their purchase likelihood in the RC condition. On the other hand, in the OC condition, despite some participants poorly evaluated the attractiveness of the persuader agent, they evaluated purchase likelihood not lower than several participants in the RC condition.

Then, it is still difficult to control many attributes in appearance of life-like agents, however, the result suggests that the OC by life-like agents can suppress the influence of negative impression of a persuader agent. What appearance is suitable should be dependent on what situation the OC by life-like agents is applied, and who interacts with the persuader agent. Moreover, it is often hard since we can hardly target various users' preference on appearance of life-like agents. Therefore, we can expect that the OC by life-like agents warrant the attitude change of users to a certain level even if there may be lots of factors which affect users badly.

There should arise one question: what if the user noticed the existence behind the agents who operate it (e.g. programmer, Web site administrator, etc.)? Considering the study of Sundar and Nass [13] regarding perception of source of information by users, it seems hard for users to keep paying attention to the existence behind the agents since it is natural and easy for them to consider the behavior of the agents themselves while they are interacting with agents. As it is difficult to follow both the story and the making process of an animation movie simultaneously when we watch it, thinking the existence behind the agents when watching their behavior should be tiring for users. Then, in most cases, users accept behavior of the agents without taking into account the existence behind them.

5.2 The Potential of Application of OC

In the OC by life-like agents, the social cue of a persuader agent's gaze was functioned in the experiment. However, there are still few studies which focus on the function of a body of a life-like agent. Thus, the influence of non-verbal social cues triggered by the appearance and behavior of life-like agents is not clear so far. This influence should not only apply to human-agent interaction, but to human-robot interaction. If we hope that technology pervade many aspects of our life, we should emphasize the social aspect of human-agent interaction.

Since all the participants of the experiment in this study are Japanese, the influence of OC may partly derive from cultural factors. However, Godin [7] showed examples of ineffectiveness of intrusive marketing in the United States, thus, the problem of intrusiveness in marketing regards users beyond countries. The result of the experiment indicates that the OC by life-like agents can hinder such intrusiveness with avoiding directing the persuader agent's gaze toward a user.

Besides, we did not mention the interactivity between a user and agents. First, this study does not consider the influence of the difference of a reaction by a persuadee agent since we focus on the existence of inter-agent interaction. Some persuasion studies reveal that the negative reaction of others toward a persuader gave people negative impression (for example, Axsom et al. [3]). The valence of reaction of a persuadee agent can influence the decision of users, and should be considered in future works. In addition, if a user has interacted with agents before the OC, the user can be influenced with the history of interaction by the agents [8]. Then, in the future, the influence of the history of interaction to the user should be considered with regard to relation between the interactivity with the agents and the influence of OC by the agents.

We dealed novel media and information for most of participants in the experiment in this study. In such environment that people do not get accustomed, they tend to rely

on the superficial information rather than the content of information [11]. This means if the content of information is known to users well, users may take the content of information into consideration more than the social cues of the agents. How much the users understand the content of information can be the important factor of persuasion with agents, and should be one of unignorable issues afterward.

If we utilize life-like agents as social actors to persuade users, we should pay attention to whether we deceive users or not. The result of the experiment revealed how strong the OC by life-like agent affected toward the attitude of users. Even though the message provided by a persuader agent contains unfavorable information, users may overlook the problem underlying the message if they “overheard” it. We should provide other means for users to examine the reliability of information to prevent users from deception.

6 Conclusion

In this study, we discussed the influence and potential of overheard communication by life-like agents. Particularly, it is pointed out that existence of the persuadee agent and the direction of the persuader agent’s gaze played an important role in the overheard communication by life-like agents. From the stance of social responses of users to life-like agents, the way to utilize life-like agents for the voluntary attitude change of users should be explored in the future.

Since the result of this study was obtained under controlled environment, it is hard to immediately apply the discussion in this study to other situations. Nonetheless, this study could suggest the potential of life-like agents based on social interaction with a user and its embodied characteristics.

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