

Psychological Effects of Compliment Expressions by Communication Robots on Humans

Motoki IWASHITA

dept. of Applied Computer Science, Faculty of Engineering
Tokyo Polytechnic University
1583, Iyama, Atsugi-shi, Kanagawa, Japan
c1618013@st.t-kougei.ac.jp

Daisuke KATAGAMI

dept. of Applied Computer Science, Faculty of Engineering
Tokyo Polytechnic University
1583, Iyama, Atsugi-shi, Kanagawa, Japan
katagami@t-kougei.ac.jp

Abstract—The purpose of this research is to construct a dialogue model using proper compliments by an agent. This paper reports compliment expression by communication robot in the conversation necessary to construct dialogue model. Compliments are one of the important verbal behavior for having human communication. Humans use compliments to build and maintain relationships in daily life, taking into account social relationships and psychological states. Several research has proven that compliments used by humans in daily life is constructed several syntactic patterns. If the agent is able to use properly these compliment patterns, the agent can build an affinity relationship with human. However, few research has been done about effects of formulated compliments by agents on humans. The purpose of the experiment of this research is to investigate the effect of agents on impressions of formulated compliments and on the construction of relationships. The comparative experiment was conducted to verify the psychological subjective evaluation of dialogue interaction between the agent giving compliments and the agent not giving compliments. Experimental results showed that formulated compliments by the agent gave a positive impression to humans and was recognized as the compliment. However, there was no significant differences in the psychological impression of humans from the expression of compliments, indicating that it is necessary to construct the flexible compliment dialogue system using fuzzy control for the expression of compliments.

Keywords—Compliment, Formulated Compliment, Compliment Behavior, Compliment Agent

I. INTRODUCTION

Our research aims to build affinity with humans by the agent uses compliments. In recent years, systems with interactive functions such as Apple's Siri and Microsoft's Rinna have been provided, and various interactive systems have been widely recognized around the world. In addition, research has been conducted on agents equipped with a conversation function to communicate with people using verbal behavior such as requests and greetings [1]. Fong [2] describes an overview such interactive robot. Social interactive robots convey information by imitating human verbal behavior and maintain and establish social relationships. However, in order for socially interactive robots to be built relationship as natural dialog partners, they need to be able to recognize social context and convention of humans.

In daily life, compliment conversations such as “You did a good job!”, “Your new hairstyle looks nice.” often occur between social relationships such as friends, family, colleagues, and bosses. The compliment has a social function of strengthening the sense of solidarity between the complimenter and the person addressed, and is said to be closely related to the basic interactive functions of conversation [3]. According to the politeness theory of Brown & Levinson Brown [4], a compliment can improve the mutual relationship and strengthen the sense of solidarity by shortening the social distance to the target person. However, the compliment become face-threatening acts (*FTA*) that threatens the negative face if the person addressed receives compliment, sarcasm, or teasing. When the compliment become *FTA*, the person who received compliments reject or avoid compliments to keep the face [5]. From described above, we consider that compliments are social acts, and humans use compliments consciously and unconsciously in conversation and adjust their sense of distance to each other.

Emotions also play an important role in human interaction and are closely linked to social context. Therefore, it has an important function in the interaction with the emotion of the embodied or virtual agents [6]. From this fact, much research on dialogue systems considering emotion recognition and emotions have been conducted [6, 7]. Austermann et al. [6] Recognizes emotions from fuzzy models based on natural speech prosody information and estimates human emotions. Andre et al. [7] assumed that the perceived threat from speech act was heavily dependent on human emotional states. They propose a dialogue model that estimates human emotional state from a two-dimensional emotional model expressed by valence and arousal, and controls the utterance content considering the weight of face threat. Such a dialogue model is promised to reduce the deterioration of social relations due to the mismatch between the utterance content and the human emotional state.

Building a dialogue system that takes into account social aspects such as social relationships and social distances is an important approach to being recognized as the partner [8]. Compliments are social/emotional nature, and are speech acts that can instead on other acts, such as expressing gratitude or apology. Because they have a function to adjust the relationship between interlocutors, we believe that incorporating compliments into the dialogue model will enable agents to perform social acts. However, few studies have been reported on

dialogue systems that control the utterances of such compliments.

The this research focuses on compliment that has an important function to activate human interaction and reduces social distance. A dialogue model is developed using different compliments by capturing the linguistic features of compliments. Based on the compliment characteristics in pragmatics and counseling research construct the complimenting agent and investigate how it affects psychology of a human.

II. COMPLIMENTS

A. Form of Compliment Expressions

Holmes [9] used ethnographic methods to collect compliments in New Zealand and analyze their distribution between gender differences. Fig. 1 shows the syntax of compliments classified by Holmes based on the results [10]. The noun phrase (*NP*) and adjective (*ADJ*) are shown in the syntax of compliments. *NP* stands for noun phrase which does not include semantically positive adjectives, and *ADJ* stands for semantically positive adjectives. *Look* stands for any linking verb other than be, e.g. look, feel, seem. *Like* and *love* stands for any verb of linking, e.g. like, love, enjoy. Intensifier (*INT*) stands for any *INT*, e.g. very, really, or so. Pronoun (*PRO*) includes you, this, that, these or those. As mentioned above, there are syntactic patterns used by humans in English compliments.

In addition, compliments act as a social lubricant and have not only a sense of solidarity but also a multi-functionality, such as improvement of self-esteem and motivation to learn. As compliments have multiple functions, expressions of compliments may not only be formulated compliments, but may also add information before and after compliments. For example, the reason for giving compliments, specific information about the topic of compliments, or questions. Therefore, vocabulary expressions and syntaxes in the compliment are free-form, and compliments may be given differently depending on the language culture and its purpose. Furthermore, the way in which the compliment is delivered may increase or decrease its effectiveness, so thought need to change the compliment into expressions that can be effectively delivered for the addressee.

Counseling is one of the situations to consider the expression of compliments. The compliment in counseling have proven to be raising therapeutic effect, including increasing the children's independence and highly effective motivating clients [11, 12]. Wall et al. proposed that the type of compliment should be varied with the client's response and characteristics [13]. The this research focuses on the method of expressing compliment in counseling. Franklin et al. [14] described compliments as "confirming that the client is already doing well and recognizing the difficulty of those problems."

Kojima et al. [15] pointed out that positive feedback does not always have a positive effect on the side of the feedback. Positive feedback for people who have a high desire for compliments gives satisfaction and accepts compliments. In contract, it has been shown that positive feedback for people who have a high desire to avoid rejection leads to feelings of embarrassing. Kawaguchi et al. [16] analyzed the response to

1. *NP BE (LOOKING) (INT) ADJ*
2. *I (INT) LIKE/LOVE NP*
3. *PRO BE (a) (INT) ADJ NP*
4. *What (a) (ADJ) NP!*
5. *(INT) ADJ NP*
6. *You (V) (a) really ADJ NP*
7. *You (V) (a) really ADJ*
8. *You have (a) ADJ NP!*
9. *ADJ NP!*
10. *Isn't NP ADJ?*

Fig. 1. Compliment Syntactic Patterns [9]

compliments and the specific behavior when receiving it in relation to the purpose and user characteristics of compliments. From the results of the analysis, it was found that more effective compliments could be implemented by considering the contents of compliments according to the user characteristics.

From the above, we consider that compliments used in daily life conversation is formulated to some extent, and compliments used in counseling has various expression methods. This research classifies the compliment into two categories that the formulated compliment is called the "*Pragmatics-compliment*", and the compliment that considers the contents of compliments are called the "*Counseling-compliment*". Compliments are always given to recipients. When humans face to face other, they adapt their actions according to their social relationships with each other, such as adjusting their eyes and adjusting their distance [17]. Therefore, in order to respond to compliments, to give an example, accepting, rejecting, or avoiding compliments, we believe that compliments activate interactions with the interlocutor.

B. Compliment Relations

To clarify about the interaction relations difference between *Pragmatics-compliment* and *Counseling-compliment*, the purpose of compliments need to be distinguished. The purpose of the *Pragmatics-compliment* is to convey to the recipient using explicit expressions for the values that the complimenter has placed a positive rating on from Fig. 1. It has meaning in the action of telling itself, and compliments the addressee on from a subjective point of view. In contract, the purpose of the *Counseling-compliment* is to convey the evaluation after the complimenter acknowledges and accepts the difficulties and events of the other party. It is worthwhile to acknowledge the situation and effort of the client, and give compliments so that the addressee of compliments can accept the recognition. From the above purposes, we consider that the *Pragmatics-compliment* is the complimenter and the *Counseling-compliment* is the recipient of compliments, as the axis of consciousness of giving compliment. Fig. 2 shows the Pragmatics-compliment interaction and Fig. 3 shows the Counseling-compliment interaction.

The interaction of the *Pragmatics-compliment* shown in Fig. 2 is a relationship in which the complimenter gives compliments and the person addressed returns the complimenter a response to compliments. The characteristic of the interaction between *Pragmatics-compliment* is that the complimenter becomes a subject of the interaction. The complimenter gives compliments the person addressed and the person received compliments

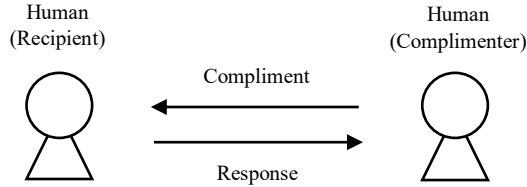


Fig. 2. Pragmatics-compliment Interaction

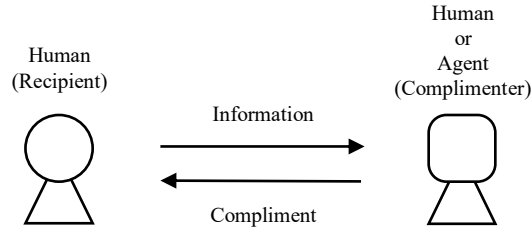


Fig. 3. Counseling-compliment Interaction

returns something responses to the person who delivered compliments. The main interaction is that the complimenter subjectively conveys a positive evaluation to the person addressed. If the response can be read as a response such as acceptance, evasion, or refection, the interaction of *Pragmatics-compliment* is considered to have been established. In addition, *Pragmatics-compliment* has feature that interact only with humans.

The interaction of *Counseling-compliment* shown in Fig. 3 compliments the resource of what the was able to do and the situation based on information obtained from the recipient, that is, the problem and personality obtained. The characteristic of the *Counseling-compliment* is the flow from getting the partner's status to recognizing and communicating. The characteristic of the interaction between *Counseling-compliment* is that the recipient becomes a subject of the interaction. The complimenter needs to be careful that the person addressed can be accepted compliments. The *Pragmatics-compliment* has focused only on the interaction between humans, but in the Counseling-compliment, communicated with agents as well as humans.

From the relationship of the above interactions, we think that the agent needs to change the expression of compliments according to characteristic of humans. The compliment interactions are often given between humans, and there is still room for debate as to how they affect the relationship between humans and agents.

III. COMPLIMENT DIALOGUE SYSTEM

A. Compliment Utterance Generation

The generation of compliment utterances is focused on the formulated expression form and the topic of compliments, that are the features of compliments. From the expression form of Holmes's compliment [9], We believe that the compliment can be constructed by evaluation words with positive meaning, topics of positive value, and expressions that convey good value to the person addressed. According to Wolfson [18], the two main values of complimented values are "appearance including possession" and "ability including skill, performance, personality". Therefore, the this research tries to construct

TABLE I. COMPLIMENT UTTERANCE EXAMPLE

	<i>Formulated compliment</i>	
	<i>NP BE (LOOKING) (INT) ADJ.</i>	<i>ADJ NP!</i>
Utterance Example	[Noun Phrase] look [Adverb] [Adjective].	[Adjective] [Noun Phrase]!

compliments utterance using a formulated sentence necessary for the positive evaluation word and expression form, and the categorized topic in the fixed sentence.

Compliment phrases are created referring to Fig. 1 and shown in Table 1. Categorized topics are a recipient's personality and behavior, and evaluation words that perform the functions of compliments such as "great" and "good". In adverb, *INT* is almost always expressed in fixed phrases such as "really" or "very".

B. Dialog System Procedures

Fig. 4 shows the flow of the system for giving compliments. The system model proposed in this paper acquires utterance information from the user who the interlocutor and performs utterance selection based on syntactic patterns of compliments. The compliment utterance system executes the processing in the following flow.

1) *Input information understanding section*: The agent receives user information such as the user's appearance, utterance content, and movement, and sends them to the dialogue system. The input information understanding selection analyzes the transmitted utterance contents and appearance information and estimates the elements that are the resources of compliments. an utterance content is subjected to morphological analysis to identify parts of speech such as nouns and adjectives. In order to give compliments, topic of compliments is required. Then, the resource corresponding to the identification data of the user information is acquired from the *Resource Database (DB)*. In the *Resource DB*, words that are resources of compliments are classified by part of speech and category. categories use five items from Wolfson [18], appearance, personal belongings, performance, ability, and personality. The words to be complimented are given positive evaluation words that express the value of user. Compliment can be generated by obtaining these elements. When the above processing is completed, the analyzed data is transmitted to the utterance classification selection. In addition, the user information sent to Input information understanding section is stored the *User Information DB*, e.g. appearance, hobby, or personality.

2) *Utterance classification section*: The utterance classification selection estimates utterance strategy parameter by fuzzy control based on the processing result of Input information understanding section, namely resources for the compliment and emotion information readable from the user. Fuzzy if-then control rules are used for the utterance classification selection. The rules used in the proposed system are as follows.

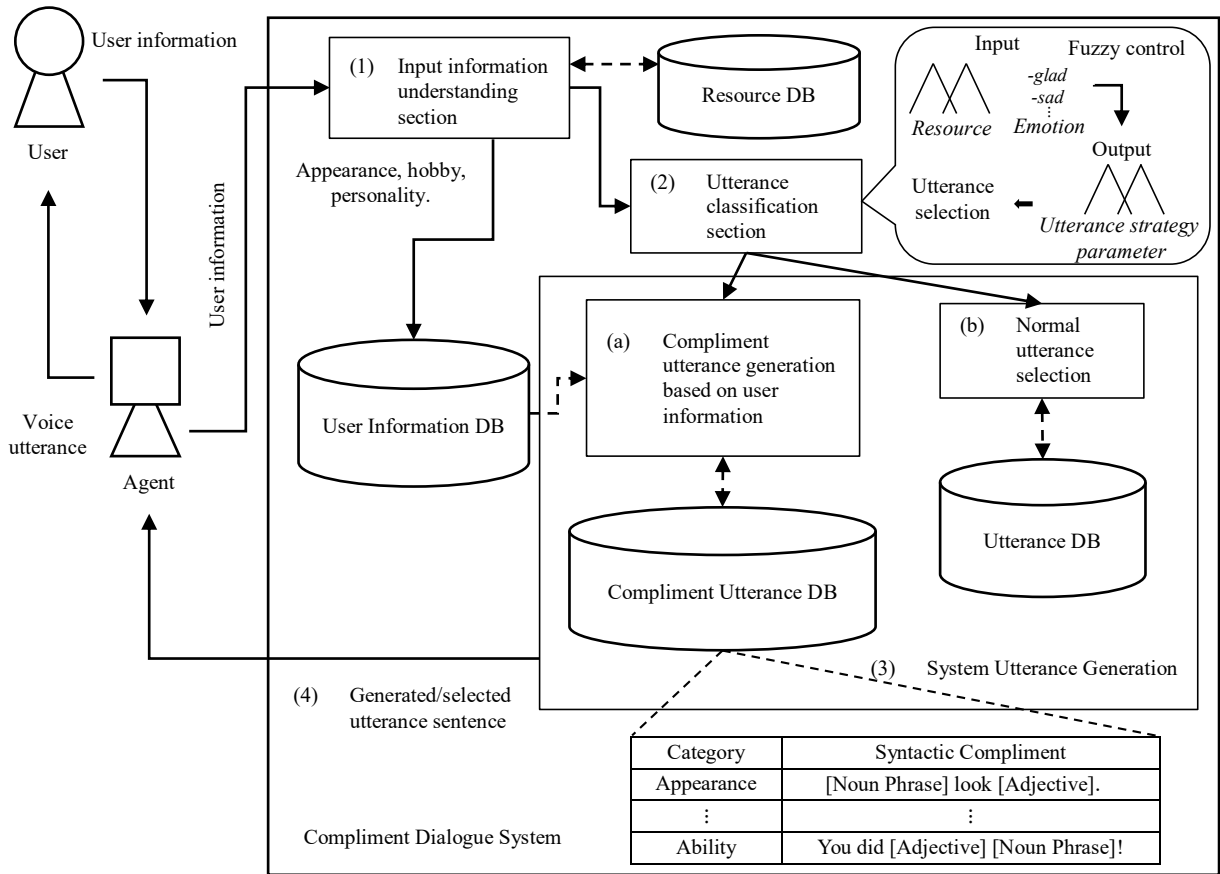


Fig. 4. Compliment Dialogue System Configuration Diagram

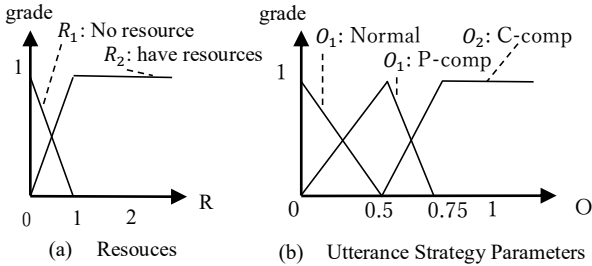


Fig. 5. Resources (a) and Utterance Strategy Parameters (b) Membership Functions

$$\text{If } R \text{ is } R_i \text{ and } E_j \text{ Then } O \text{ is } O_k \quad (1)$$

In (1), R in the antecedent part is a resource, R_i , E_j is a fuzzy label for resources and emotions, O in the consequent part is a speech strategy parameter, and O_k is the fuzzy label for the utterance strategy parameter. Resources and utterance strategy parameters are described using membership functions. The resource membership function (Fig. 5) is a fuzzy set of R_1 (No resource) and R_2 (have resources). The membership functions of utterance strategy parameters are O_1 (Normal) and O_2 (P-comp), O_3 (C-comp), which represented by the fuzzy set of labels. The elements of emotion use the types of emotions based on Russell's emotional circle model [19]. As for the type of emotion was adopted the typical emotions of Russell's emotional circle model: "glad", "relaxed", "sad", "distressed". From the grade value in R of the antecedent part and the type of E , the

grade value of each utterance strategy parameter is obtained based on all (1). Then, the utterance strategy parameters are determined by taking the center of gravity of the obtained inference result.

3) *System utterance generation*: System utterance generation has multiple functions. The utterance to be generated by the function selected by the utterance classification section is generated. The following describes the function of system utterance generation.

a) *Compliment utterance generation based on user information*: The utterance of compliments is generated from the resource acquired in the Input information understanding section and the *Compliments Utterance DB*, and the inference result of Utterance classification section. Based on categories and user characteristic information assigned to the resource, select formulated compliments in the *Compliment Utterance DB*. In addition, by referring to the user characteristics in the *User Information DB*, it is able to give compliments suitable for the user.

b) *Normal utterance selection*: In utterance selection, utterance sentences are acquired from the *Utterance DB*. In addition, utterances that express a nod or agree, which is an important element for smooth conversation, are also stored in the *Utterance DB*.

4) *Voice utterance*: The generated compliment utterance or the selected utterance is sent to the agent. The agent utters the sent utterance to the user using speech synthesis.

As described above, the proposed system can select the compliment utterance sentence according to the utterance of the user and give compliments to the user. It is also assumed that speech recognition and image recognition function well.

An important aspect of compliments in dialogue is that compliments are communicated to the interlocutor. However, the effectiveness of formulated compliments gave by agents has not been verified. Therefore, it is necessary to verify compliments utterance itself by the agent before uttering using fuzzy control. The chapter IV EXPERIMENTS is focused on the function that the agent gives compliments.

IV. EXPERIMENTS

A. Experimental Purpose

Experiments interact with agents that give *Pragmatics-compliment* or *Counseling-compliment* and agents that do not. The impression of the agent and the dialogue interaction was measured using the questionnaire, and the evaluation between each condition was compared. In addition, experiments were investigated what the correlation between impression each compliment condition gave to humans, and the personality characteristic.

B. Experimental Design

In this experiment, a simple simulation conversation of about 4 to 6 minutes is performed. To compare the impressions of each compliment, this experiment was designed an agent that gave *Pragmatics-compliment*, an agent that gave *Counseling-compliment*, and an agent that did not compliment. These were the three conditions, namely *Pragmatics-compliment* condition that is "P-comp", *Counseling-compliment* condition that is "C-comp", and no-compliment condition that is "N-comp". The simulation conversation in this experiment must be a conversation in which the agent can compliments the experiment participants. Therefore, the dialogue experiment was designed assuming a situation in which the agent consults with the experimental participant as a place where it was easy to give compliments.

The method of the simulation conversation was role-playing used in simulated counseling training. Role play is one of the learning methods that allows a plurality of people to act according to their assigned roles in a certain situation and to respond appropriately. this experiment with role play created artificial a situation in which compliments will be performed. Participants were given roles, and were promised to prevented differences in the dialogue content of each experiment condition. A role setting and a profile that were provided information on the role were prepared. In this experiment, the agent was set to the "role to receive consultation" and the experiment participant was set to "role to consult". Profiles and utterance lists suitable were created for each role according to the set roles. The utterance lists of the agent were prepared three kinds of conversation conditions, P-comp, C-comp, and N-comp. The conditions for speech in each compliment were set as follows.

- P-comp: Use formulated compliments.
- C-comp: Use compliments with reasons.

- N-comp: Do not use compliments that satisfies the conditions of P-comp and C-comp.

As a condition of the whole utterance, the normal utterance which was not compliments was the same utterance in all three conditions.

This experiment was adopted the Wizard of Oz (*WOZ*) method. Using the *WOZ* method, it is able to remotely control the utterance of the agent and make it appear to participants that the agent is operating autonomously. The agent used Pepper, a communication robot jointly developed by SoftBank Robotics and Aldebaran Robotics. People has been reported that Pepper's social influence makes it difficult to accept requests from Pepper [20]. Also, Pepper's impression is not favorable that may be a reason why Pepper's request is less likely to accept. Therefore, it is believed that to able to improve Pepper's impression and reduce requests accessibility difficulties by giving compliments.

First, the procedure of the experiment was explained to the experiment participants using the audio data recorded in advance about the outline of the experiment and the profile used in the experiment.

After completing the instruction, the experimental participant was started a conversation with Pepper when Pepper started speaking. Participant answered the questionnaire at the end of the Each dialogue. After answering, talked again. After the three dialogues were completed, filled out the questionnaire after the experiment and complete the experiment when all the questionnaires were answered. The order of the dialogue took into account the counterbalance.

Experiment conducted the questionnaire to evaluate the impression of the agent and the dialogue, and to investigate the characteristics of the experiment participants.

The agent's impression evaluation used the psychometric scale of the "Godspeed Questionnaire" [21], which measures the subjective evaluation of agents. Godspeed Questionnaire has consisted of five perceptual constructs, "Anthropomorphism", "Animacy", "Likability", "Perceived intelligence", and "Perceived safety". In order to evaluate the dialogue, 11 questionnaire items prepare, and the evaluation calculated by the Likert scale method of seven-point scale (1: Very Strongly Disagree, 7: Very Strongly Agree). Evaluate the impression of the agent and the dialogue in each dialogue condition, participants answered the questionnaire every time the dialogue ends. According to Kawaguchi et al. [16], the effects of compliments that took into account the psychological characteristics of clients had shown that the effects of compliments differ depending on the purpose. This suggests that there was a difference in the effect and impression of the agent's compliment depending on the attributes of the experiment participants. Therefore, this experiment also investigated the personality characteristics of the experiment participants. The questionnaire of user characteristics used the praise acquisition desire/rejection avoidance desire scale used by Kawaguchi et al. The praise acquisition desire/rejection avoidance desire scale have been the scale created by Kojima et al. [15], which evaluated oneself from a subjective viewpoint that oneself thinks, not from own characteristics that was seen by others. The

praise earned desire/rejection avoidance desire scale was asked for answers by the five-point scale.

C. Hypothesis

Two hypotheses were made in conducting this experiment.

- Compliments enhance the positive impression of the agent.
- *Counseling-compliment* are more reliable than *Pragmatics-compliment*.

D. Results

The participants targeted university students. Several research have been pointed out that Japanese university students have low self-esteem [22]. Under these circumstances, giving compliments to university students is an effective means. As a result, The experiment participants were 15 men and 3 women, a total of 18 people, two of which were excluded from subjective evaluation analysis because they did not correspond to the questionnaire "Did you notice the difference in the utterance of the robot?". Therefore, subjective evaluation was analyzed for a total of 16 males and 13 females (mean age: 21.1 years, standard deviation: 0.66). The experiment participants were 15 men and 3 women, a total of 18 people, two of which were Excluded from subjective evaluation analysis because they did not correspond to the questionnaire "Did you notice the difference in the utterance of the robot?". Therefore, subjective evaluation was analyzed for a total of 16 males and 13 females (mean age: 21.1 years, standard deviation: 0.66).

The evaluation between dialogue conditions was compared using the results of agent impression evaluation and dialogue items. A non-parametric Friedman test was performed to confirm the difference in evaluation for each dialogue condition, and if there was a significant difference, Scheffe's multiple comparison was performed to verify whether there was a significant difference between each dialogue condition. Fig. 6 shows the results of the agent's impression evaluation, and Fig. 7 shows the items with significant differences in the evaluation of items related to dialogue.

Fig. 6 shows significant difference between P-comp and N-comp in "Anthropomorphism" and "Animacy". In addition, "Anthropomorphism", "Animacy", "Likability" and "Perceived of intelligence" showed significant differences between C-comp and N-comp.

In Fig. 7, significant differences was confirmed between P-comp and N-comp, and C-comp and N-comp in the six items. These items are "Did you feel the agent is listening to the conversation?", "Did you enjoy the conversation with the agent?" "Did you felt that you were given compliments by the agent?", "Did you feel glad in the conversation with the agent?" "Did the agent feel interested in your topic of conversation?" And "Did the conversation nature?". In addition, a significant difference is confirmed between C-comp and N-comp in two items, "you can trust the agent" and "you believed in compliments of agent."

The results of the questionnaire on user characteristics obtained in this experiment and the relationship between the impression of the agent were analyzed in each dialog condition.

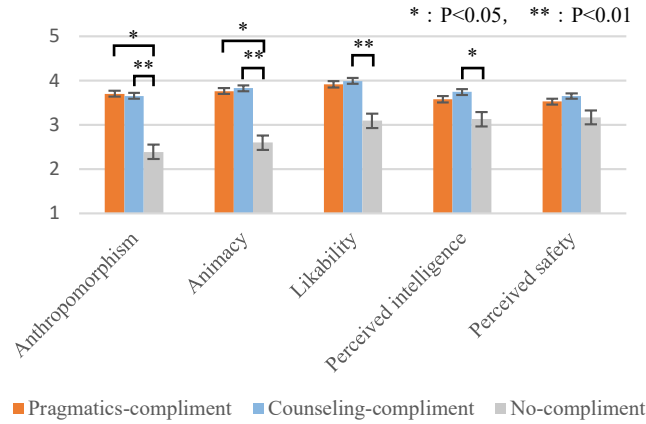


Fig. 6. Godspeed Questionnaire Mean and Standard Error (n=16)

Godspeed Questionnaire each constructs and the praise acquisition desire/rejection avoidance desire score of the experiment participants was analyzed by a non-parametric Spearman's rank correlation matrix.

As a result, N-comp confirmed that the positive correlation between the desire to gain praise and the perception of safety was significant, and the negative correlation between the desire to avoid rejection and the perception of intelligence was a significant difference.

The non-parametric Spearman's rank correlation matrix was also used to evaluate the relationship between the score of the desire to obtain praise and the need to avoid rejection, and each item related to the dialogue of each dialogue condition.

There was a correlation between the scores of the desire to get praise and the need to avoid rejection, in some of the items related to dialogue under each dialogue condition. In P-comp, a positive correlation was found between the desire for praise acquisition and the item that "Did the agent feel interested in your topic of conversation?" as a significant trend. In the C-comp, a positive correlation was confirmed between the desire for praise acquisition and the item, which is "Did you feel the agent is listening to the conversation?" as significant trend. In addition, a negative correlation was confirmed as a significant tendency in the item of rejection avoidance desire, "Did the agent feel interested in your topic of conversation?".

E. Discussion

As shown in Fig. 6, it was confirmed that the positive impression of the agent who gave compliments was higher than that of the agent who did not compliment. In particular, significant differences were observed between P-comp and N-comp and between C-comp and N-comp in the items that "Anthropomorphism" and "Animacy". This reveals that participants being are aware that the compliment is a verbal behavior that is used by humans, and that the agent's formulated compliments were able to express humanity. In addition, detailed observations have been required in order to give compliments [23], that is, a factor that seems to be of interest to humans. In other words, we consider that the act of giving compliments itself influences the positive impression that include empathy and curiosity on humans. Therefore, this result indicates that the first hypothesis is valid.

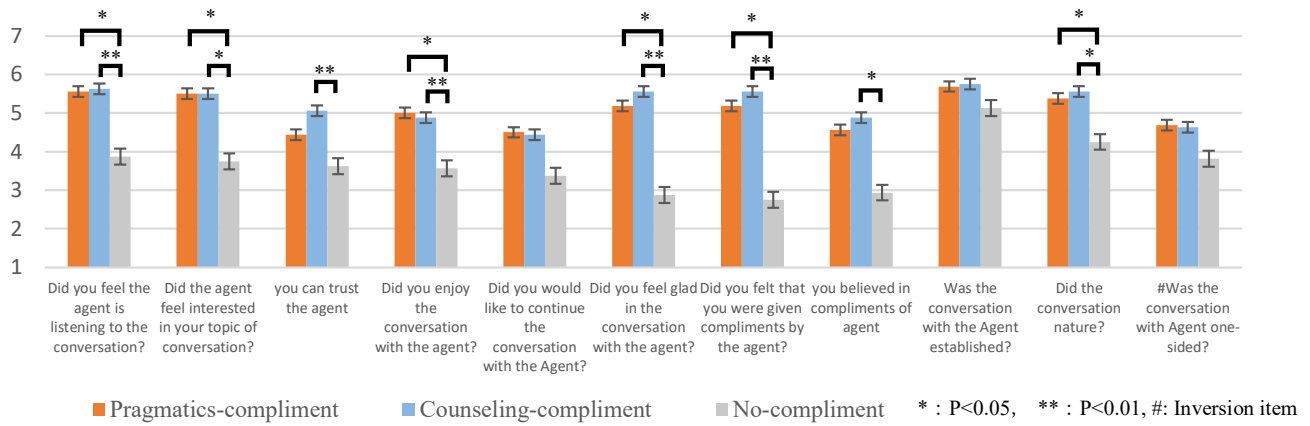


Fig. 7. Subjective Evaluation for Dialogue with Agents

In Fig. 7, in the dialogue with the agent using P-comp, the items "Did you feel glad in the conversation with the agent?" and "Did you felt that you were given compliments by the agent?" showed a significant difference from N-comp. The difference between P-comp and N-comp is the presence or absence of compliments, and P-comp uses formulated compliments. Therefore, formulated compliments used by the agent has the same effect as the one used by humans, such as liking and approval, revealing that it is recognized as compliments.

In addition, "you believed in compliments of agent." was highly evaluated with P-comp and C-comp, but significant difference was confirmed only between C-comp and N-comp. This result will be considered from the characteristics of each compliment expression. The characteristic of P-comp is formulated representation method. The formulated compliment often may the utterance content is simple that has tended to be a direct expression, while the characteristic of C-comp is that it considers the acceptance of the recipient. The constitution of compliments added a reason of compliments to the content of the utterance, the basis of the content of compliments. Therefore, it is thought that *Counseling-compliment*, compliments with reasons were evaluated as believable. However, the this results cannot suggest the second hypothesis because significant difference not show between P-comp and C-comp. This result is considered that giving compliments lead to gain the trust of the participants, regardless of the difference in compliment expressions. The way of expressing the compliment to gain more trust needs to be examined in the future other than linguistic features. In order to give the compliment that is most effective for the user, the compliment must be adapted to the user. From the above, we believe that it is better to aim for the compliment expression that can be flexibly handled using fuzzy control, rather than uniquely determining the compliment expression. For that purpose, we will need to investigation compliment expressions using fuzzy inference in the future.

In the overall evaluation of the dialogue, there was a difference in the mean of the evaluation between P-comp and C-comp dialogue conditions, but no significant difference was shown. From these results, it was found that irrespective of the definitions of P-comp and C-comp, complimenting itself gave a positive impression to the agent. We also believe that the

delivered way of compliments can be estimated by fuzzy inference because no significant difference could be confirmed in the agent's evaluation despite the presentation of compliments are different.

The correlation between the user's characteristics was analyzed using the desire to obtain praise and the desire to avoid rejection and the dialogue conditions. It is found that C-comp has low Anthropomorphism, Animacy, and Likeability in the impression of the agent if the rejection avoidance desire is high score. People who have a strong desire to avoid rejection have a sense of shyness when receiving compliments, suggesting that it is likely to avoid or rejection of compliments [15]. From the above, it is thought that those who have a strong desire for avoid rejection feel shy of compliments behavior even if they consider the content of compliments. Therefore, we need to consider other approach paralinguistic information or situation of giving compliments as well as the content of compliments.

There were different correlations between the desire for praise/rejection avoidance and the impression of dialogue, depending on the strength of the desire for praise and the desire for rejection avoidance, in each dialog condition. In the dialogue items of P-comp, a positive correlation as a significant tendency was confirmed between the desire to gain praise and the item that "Did the agent feel interested in your topic of conversation?". The desire to obtain praise aims to obtain praise from the other party, and getting praise has been said to increase satisfaction [15]. Moreover, because formulated compliments are an expression of a direct evaluation using a positive evaluation word, the compliment topics trend to be clearer. The expressions of formulated compliments are easy to satisfy the desire to get praise, therefore it find that tends to be accepted by those who have strong desire to get praise.

In the C-comp dialogue conditions, it was found that people who had a strong desire for praise tended to feel that they were listening to their own story, whereas it was shown that people who have a strong desire to avoid rejection tend hard to feel other person is interest in their own story. Some people with a high desire for praise felt that the agent was sympathetic to their story because the basis for complements was clear. As a result, the credibility of the agent's compliments has improved. People who have a strong desire to avoid rejection try to avoid negative evaluations and avoid raising expectations for behavior. Compliments with reason expects the person addressed to accept

compliments. If accepted its compliments, it is thought that for those who have strong desire to avoid rejection, the person who gave compliments are more likely to hope the effect on compliments, and as a result of the psychological load, the anxiety has increased and they have moved away from the positive impression.

V. CONCLUSION

This research constructed a dialogue model of the agent who gives compliments by overviewing the features of compliments from the difference between compliments in the pragmatics research and the counseling research. In addition, an agent was proposed that searches for resources from the utterance of the interlocutor and gives compliment utterance in the interaction for conversation. The experiment of this research focused on the expression form of compliments and investigated the impression of the agent giving compliments.

As a result of the experiment, compliments by the agent found that they worked favorably on human. The effectiveness of the formulated compliments by the agent was also confirmed, revealing that formulated compliments by the agent was recognized to humans as the compliment. However, it is thought that the impression received by humans is not obvious difference due to differences in expression because significant difference could not confirm between the evaluations of Pragmatics-compliment and Counseling-compliment. The reaction of compliments may difference from person to person, so that The recipient's desire of the praise may fully satisfied by the manner in which compliments are delivered. The compliment dialogue system consider that need to personalize compliments using fuzzy control in order to vary the expression of compliments according to the physical condition, mental states and characteristics of the recipient. This result is effective knowledge for constructing the compliment dialogue system.

However, the proposed compliment dialogue system has not been implemented yet, the effects of compliments gave by agents are not always positive. In this experiment, a favorable impression was strongly obtained, but some people might be able to not accept agent's compliment expression. Compliments have the potential to be perceived as ironic or disgust depending on interpersonal relationships and expressions [24]. Therefore, it will be a future task to develop a dialogue system that considers the results of user characteristics such as the desire to get praise or avoid rejection, and the impression of compliments delivered by the agent. Moreover, it is necessary to examine the way of receiving compliments from the social relation with the agent as well as the content and the expression method, and paralinguistic information in compliments by the agent as well as the human.

REFERENCES

- [1] S. Provoost, H. M. Lau, J. Ruwaard, H. Riper: Embodied Conversational Agents in Clinical Psychology: A Scoping Review, *Journal of Medical Internet Research*, Vol. 19, No. 5, 2017.
- [2] T. Fong, I. Nourbakhsh, K. Dautenbahn: A Survey of Socially Interactive Robots, *Robotics and Autonomous Systems*, Vol.42, pp.143-166, 2003.
- [3] N. Wolfson and J. Manes: The compliment as a social strategy, *Paper in Linguistics*, Vol. 13, pp. 391-410, 1980.
- [4] P. Brown & S. C. Levinson: *Politeness: Some universals in language usage*, Cambridge University Press, 1987.
- [5] J. Holmes: Paying Compliments: A Sex-Preferential Politeness Strategy, *Journal of Pragmatics* Vol. 12, pp. 445-465, 1988.
- [6] A. Austermann, N. Esau, L. Kleinjohann, B. Kleinjohann: Fuzzy emotion recognition in natural speech dialogue, *ROMAN 2005, IEEE International Workshop on Robot and Human Interactive Communication*, pp. 323-328, 2005.
- [7] E. Andre, M. Rehm, W. Minker, D. Buhler: Endowing Spoken Language Dialogue Systems with Emotional Intelligence, *Tutorial and Research Workshop on affective Dialogue Systems*, pp. 178-187, 2004.
- [8] M. Sifianou: "Oh! How appropriate!" Compliments and politeness, In A. Bayraktaroglu and M. Sifianou, Eds. *Linguistic Politeness Across Boundaries: The Case of Greek and Turkish*, pp. 391-430, 2001.
- [9] J. Holmes: Compliments and compliment responses in New Zealand English, *Anthropological Linguistics*, Vol. 28, No. 4, pp. 485-508, 1986.
- [10] A. H. Shaari, M. Maros: Compliments and Compliment Responses Across Borders: Language and Cultural Change Among the New Generation of Malays, *e-Bangi, Journal of Social Science and Humanities*, Vol. 12, No. 1, pp. 29-42, 2017.
- [11] A. L. Apple, F. Billingsley, I. S. Schwartz, E. G. Carr: Effects of video modeling alone and with self-management on compliment-giving behaviors of children with high-functioning ASD, *Journal of Positive Behavior Interventions*, Vol. 7, No. 1, pp. 33-46, 2005.
- [12] K. L. Brasher: Solution-Focused Brief Therapy: Overview and Implications for School Counselors, *The Alabama Counseling Association Journal*, Vol. 34, No. 2, pp. 20-30, 2009.
- [13] M. D. Wall, J. H. Amendt, T. Kleckner, R. D. Bryant: Therapeutic compliments: Setting the stage for successful therapy, *Journal of Marital and Family Therapy*, Vol. 5, No. 2, pp. 159-167, 1989.
- [14] C. Franklin, T. S. Trepper, E. E. McCollum and W. J. Gingerich, Eds.: *Solution-Focused Brief Therapy: A handbook of Evidence-Based Practice*, Oxford University Press, 2012.
- [15] Y. Kojima, K. Ota, K. Sugawara: Attempt to create a scale for the desire to gain compliment and avoid rejection, *Personality Psychology Research*, Vol. 11, No. 2, pp. 86-98, 2003 (In Japanese).
- [16] T. Kawaguchi, A. Shirahama, S. Koga: Examination of the Effect of Compliment in Consultation Scenes Using Scene Assumption Method: Focusing on the desire to gain Praise or Avoid Rejection, *Kyushu University Clinical Psychology Research, Kyushu University Graduate School Human Center for Integrated Clinical Psychology, Graduate School of Environmental Studies*, Vol. 8, pp. 25-36, 2017 (In Japanese).
- [17] S. Duncan, D. W. Fiske: *Face-to-Face Interaction: Research, Methods, and Theory*, Lawrence Erlbaum Associates, Inc., 1977.
- [18] N. Wolfson: An empirically based analysis of complimenting in American English, In N. Wolfson & E. Judd, Eds. *Sociolinguistics and Second Language Acquisition*, Rowley, MA: Newbury House, pp. 96-102, 1983.
- [19] J. A. Russell: A circumplex model of affect, *Journal of Personality and Social Psychology*, No. 39, Vol. 6, pp. 1161-1178, 1980.
- [20] S. Thunberg, S. Thellman, T. Ziemke: Don't Judge a Book by its Cover: A Study of the Social Acceptance of NAO vs. Pepper, *HAI 2017, Proceedings of the 5th International Conference of Human Agent Interaction*, pp. 443-446, 2017.
- [21] C. Bartneck, E. Croft, D. Kulic and S. Zoghbi: Measurement instruments for the anthropomorphism, Animacy, likeability, perceived intelligence, and perceived safety of robots, *International Journal of Social Robotics*, Vol. 1, No. 1, pp. 71-81, 2009.
- [22] K. Kino, T. Hayamizu: Formation of Virtual Competence and Cultural Factors: For University Students, *Proceedings of the General Meeting of the Japanese Society of Educational Psychology*, Vol. 51, 2009 (In Japanese).
- [23] Y. Yanagita: "How to compliment and scold" and class communication, *Nagasaki University Educational Sciences Educational Research Report*, No. 55, pp. 9-24, 1998 (In Japanese).
- [24] Y. Furukawa: When "Compliment" is ironic or hated, *Japanese language and culture*, No. 36, pp. 45-57, 2010 (In Japanese).