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A Customer's Attitude to a Robotic Salesperson Depends on Their Initial Interaction

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***Abstract*— In recent years, robotic salespersons have been rapidly deployed in various shops especially in Japan. However, it is still unclear what kind of action is effective for sales, and robotic salespersons are often ignored by customers. In this paper, we analyzed the multimodal conversations between a robotic salesperson and visitors by conducting a field experiment. We aim to investigate the actions of the robot that lead to interactive conversations. The results of the experiment showed that in order to conduct an interactive conversation, it is necessary to a give short speech that is easy to answer. The most important finding obtained from this research is that the impression of a robot is strongly influenced by the beginning of the interaction. When a robot gives a short speech that is easy to answer at the beginning of the interaction, an interactive conversation can start because the customers treat the robot similar to a salesperson which is capable of humanlike interaction.**

I. Introduction

In recent years, speech recognition technology has improved, and robots called communication robots that can make a conversation were invented. This type of communication robot is used in many situations because of its ability to talk, and there are some researches about the interaction between a human and a robot [1]. Some researches for example show that specific actions of a robot have a large influence on the impression of a robot [2], [3], [4], and that a particular behavior and speech method can attract people's attention to the robot [5], [6]. They are also used as a museum guide [7], [8], [9], [10] and for children's education [11], [12]. In addition, there are robots that receive visitors at a shop or a shopping mall [13]. With these robots, however, common actions are not always effective for each purpose, and it is necessary to act according to each purpose.

Nowadays, foreign tourists are increasing around the world. Nevertheless, many human salespersons cannot speak a foreign language. Thus, robotic salespersons can be set up in shops to attract customers and introduce products by using a foreign language. Also, based on the customers data such as the face recognition function and purchase information, robot services can be provided according to the customers purchase frequency and preferences. In addition, customers may be tense because the salesperson is a human. However, customers can be attracted by a robot salesperson because they are interested in robots and talking with a robot is more relaxing. For these reasons, robotic salespersons have been rapidly deployed in various shops. However, it is still unknown what kind of action is effective for sales, and robots are often ignored by customers. Because a communication robot salesperson should provide an introduction of products to customers, it is necessary to start and continue a conversation to a proper extent.

In this paper, we placed a humanoid robot, Pepper, into a real shop and made it communicate with customers. We then conducted a multimodal conversation analysis including not only verbal information, but also non-verbal information. We aimed to find what actions the robot should perform in order to get customers to listen to the robot's speech.

II. Related works

A. Field Trials

In order to observe the natural interaction with robots which cannot be observed in laboratory experiments, some experiments in a museum [7], [8], [9], [10] and a classroom [11] have been conducted. In robotic salespersons, some experiments in actual fields have been carried out for various purposes [14], [15], [16]. In spite of that, the number of such field trials is small compared to laboratory experiments.

B. Robotic Salesperson in a Shopping Mall

Several experiments on robotic salespersons in shopping malls have been conducted. For example, an experiment has been conducted in a shopping mall which a robotic salesperson offered information of the shopping mall and route guidance to make friendship with customers [17]. Another experiment, which a robot system was designed to offer coupons, has been conducted [18]. In this experiment, the designers wanted to search whether setting a robot in a shopping mall can enhance the effect of advertise, and shown a method which can offer the most coupons. However, these robotic salespersons did not introduce products to customers directly. Thus, we are still unknown that what behaviors a robotic salesperson can use to enhance the effect of purchasing.

C. Robot Obtaining Visitors' Attention

There have been several experiments on how a robot starts a conversation with customers. For example, A. Yamazaki and K. Yamazaki found that using robots head movement and face track can be easier to start conversations with customers in museums [8], [19]. Although their robots can work automatically, the robots were not so natural and were not like a human being. Another experiment, M. Lee put a robot in an information kiosk to find out what actions the robot needs to start conversations with customers [20]. Nevertheless, they did not have a big dataset. In our experiment, we put a robot in a shopping mall and got more data by letting an experimenter control the robot remotely in order to find out what kind

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actions the robot did that can be easier to start conversations with customers.

III. System Overview

A. Pepper

Pepper is a humanoid personal robot cooperatively developed by SoftBank Corp. and Aldebaran Robotics SAS in 2014. There are some research using Pepper, not only for customer service, but also for nursing care and educational purposes [11]. In this experiment, Pepper was adopted as a robotic salesperson, which Figure 1 shows. Pepper's size is 1.2m high. Therefore, visitors can see it from outside a shop and it does not disturb the purchase of products even when it is installed. It can explain and introduce the products by using its personalized robot-mounted tablet while it is communicating with customers. Currently, Pepper can speak Japanese and English, and in this experiment these two languages were used for customer service.

B. The Wizard of OZ method

Speech recognition is operated by a person using the Wizard of Oz method [21]. The Wizard of OZ method is an effective simulation method in the development of the dialogue system. This method has the advantage that it is possible to know the requirements and possible problems of the system in advance. To use this method, the user has to be informed about the deceptive instruction of talking to the system. However, with the Wizard of OZ method in field trials, the enjoyment of participants was unaffected by the knowledge of whether the robot was being controlled by a program or a human [22]. Therefore, in this experiment, we posted the contents on the body of the robot, that part of the robot's motion would be remotely controlled by a person.

C. User Interface for Robot Control

In the interaction with visitors in this research, the experimenter selected Pepper's reaction appropriate for that situation using the Wizard of OZ method. Thus, Pepper needs to be controlled remotely. Therefore, we developed an application that can be controlled remotely using a smartphone. Peppers OS is called NAOqi. The API is in NAOqi. By using it, it is possible to acquire and control the state of various devices and memories equipped in Pepper. We designed an application which was written in Javascript which enabled us to control Pepper remotely with a browser. This application can connect a smartphone to a Pepper with the same wireless LAN, let the Pepper perform the installed actions or speak the inputted words. To avoid the situation of entering many words during the experiment, we installed a series of frequent actions in our Pepper in advance. These actions were developed by using Choregraphe which is a software that enables us to develop Peppers application.

D. Actions of the Robot

When Pepper is controlled remotely and talks, most of the robot's body movements are generated automatically. However, we developed three functions with particular body movements: handshaking, offering to try a sample and cooperating with a human salesman. When Pepper talks, it moves randomly like a human speaker. The robot's handshaking behavior is shown in Figure 2a. Because of the robot's low height, the angle between its arm and body needs

Figure 1. A customer service robot (Pepper)

to be larger than normal. From several experiments, we determined an angle which is easy for adults to shake hands. The behavior of the robot that suggests for customers to try a sample is shown in Figure 2b. Considering the height of the product shelf next to the robot, we designed this gesture to guide customers to try the samples. We also developed a function in which the robot calls a salesperson and looks for cooperation because the robot cannot give the sample by itself. In this function, the robot first says "Excuse me!" and raises its left hand, as shown in Figure 2c. After that, the robot says "please give a sample" and uses its right hand to gesture towards the customer.

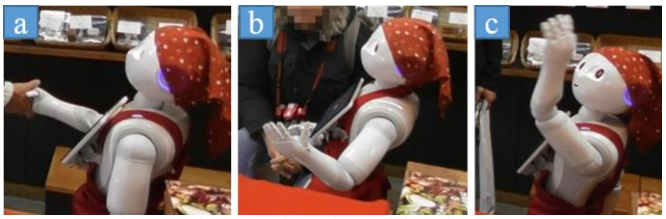


Figure 2. The actions of the robot

IV. Analyzing Method

There are series of ordered structures and patterns in customers' interactions. Actions and words are established based on these. We conduct multimodal conversation analysis in order to observe and analyze such structures and patterns. First of all, we create transcripts that transcribe the conversation in detail using the video footage we acquire. In addition to the spoken conversation, the transcript also described the timing of the participant's remarks, movement of the body, gaze direction and so on. By using such transcripts and recorded videos, we analyze interactions taking into account not only verbal but also non-verbal information. In transcripts, Pepper is denoted as P; Customers as C1, C2...; and Salespeople as S1, S2...etc. The brackets in the caption of the transcripts shows the elapsed time from the start of the experiment at the beginning and the end of the transcripts.

V. Field Trial

We conducted this experiment under the approval of the Research Ethics Committee of our University. During the experiment, continuous recording was performed around the robot using cameras that obscured the face images of shoppers by shifting the focus. In this experiment, three obscure recording cameras were used. The first one is focused on the robot's front view, the second one is on the robot's rear view,

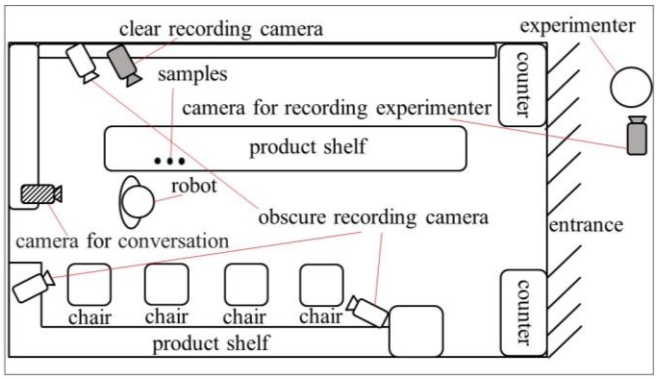


Figure 3. A top view of the shop


Figure 4. The robot shaking hands with the customer


Figure 5. The robot offering to try a sample to the visitor

and the third one is on the side view in order to get a wider range. The clear recording camera is also focused on the robot's side view, when the shoppers approached the robot, the robot-mounted tablet displayed an agreement form that can be answered by using the touch screen and it recorded only when consent had been given. Moreover, to allow the experimenter to observe the inside of the shop during the experiment, we placed a tablet behind the robot. The tablet was connected through a video call with the experimenter. The experimenter stood in front of the shop and confirmed the interaction between the robot and visitors by visual observation and through the video call. In this case, the dialogue was prepared in advance in the application. In addition, the outline of the experiment contents, the name of the responsible person of this research, and the telephone number were posted on the body of the robot. The handouts with the same content were placed in a case and installed on the body of the robot so that shoppers can take it out freely. Figure 3 shows a top view of the shop.

The experiment was carried out for seven days: August 14th (16:21-17:58), 15th (15:20-16:22), 16th (14:15-15:58), November 27th (16:08-17:34), December 2nd (14:07-16:58), 4th (14:05-17:13), and 5th (14:13-16:45), 2017. In August, we added a camera to record the experimenter and prepared three kinds of Shichimi for trying on the product shelf which was next to the robot.

VI. Results and Discussion

In this experiment, 119 groups of customers visited the shop. 54 out of the 119 groups have communicated with Pepper, and 16 groups out of the 54 groups have purchased products. The average number of people in one group was 2 or 3 customers, and about 270 customers visited the shop during the experiment. Figure 4 shows Pepper shaking hands with the customer and Figure 5 shows Pepper offering to try a sample to the visitor. For the robotic salesperson to offer service to customers and promote purchasing activities, it is necessary to let the customers listen to the robot. Thus, it is necessary to investigate which kind of actions the robot can perform to attract the customer's attention to its speeches to get the customers response to it accordingly. When Pepper receives a consecutive reply more than twice by a customer, it is defined as an interactive conversation. On the other hand, if the customer did not respond, or have only replied once, we define these as a unilateral conversation. We have searched these two kinds of conversation from our experiment data and have found that there are 25 groups that can be classified as an interactive conversation and 94 groups which are unilateral in comparison. From these results, it turns out that the robot is ignored by many customers.

In the following section, we explain the advantages of interactive conversation using two examples first. Then, we use three examples to discuss the causes of starting interactive conversation. Finally, we summarize our content and explain how to apply in existing robots.

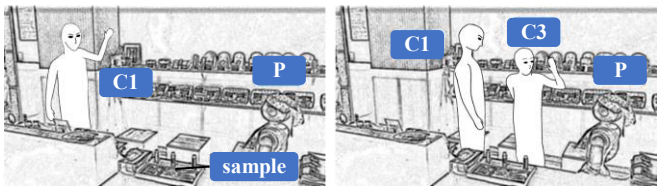
A. Benefits of Interactive Conversation

In this experiment, we examine the advantages when conversations between the robot and customers are interactive. The group from Transcript 1 shows a consecutive response to Peppers speech thus conducting an interactive conversation. Figure 6a shows the situation C1 returns Peppers greeting (Line 4). Furthermore, at the end of the conversation, the following features can be noted. When C1 says "Bye" (Figure 6b), the robot immediately says "Do you know Shichimi?" (Lines 37 and 38). If the customers have treated Pepper simply as a robot that can only speak, there is no sense of guilt even if they ignore it, but this group did not ignore Pepper and stayed for a while. Therefore, this group treated Pepper as a robot that is capable of interactive dialogue, and it seems that Pepper was able to observe and understand the customer's behaviors. As a result, during this section of the experiment, the customers have responded to Peppers attempt to make a conversation.

(P=Pepper, C1=man, C2=woman, C3=boy1, C4=boy)

1		((Entering the shop))
2		((Standing at the entrance looking at Pepper))
3	P	Hello! ((Waving right hand))
4	C1	Hello. ((Waving his hand)) (3.5)
5		((C1 is waving his hand))
6	P	[Hello!
7	C1	Hello.
		(...)
16	P	Nice to meet you!
17	C1	Nice to meet you!
18	P	Would you like try a sample?
19	C1	Yes.
		(...)
33	P	Yuzu Shichimi. This is Yuzu Shichimi which added pomelo to Shichimi.
34		(1.0)
35	C1	Good.
36	C3	Bye.
37	C1	Bye [bye.
38	P	[Do you know Shichimi?
39		(3.0)
40	P	Thank you, have a nice day. ((Waving hand))
41	C3	Thank you. ((Waving hand and turning around))
42		((Leaving the shop))

Transcript 1. The group did not ignore the robot and stayed for a while (August 16th 00:34:11-00:36:10)



(a) Responding to the greeting (b) Saying "Bye"

Figure 6. Scenes in Transcript 1

The group in Transcript 2 have also replied to the remarks of Pepper more than once and conducted an interactive conversation. Figure 7a shows the situation the customers notice Pepper and say hello to Pepper. The customers walking towards the entrance to leave, and said "Bye, bye." (Lines 26 and 27). However, Pepper had no response, then the customer returned to the robot's side (Line 28). Figure 7b shows the situation of the customers coming back to say goodbye to Pepper. This indicates that this customer thought that Pepper can respond accordingly and shows that the customers initiative to be polite with Pepper.

In this way, not only would customers get to hear the robot's speech but also similarly, the customers would try to start a conversation with Pepper, stopping them from leaving the shop. In other words, from this example, there is a possibility that Pepper was not simply treated as a complete mechanical object but treated like a human being.

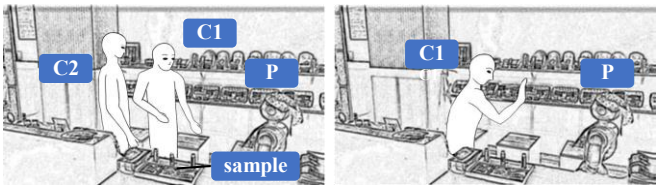
B. The First Impression of the Robot Strongly Influenced on the Conversation

In general society, robots may be perceived as mechanical beings tasked to merely execute accurate orders given by humans. However, unlike industrial robots, some robots coexist with people in society. Thus, the relationship between

(P=Pepper, C1=woman1, C2=woman2, C3=woman3, S1=salesperson

1		((Entering the shop))
2		((Approaching Pepper))
3	P	Boku no namae wa Pepper desu(1.5)
		My name is Pepper.
4	P	Yoroshikune
		Nice to meet you.
5	C1	Ara
		Wow!
6	C1	Pepper, konnichiwa
		Pepper, hello.
		(...)
25	S1	ookini! arigatougozaimasu
		Thank you very much.
26		((C1 turns around and prepares to leave))
27	C1	Bye, bye. ((Looking back)) (1.5)
28	C1	Bye, by:::e! Pepper, Bye, by:::e! ((Returning toward Pepper and waving her hand))
29	P	Bye, by:::e. [matane
		See you
30	C1	[Bye, bye. huhuhuhu:
31		((Leaving the shop))

Transcript 2. The group returned to the robot's side to say goodbye (August 14th 00:46:33-00:47:50)



(a) Saying hello (b) Coming back to say "bye"

Figure 7. Scenes in Transcript 2

humans and robots is not only that humans give commands to robots, but also robots should be able to communicate interactively with humans on an equal footing. In this experiment, we also examined the kinds of actions customer service robots do when the conversation between the robot and customers becomes interactive.

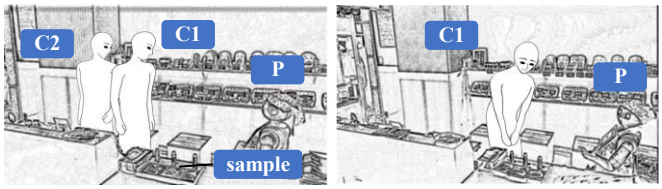
The Transcript 3 shows an example of customers who had an interactive conversation with Pepper. At the beginning, after the customer entered the shop, as shown in the Figure 8a, Pepper said "Hello!" (Line 4), then the customer replied "Hi!" to Pepper (Line 5). After that, Pepper made some short remarks to which the customer replied: "Nice to meet you" (Line 9) and "May I shake hands with you?" (Line 13). Therefore, it can be said that they conducted an interactive conversation. Once an interactive conversation is started, even if the robot speaks a slightly longer sentence, such as "Would you like to try a sample? You can taste here", the customer answered "OK!" (Line 20) and looks at the samples (Line 21). Figure 8b shows C1 looking at the sample.

On the other hand, an example of a unilateral conversation is shown as Transcript 4. When the customers entered the shop, Pepper gives a lengthy explanation about the shops product stating: "Medium hot Shichimi is standard spicy for normal use." (Line 3, Figure 9a); however, the customers did not respond. We can see that once a unilateral conversation is started, even if the robot makes short and easy-to-answer

(P=Pepper, C1=woman1, C2=woman2)

1		((Entering the shop))
2		((C1 approaches Pepper while holding a camera))
3		((C1 looks at Pepper))
4	P	Hello!=
5	C1	Hi!
6	C2	Hello
7	P	My name is Pepper.
8	C1	Hi, Pepper!
9	P	Nice to meet you.
10	C2	Nice to meet you too.
11	C1	Nice to meet you too.(1.0)
12	C1	Hi, Pepper::.
13	P	May I shake hands with you?
14	C1	Sure! Hi! Hello
15		((C1 is shaking hands with Pepper))
16	P	Nice to meet you.
17	C1	Nice to meet you.
18		((C1 is touching Peppers hand))
19	P	Would you like to try a sample? You can taste here.
20	C1	OK! ( )
21		((C1 and C2 are looking at the tasting sample)) (7.0)
22	P	Excuse me.
23	C1	Hi((Looking at Pepper))
24	P	Please give a sample.
25		((C1 and C2 are looking at the salesperson))
26	C1	Sample?
27		((The salesperson gives a tasting sample to C1))
28		((C1 is tasting the sample))
29		((C1 buys the products))

Transcript 3. The group that had an interactive conversation with Pepper (December 5th 02:04:17-02:05:26)



(a) The robot saying hello (b) Looking at the sample

Figure 8. Scenes in Transcript 3

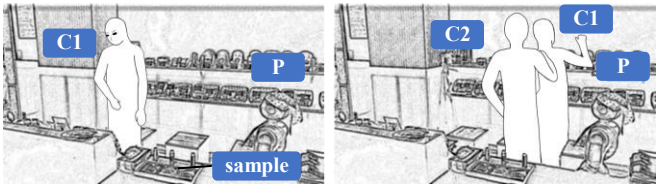
remark such as “Hello!” (Line 6) and “My name is Pepper” (Line 7), the robot was simply ignored (Figure 9b).

Comparing these two examples, when the robot communicated with the customers through short speeches, the conversation became an interactive conversation. Whereas, when the robot gave a longer speech to the customers, the conversation became a unilateral conversation. And, these differences are particularly noticeable at the beginning of the conversation. Therefore, the impression that the robot gives to customers at the beginning of the conversation is the most important, and there is a possibility that the attitude of customers to the robot after that is determined. For all customers entering the shop, we investigated the first utterance of the robot and the first customer’s responses. The results are shown in Table I. The result of this table is different from 54 groups which we regarded above. In that 54 groups, if they responded to the robot in the period from entering to leaving the shop, we defined the group has communicated with Pepper. However, in this table, we only focus on the very

(P=Pepper, C1=man1, C2=man2, C3=man3, S=salesperson)

1		((Entering the shop))
2		((Looking at the products))
3	P	Medium hot Shichimi is standard spicy for normal use.
4	P	Very hot Shichimi is characterized by a numbing and exciting spicy taste.
5		((C1, C2 and C3 are looking at the products))
6	P	Hello
7	P	My name is Pepper.
8		((C1, C2 and C3 get away from Pepper))
9	P	Wait, wait. Come on! Let’s talk together.

Transcript 4. The group that robot spoke unilateral remarks (August15th 00:39:33-00:40:50)



(a) Lengthy explanation (b) The robot being ignored

Figure 9. Scenes in Transcript 4

TABLE I. RESULT OF THE ROBOT’S FIRST REMARK

	Interactive	Unilateral
Responding to the robot’s first remark	16	2
No response	9	92

beginning of the conversations. There were nine group conversations that showed customers not responding to Pepper that became interactive conversations. However, most of these instances were due to the robot using the wrong language or the customers did not pay attention to the robots first remark. On the other hand, when the robot said something later, most of them were surprised and willingly responded.

Conversely, there were two groups that have replied to the robots first remark, resulting in a unilateral conversation. However, in these two cases, the customers included words that seemed to be spontaneous like “I was surprised”. Therefore, it is conceivable that the impression of the robot at the beginning of the interaction vitally influences the effect of the subsequent conversation in most customer groups. In addition, when investigating the first remarks of the robot, in most groups when a customer entered the shop, the customer tended to answer short utterances like “Hello!” and “Nice to meet you!” Then, when the customer responds to the first remark that is easy to answer, it is considered to give an impression that the conversation between the customer and the robot have become an interactive conversation. The robot is easy to be ignored, which we have known, thus the number of each data is unbalance. To summarize, the case of the robot giving a long speech such as the product introduction at the beginning, the customers tended to treat the robot similar to a voice guidance machine, not vocally responding, thus becoming a unilateral conversation. In the case of the robot giving short remarks that is easy to answer at the start, the customers have willingly responded, allowing for a more interactive conversation because the robot was able to give a good impression.

C. Application to Existing Robotic salespersons

In conclusion, the most important fact to consider is the impression of the robot determined at the beginning of the interaction. If the customer receives a unilateral impression from the robot at the beginning of the interaction, the robot's subsequent actions would be high potentially ignored, resulting with the robot not being treated as a robotic salesperson. Therefore, as soon as a robot encounters a customer, the robot must be able to conduct a human-like action which is capable to start an interactive conversation. When designing a robotic salesperson, one of the guidelines to which we should pay more attention is to make the customers' first impression of the robot not to be completely robotic.

VII. Conclusion

In this study, it was clarified through field experiments what kind of actions robotic salespersons should perform in order to attract customer's attention towards the robot's speech. As a result of the experiment, we found that listening to the robot's speech and conducting an interactive conversation have made the customers not only listen to the robot more attentively, but also tend to treat the robot more like a person. Moreover, in order to conduct such an interactive conversation, we clarified that it is necessary not to give lengthy remarks at the beginning of the interaction, but to instead give short remarks that are easy to answer. The most important finding in this research is that the impression of the robot held by the customers was strongly influenced by the beginning of the interaction. When the robot gave lengthy remarks at the beginning of the interaction, the customers were unwilling to answer because they treated the robot as a machine. When the remarks were short and easy to answer, it was more possible that an interactive conversation could start, because the customers treated the robot similar to a salesperson that is capable of humanlike interaction. Therefore, when designing a robotic salesperson, one of the guidelines to which we should pay more attention is to make the customers' first impression of the robot not to be completely robotic.

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References

[1] C. L. Sidner, C. D. Kidd, C. Lee, and N. Lesh, "Where to look: a study of human-robot engagement," in Proceedings of the 9th international conference on Intelligent user interfaces. ACM, 2004, pp. 78–84.

[2] T. Kanda, H. Ishiguro, and T. Ishida, "Psychological analysis on human-robot interaction," in Robotics and Automation, 2001. Proceedings 2001 ICRA. IEEE International Conference on, vol. 4. IEEE, 2001, pp. 4166–4173.

[3] T. Kanda, H. Ishiguro, M. Imai, and T. Ono, "Body movement analysis of human-robot interaction," in IJCAI, vol. 3. Citeseer, 2003, pp. 177–182.

[4] M. Shiomi, T. Kanda, H. Ishiguro, and N. Hagita, "Interactive humanoid robots for a science museum," in Proceedings of the 1st ACM SIGCHI/SIGART conference on Human-robot interaction. ACM, 2006, pp. 305–312.

[5] H. Kuzuoka, K. Pitsch, Y. Suzuki, I. Kawaguchi, K. Yamazaki, A. Yamazaki, Y. Kuno, P. Luff, and C. Heath, "Effect of restarts and pauses on achieving a state of mutual orientation between a human and a robot," in Proceedings of the 2008 ACM conference on Computer supported cooperative work. ACM, 2008, pp. 201–204.

[6] C. L. Sidner, C. Lee, C. D. Kidd, N. Lesh, and C. Rich, "Explorations in engagement for humans and robots," Artificial Intelligence, vol. 166, no. 1-2, pp. 140–164, 2005.

[7] Y. Kuno, K. Sadazuka, M. Kawashima, K. Yamazaki, A. Yamazaki, and H. Kuzuoka, "Museum guide robot based on sociological interaction analysis," in Proceedings of the SIGCHI conference on Human factors in computing systems. ACM, 2007, pp. 1191–1194.

[8] A. Yamazaki, K. Yamazaki, Y. Kuno, M. Burdelski, M. Kawashima, and H. Kuzuoka, "Precision timing in human-robot interaction: coordination of head movement and utterance," in Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. ACM, 2008, pp. 131–140.

[9] R. Gehle, K. Pitsch, and S. Wrede, "Signaling trouble in robot-togroup interaction. emerging visitor dynamics with a museum guide robot." in Proceedings of the second international conference on Human-agent interaction. ACM, 2014, pp. 361–368.

[10] M. Bennewitz, F. Faber, D. Joho, M. Schreiber, and S. Behnke, "Towards a humanoid museum guide robot that interacts with multiple persons," in Humanoid Robots, 2005 5th IEEE-RAS International Conference on. IEEE, 2005, pp. 418–423.

[11] F. Tanaka, K. Isshiki, F. Takahashi, M. Uekusa, R. Sei, and K. Hayashi, "Pepper learns together with children: Development of an educational application," in Humanoid Robots (Humanoids), 2015 IEEE-RAS 15th International Conference on. IEEE, 2015, pp. 270–275.

[12] M. Saerbeck, T. Schut, C. Bartneck, and M. D. Janse, "Expressive robots in education: varying the degree of social supportive behavior of a robotic tutor," in Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. ACM, 2010, pp. 1613–1622.

[13] I. Aaltonen, A. Arvola, P. Heikkila, and H. Lammi, "Hello pepper," may i tickle you?: Children's and adults' responses to an entertainment robot at a shopping mall," in Proceedings of the Companion of the 2017 ACM/IEEE International Conference on Human-Robot Interaction. ACM, 2017, pp. 53–54.

[14] K. Nakagawa, M. Shiomi, K. Shinozawa, R. Matsumura, H. Ishiguro, and N. Hagita, "Effect of robots whispering behavior on peoples motivation," International Journal of Social Robotics, vol. 5, no. 1, pp. 5–16, 2013.

[15] M. Niemela, A. Arvola, and I. Aaltonen, "Monitoring the accep-¨ tance of a social service robot in a shopping mall: first results," in Proceedings of the Companion of the 2017 ACM/IEEE International Conference on Human-Robot Interaction. ACM, 2017, pp. 225–226.

[16] M. Niemela, P. Heikkil¨ a, and H. Lammi, "A social service robot¨ in a shopping mall: Expectations of the management, retailers and consumers," the Companion of the 2017 ACM/IEEE International Conference on Human-Robot Interaction. ACM, 2017, pp. 227–228.

[17] T. Kanda, M. Shiomi, Z. Miyashita, H. Ishiguro, and N. Hagita, "A communication robot in a shopping mall," IEEE Transactions on Robotics, vol. 26, no. 5, pp. 897–913, 2010.

[18] M. Shiomi, K. Shinozawa, Y. Nakagawa, T. Miyashita, T. Sakamoto, T. Terakubo, H. Ishiguro, and N. Hagita, "Recommendation effects of a social robot for advertisement-use context in a shopping mall," International Journal of Social Robotics, vol. 5, no. 2, pp. 251–262, 2013.

[19] K. Yamazaki, A. Yamazaki, M. Okada, Y. Kuno, Y. Kobayashi, Y. Hoshi, K. Pitsch, P. Luff, D. vom Lehn, and C. Heath, "Revealing gauguin: engaging visitors in robot guide's explanation in an art museum," in Proceedings of the SIGCHI conference on human factors in computing systems. ACM, 2009, pp. 1437–1446.

[20] M. K. Lee, S. Kiesler, and J. Forlizzi, "Receptionist or information kiosk: how do people talk with a robot?" in Proceedings of the 2010 ACM conference on Computer supported cooperative work. ACM, 2010, pp. 31–40.

[21] J. F. Kelley, "An iterative design methodology for user-friendly natural language office information applications," ACM Transactions on Information Systems (TOIS), vol. 2, no. 1, pp. 26–41, 1984.

[22] F. Yamaoka, T. Kanda, H. Ishiguro, and N. Hagita, "Interacting with a human or a humanoid robot?" in Intelligent Robots and Systems, 2007. IROS 2007. IEEE/RSJ International Conference on. IEEE, 2007, pp.2685–2691.