DOI: 10.1109/RO-MAN60168.2024.10731280

Two is better than one: descriptions by multiple robots strengthen the feeling of kawaii toward objects

Yuki Kimura, Emi Anzai, Naoki Saiwaki, and Masahiro Shiomi, *Member, IEEE*

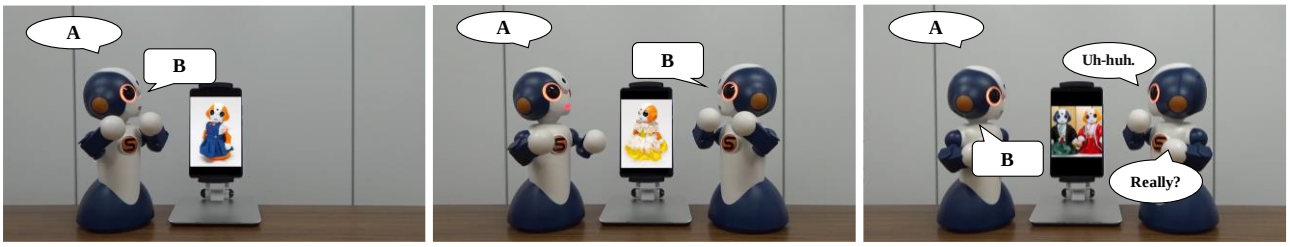

Figure 1. Robot sales clerks describe robot's clothing with different numbers/amounts of speech: Left: one robot; Middle: two robots with an equal amount of speech; Right: two robots with not equal amount of speech (right one only did back-channeling).

***Abstract*—Using multiple robots in presentations more effectively attracts customers and provides information to them than a single robot. Many robotics researchers have employed this approach to achieve effective robot-presentation systems in real environments. Although these systems implicitly equalize the amount of speech in the conversational content among multiple robots, it remains unknown whether that strategy is actually important. For example, the effects of the second robot that provides only back-channel responses have not yet been investigated. Unveiling the relationships between the presentation effects and the amount of speech in multiple robot presentations is undoubtedly crucial for designing the content of multiple robots' conversations. For this purpose, we conducted a video-based web-survey whose findings suggest that using multiple robots for product recommendations increases their commercial attractiveness. The results showed some advantages by equalizing the amount of speech compared to biasing that amount in presentations.**

I. Introduction

Due to COVID-19's impact, many social robots are being used in daily environments instead of human workers to mitigate the risk and spread of infections [1, 2]. Such robots are increasingly being used worldwide, including at shopping malls [3-6], cafeterias [7, 8], nursing homes [9-11], and exhibitions [12-14].

In this context, these robots are expanding their working environments into commercial uses. Robotics researchers have recently been focusing on the effects of robots' presentations from an advertisement perspective. For example, past studies investigated the advertisement effects of robots that distribute flyers in a shopping mall [5, 15]. Using multiple robots is an interesting approach for added sales [16]. Previous studies have already described how multiple robots effectively attract visitors' attention in shopping malls [17, 18]. Recent studies showed how multiple robots raised sales in actual shops [4, 19, 20]. These studies provided rich knowledge about the effectiveness of multiple social robots in presentations.

Unfortunately, these studies focused less on conversational interaction design between robots. In most cases, they are designed to deliver a similar amount of speech. As a result, the impact of unbalanced speech amount between robots on presentation outcomes remains unclear. For example, when two robots recommend a product, if the second robot only responds with back-channel feedback, such as nodding or verbal affirmations, is the presentation of the robots' product's attractiveness enhanced?

We focused on the effects of the amount of speech because they are crucial for designing conversations among multiple robots. Although current studies tend to equalize speech amounts in conversational content among robots, the importance of this practice hasn't been yet established. Clarifying whether a balanced speech distribution is essential for enhancing the impact of robot presentations might very well serve as a valuable guideline for designing robot conversations. Conversely, if a back-channel response from a second robot is sufficient, such a result would simplify conversational content design.

Based on these considerations, this study explores how varying the amounts of speech in robot presentations affects effectiveness (Fig. 1). We examined scenarios where robot sales clerks recommend robot clothing in a manner that resembles human sales clerks at clothing stores. This focus is motivated by the burgeoning market for robot apparel, spurred by the growing popularity of pet and social robots [21-24]. Note that since robot's clothing often emphasizes aesthetics (particularly cuteness; note that we focused on the Japanese feeling of *kawaii*, a word that means "cute" [33, 34] in this study.) that match the designs of the robots' themselves, our experiment involves robot clerks who are highlighting the attractiveness of such clothing. We developed a series of visual stimuli and conducted web-based experiments.

* This work was partially supported by JST CREST (Core Research for Evolutional Science and Technology) Grant, Number JPMJCR18A1, Japan, and JSPS (Japan Society for the Promotion of Science) KAKENHI Grant Numbers JP21H04897 and JP 22H03895.

Yuki Kimura, Emi Anzai, and Naoki Saiwaki are with the Nara Women's University, Nara, Japan.

Masahiro Shiomi is with the Advanced Telecommunications Research Institute International, Kyoto, Japan. (corresponding author. e-mail: m-shiomi@atr.jp).

II. Related works

A. Multiple social robots in human-robot interaction

Robotics researchers have explored the effectiveness of deploying multiple robots for presentation tasks across diverse settings. These include engaging with people and conveying information to them in shopping malls [17, 18], advertising merchandise [4, 19, 20], providing conversational support for elderly people [9], and facilitating educational activities for children [25, 26].

Moreover, using multiple robots has increased social influences and such effects in interaction. For example, a past study reported that apologies from multiple robots are more acceptable than a single robot's apology [27]. Other studies investigated the physical interaction design between two social robots [28-30].

Other previous work focused on verbal expression design among multiple social robots. For example, a past study reported that a double-meaning agreement among multiple robots provided positive feelings toward those with whom the robots interacted [31]. Another study investigated conversational design patterns to conceal incoherent responses with multiple social robot [32].

While these studies provided useful knowledge that improved the design of the conversation contents of multiple robots, they focused less on the effects of an unbalanced amount of speech in recommendation settings. They also focused less on the cuteness or the feeling of *kawaii* of the recommendation target's expressions, which are related to the task in our study. Compared to these past studies, one unique point of our study is its focus on investigating the effects of a not equal amount of speech in presentations.

B. Expressions of cuteness in human-robot interaction

In this study, we focus on how effectively the robots' presentations recommended the target's impressions, i.e., a robot's clothing. As described above, basically, robot's clothing is designed to be cute, and in this subsection, we described the related works that focused on expressions of cuteness and the feeling of *kawaii*.

From a commercial perspective, many Japanese companies are focusing on designing the e-appearance of such pet-type robots as Paro, LOVOT, and Robohon. In fact, the concept of *kawaii* is an essential factor from Japan's commercial perspective [35, 36]. The baby scheme is one famous design guideline for expressing *kawaii* [37, 38], although recent robotics researchers have emphasized the expression of feelings of *kawaii* with different approaches: such non-verbal behaviors as locomotion behaviors [39], touching behaviors [40], and showing friendly relationships between robots [41]. The last study focused on the relationships among multiple robots and feelings of *kawaii* without dwelling on conversational interactions. Moreover, these past studies concentrated on increasing the feelings of the *kawaii* qualities of the robot-self and failed to delve into recommendation effects toward feelings of *kawaii*. One unique point of our study, compared to these past studies, is its focus on investigating the effects of conversational interaction designs that are aimed to increase the feeling of *kawaii* for recommendation targets.

III. Experiment

A. Hypotheses and predictions

Past studies argued for the effectiveness of using multiple robots in presentation tasks [4, 17-20]. One reported that showing the relationships between robots provides a greater feeling of *kawaii* toward observers [41]. In the context of recommending a feeling of *kawaii* about clothes, presentations with multiple robots provide stronger positive impressions than presentations with just a single robot. Based on this hypothesis, we made the following prediction:

Prediction 1: People will experience the greater feeling of *kawaii* toward the presented clothing when described by multiple robots than when a single robot does so.

We also focused on the amount of speech in presentations among multiple robots. Since past related studies designed multiple robots that utter a similar amount of speech [17, 18, 25, 26], it remains unknown how the unbalanced design of the information influences the perceived impressions. Another past study concluded that observing a discussion is more agreeable when two targets discuss positive topics [42], suggesting that an equal amount of speech produces better results than a unbalanced amount. Based on this hypothesis, we made a second prediction:

Prediction 2: People will experience the greater feeling of *kawaii* toward the presented clothing when multiple robots equally share presentation conversations than when one robot dominates and another merely provides back-channels.

B. Conditions

We used three levels in the *number* factor: one robot (*one* condition), two robots who spoke the same amount (*two-equal* condition), and two robots where one robot mainly provided information as a presenter and another who only replied as a listener (*two-nonequal* condition). In preparation for this condition, we employed a commercial robot, Sota (VSTONE, Japan), which has eight degrees of freedom (DOFs) and stands 28 cm tall. Sota has a speaker and an LED on its mouth that blinks to indicate its voice volume.

We also used two levels in the *voice* factor: a boy's voice for the presenter and girl's voice for the listener (*boy* condition), and a girl's voice for the presenter and a boy's voice for the listener (*girl* condition). We prepared different voices to avoid confusion about which robot is speaking because we were concerned that such voice differences might cause different feelings in the presentation. Note that this study is *not* comparing the voice effects; we only separately investigated the effects of the *number* factor.

We also prepared three different types of garments for the robots: a blue dress, a yellow dress, and traditional garb worn by the emperor and the empress for *hina-matsuri* (Japan's famous doll's festival) (Fig. 2). We again did not compare the feelings of *kawaii* among the kinds of clothing because this study is not interested in such direct comparisons.

Figure 2. Clothing used in experiments: Left: blue dress; Middle: yellow dress; Right: traditional garb worn by emperor and empress for hina-matsuri (Japan's famous doll's festival).

C. Visual stimuli

We prepared 25- to 39-second videos featuring one or two robots describing clothing. We used voice synthesis software (VOICE PEAK, AHS Co., Ltd.) for the robots' voices and prepared eighteen videos by considering the *number* factor (*one*, *two-equal*, and *two-nonequal*), the *voice* factor (*boy* and *girl*), and three different types of clothing. In the *one* condition, we prepared about ten sentences for each garment (e.g., for the blue dress, the robot says "the red button provides a good accent, and its heart shape is very cute!"). In the *two-equal* condition, the listener robot spoke half of the sentences on behalf of the presenter robot and added replies for another robot's speech. In the *two-nonequal* conditions, since the meaning of presenter robot's sentences are identical as in the *one* condition, the listener robot replied only to the presenter robot. The information amount toward each garment was essentially identical among the conditions, with variations in the number of robots and voice types. Each video's resolution was 1280 x 720 pixels.

D. Measurements

We employed questionnaire items to assess how strongly our participants experienced *kawaii:* the feeling of *kawaii* toward the clothes. This single question demonstrated a strong positive correlation with pleasure [43] and viewing durations in a free-viewing task [43] for the Japanese participants targeted in this study. The items were measured on a 0-to-10 response format, where 0 meant *not kawaii at all* and 10 meant *extremely kawaii*. We employed an 11-point response format because a previous paper argued that this style more closely approximates interval data [44].

E. Procedure

All the procedures were approved by the Advanced Telecommunication Research Review Boards (501-3). Participants first read the experiment's explanations and guidelines for evaluating each video. They then viewed all six videos for one type of clothing in different orders and completed questionnaires for each one. We employed a within-participant design where the participants watched 6 x 3 (18) videos and evaluated them. The order of the videos was counterbalanced. Finally, participants responded to dummy questions to verify the quality of their answers because prior research identified the necessity for such screening in web surveys [45, 46]. We prepared three dummy items to detect lazy/dishonest participants using an example instruction manipulation check from a previous work [46] and removed those who failed to follow directions.

F. Participants

Our experiment was conducted using the participant pools of a Japanese survey company with 200 people: 100 women, 99 men, and 1 who declined to specify; their average age was 44.64. After applying a screening process, which included the above dummy questions, the number of valid participants was reduced to 161: 79 women and 82 men, whose average age was 41.43.

IV. Results

A. Questionnaire results about the blue dress

We conducted a two-factor repeated-measures ANOVA with a *number* factor (*one*, *two-equal*, and *two-nonequal*) and a *voice* factor (*boy* and *girl*) for feelings of *kawaii* toward the blue dress (Fig. 3). The results showed a significant main effect for the *number* factor (F (2,320) = 94.751, $p < 0.001$, partial $\eta^{2} = 0.372$) and the *voice* factor (F (1, 320) = 41.535, $p < 0.001$, partial $\eta^2 = 0.206$). The results showed no significant difference in the interaction effect (F (2, 320) = 1.08394.751, $p = 0.340$, partial $\eta^2 = 0.007$).

Multiple comparisons with the Bonferroni method of simple main effects showed significant differences in the *number* factor: *two-equal* > *one* ($p < 0.001$), *two-nonequal* > *one* ($p < 0.001$), and *two-equal* > *two-nonequal* ($p < 0.001$).

The results indicate that when two robots equally described the blue dress, the participants evaluated the feeling of *kawaii* more highly than the other conditions. With two robots, regardless of the difference in the amount of speech, the questionnaire results were significantly higher than with just one.

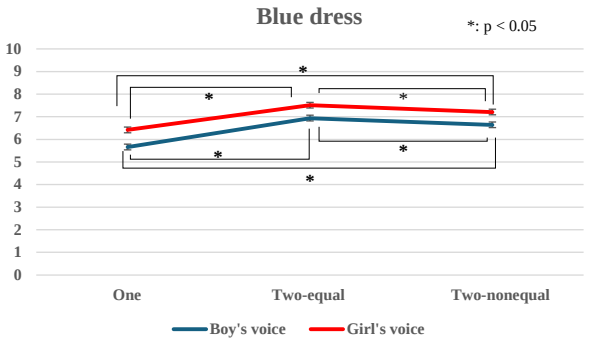

Figure 3. Means and standard errors of questionnaire rating scores about the feeling of *kawaii* toward blue dress

B. Questionnaire results about the yellow dress

We conducted a two-factor repeated-measures ANOVA with the *number* factor (*one*, *two-equal*, and *two-nonequal*) and the *voice* factor (*boy* and *girl*) for the feelings of *kawaii* toward the yellow dress (Fig. 4). The results showed a significant main effect for the number factor (F (2,320) = 71.510, $p < 0.001$, partial $\eta^{2} = 0.309$) and the *voice* factor (F (1, 320) = 47.162, $p < 0.001$, partial $\eta^2 = 0.228$). The results also showed a significant difference in the interaction effect (F (2, 320) = 17.606, $p < 0.001$, partial $\eta^2 = 0.099$).

Multiple comparisons with the Bonferroni method of the simple main effects showed significant differences in the

voice factor: in the *boy* condition (*two-equal* > *one*, $p < 0.001$, and *two-nonequal* > *one*, $p < 0.001$) and in the *girl* condition (*two-equal* > *one*, $p < 0.001$, and *two-nonequal* > *one*, $p < 0.001$). The simple main effects showed significant differences in the *number* factor: in the *one* condition (*girl* > *boy*, $p < 0.001$), in the *two-equal* condition (*girl* > *boy*, $p < 0.001$), and in the *two-nonequal* condition (*girl* > *boy*, $p = 0.017$).

The results indicate that when two robots equally described the yellow dress, the participants evaluated the feeling of *kawaii* more highly compared to a situation where only one robot did so. With two robots, regardless of the difference in the amount of speech, the questionnaire results are significantly higher with one robot. The *girl* voice was more highly evaluated than the *boy* voice.

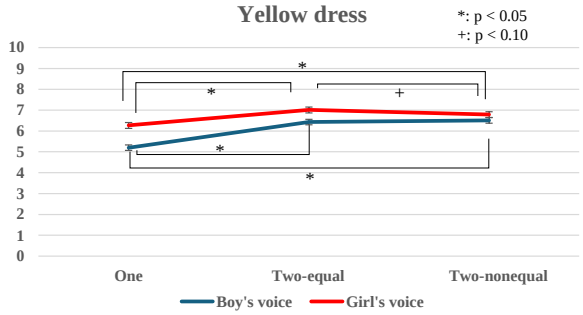

Figure 4. Means and standard errors of questionnaire rating scores of the feeling of *kawaii* toward yellow dress

C. *Questionnaire results about the traditional garb worn by emperor and empress for hina-matsuri*

We conducted a two-factor repeated-measures ANOVA with the *number* factor (*one*, *two-equal*, and *two-nonequal*) and the *voice* factor (*boy* and *girl*) for feelings of *kawaii* toward the emperor and empress (Fig. 5). The results showed a significant main effect for the number factor (F (2,320) = 105.600, $p < 0.001$, partial $\eta^{2} = 0.398$) and the *voice* factor (F (1, 320) = 22.314, $p < 0.001$, partial $\eta^{2} = 0.122$). The results also showed a significant difference in the interaction effect (F (2, 320) = 7.381, $p = 0.001$, partial $\eta^{2} = 0.044$).

Multiple comparisons with the Bonferroni method of simple main effects showed significant differences in the *voice* factor: in the *boy* condition (*two-equal* > *one*, $p < 0.001$, *two-nonequal* > *one*, $p < 0.001$, and *two-equal* > *two-nonequal*, $p=0.002$) and in the *girl* condition (*two-equal* > *one*, $p < 0.001$, and *two-nonequal* >*one*, $p < 0.001$). The simple main effects showed significant differences in the *number* factor: in the *one* condition (*girl* > *boy*, $p < 0.001$), and in the *two-nonequal* condition (*girl* > *boy*, $p < 0.001$).

The results indicate that when two robots equally described the traditional garb of the emperor and empress, the participants more highly evaluated the feeling of *kawaii* compared to a situation where only one robot did so. With two robots, regardless of the difference in the amount of speech, their questionnaire results are significantly higher with one robot. The *girl* voice was more highly evaluated than the *boy* voice.

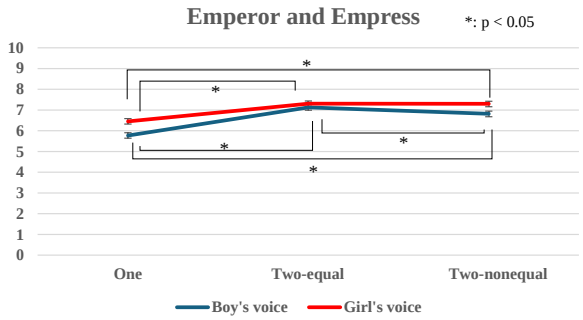

Figure 5. Means and standard errors of questionnaire rating scores of the feeling of *kawaii* toward emperor and empress garb

D. *Summary of results*

Our experimental results supported prediction 1: the participants experienced the greater feeling of *kawaii* when multiple robots presented the clothing than when a single robot did so. On the other hand, the results partially supported prediction 2: only in some of the clothing descriptions, participants experienced a greater feeling of *kawaii* when multiple robots described the clothing with an equal amount of speech than the robots with the not equal amount of speech. For example, when the yellow dress was presented, there were no significant differences between the *two-equal* and *two-nonequal* conditions.

We also identified influences of the *voice* factors. The girl's voices were basically preferred in the context of describing the feeling of *kawaii* toward the clothing. The combinations of the voice and number factors also showed interaction effects, e.g., when the garb of the emperor and empress was described, there were no significant differences between the *two-equal* and *two-nonequal* conditions when the girl's voices were used for the presenter robot.

V. DISCUSSION

A. *Implication*

This study offers several practical implications. First, our experiment results demonstrated that two robots are more crucial for enhancing the feeling of *kawaii* toward products than one. Such knowledge will contribute to prepare contents for robot sales clerks and provide additional evidence of the advantages of multiple robots in advertisement contexts [17, 18]. Our results showed the effectiveness of using two robots in the presentation compared to just one, even though their amount of speech is not equal. This result also provides promising knowledge for casting social robots as listeners that are incapable of conversation.

We expected that the effects of multiple robots would not be limited to increase the feeling of *kawaii* toward the presented objects. In fact, past studies successfully increased the attractiveness of products using multiple robots' explanations [17, 18]. Therefore, one interesting future research topic is investigating the various types of product attractiveness that can be enhanced by multiple robots, e.g., the impressions of appearances and prices.

Another possible research avenue is exploring the effects of a greater number of robots. Previous work has already

reported the effects of increasing attractiveness with more robots [4, 18], although neither study focused on the feeling of *kawaii*, and so the effectiveness of each number remains unknown. Another study investigated the feeling of *kawaii* toward robots by using one to ten robots; the study reported that two is better than other amounts [41]. Therefore, investigating the optimal number of robots in presentations will be interesting and useful for improving the designs of the contents of robot sales clerks.

B. Limitations

This study has several limitations. First, since we only used a specific robot (Sota) and specific products (robot's clothing), testing with different robots and products is essential to examine the effects of the number of robots in presentations. A past study reported that robot and human presenters can use the same technique to improve feelings of kawaii toward a product [40], although comparing two human presenters and one human presenter would provide additional knowledge in the context of making effective presentations. In addition, investigating the effects of different kinds of robots, such as androids with quite human-like appearances [47-49], might induce different *kawaii* feelings. Despite these limitations, we believe that our study provides basic knowledge about investigating the relationships among the number of robots, their amount of speech, and the feeling of *kawaii*.

VI. CONCLUSION

This study investigated the effects of amount of speech in presentations by multiple robots. We focused on clothing as a presentation target product for robots because a market for robot's clothing is emerging due to the recent proliferation of pet/social robots. We conducted a web survey and concluded that product recommendations by multiple robots make products more positive than such recommendations by a single robot. We found that equalized the amount of speech make a part of products more positive compared to the biasing amount of speech in presentations. We believe that the knowledge from this study contributes in designing the conversation contents of multiple robots.

REFERENCES

[1] Y. Jiang, and J. Wen, "Effects of COVID-19 on hotel marketing and management: a perspective article," *International Journal of Contemporary Hospitality Management*, 2020.

[2] S. S. Kim, J. Kim, F. Badu-Baiden, M. Giroux, and Y. Choi, "Preference for robot service or human service in hotels? Impacts of the COVID-19 pandemic," *International Journal of Hospitality Management*, vol. 93, pp. 102795, 2021.

[3] S. Song, J. Baba, Y. Okafuji, J. Nakanishi, Y. Yoshikawa, and H. Ishiguro, "Out for In! Empirical Study on the Combination Power of Two Service Robots for Product Recommendation," in Proceedings of the 2023 ACM/IEEE International Conference on Human-Robot Interaction, Stockholm, Sweden, pp. 408–416, 2023.

[4] T. Iwamoto, J. Baba, J. Nakanishi, K. Hyodo, Y. Yoshikawa, and H. Ishiguro, "Playful Recommendation: Sales Promotion That Robots Stimulate Pleasant Feelings Instead of Product Explanation," *IEEE Robotics and Automation Letters*, vol. 7, no. 4, pp. 11815-11822, 2022.

[5] 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.

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

[7] G. Barbareschi, M. Kawaguchi, H. Kato, M. Nagahiro, K. Takeuchi, Y. Shiiba, S. Kasahara, K. Kunze, and K. Minamizawa, ""I am both here and there" Parallel Control of Multiple Robotic Avatars by Disabled Workers in a Café," in Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems, Hamburg, Germany, pp. Article 75, 2023.

[8] W. Kamino, and S. Sabanovic, "Coffee, Tea, Robots? The Performative Staging of Service Robots in 'Robot Cafes' in Japan," in Proceedings of the 2023 ACM/IEEE International Conference on Human-Robot Interaction, Stockholm, Sweden, pp. 183–191, 2023.

[9] T. Iio, Y. Yoshikawa, M. Chiba, T. Asami, Y. Isoda, and H. Ishiguro, "Twin-Robot Dialogue System with Robustness against Speech Recognition Failure in Human-Robot Dialogue with Elderly People," *Applied Sciences*, vol. 10, no. 4, pp. 1522, 2020.

[10] H. Sumioka, N. Yamato, M. Shiomi, and H. Ishiguro, "A minimal design of a human infant presence: a case study toward interactive doll therapy for older adults with dementia," *Frontiers in Robotics and AI*, vol. 8, pp. 633378, 2021.

[11] N. Yamato, H. Sumioka, H. Ishiguro, M. Shiomi, and Y. Kohda, "Technology Acceptance Models from Different Viewpoints of Caregiver, Receiver, and Care Facility Administrator: Lessons from Long-Term Implementation Using Baby-Like Interactive Robot for Nursing Home Residents with Dementia," *Journal of Technology in Human Services*, pp. 1-26, 2023.

[12] M. Shiomi, T. Kanda, H. Ishiguro, and N. Hagita, "Interactive Humanoid Robots for a Science Museum," *IEEE Intelligent Systems*, no. 2, pp. 25-32, 2007.

[13] P. K. Nikolić, and M. R. M. Tomari, "Robot-Robot Interaction, Toward New Conversational Artificial Intelligence Aesthetic," in 10th International Conference on Digital and Interactive Arts, Aveiro, Portugal, Portugal, pp. Article 15, 2022.

[14] A. Nijholt, "Robotic Stand-Up Comedy: State-of-the-Art," in Distributed, Ambient and Pervasive Interactions: Understanding Humans, Cham, pp. 391-410, 2018.

[15] C. Shi, M. Shiomi, C. Smith, T. Kanda, and H. Ishiguro, "A Model of Distributional Handing Interaction for a Mobile Robot," in Robotics: Science and Systems, Berlin, Germany, pp., 2013.

[16] M. Shiomi, "A systematic survey of multiple social robots as a passive- and interactive-social medium," *Advanced Robotics*, pp. 1-15, 2023.

[17] D. Sakamoto, K. Hayashi, T. Kanda, M. Shiomi, S. Koizumi, H. Ishiguro, T. Ogasawara, and N. Hagita, "Humanoid Robots as a Broadcasting Communication Medium in Open Public Spaces," *International Journal of Social Robotics*, vol. 1, no. 2, pp. 157-169, 2009.

[18] J. Amada, Y. Okafuji, K. Matsumura, J. Baba, and J. Nakanishi, "Investigating the crowd-drawing effect, on passersby, of pseudo-crowds using multiple robots," *Advanced Robotics*, vol. 37, no. 6, pp. 423-432, 2023.

[19] M. Aizawa, and H. Umemuro, “Behavioral Design of Guiding Agents to Encourage their Use by Visitors in Public Spaces,” in Companion of the 2021 ACM/IEEE International Conference on Human-Robot Interaction, Boulder, CO, USA, pp. 247–251, 2021.

[20] S. Song, J. Baba, Y. Okafuji, J. Nakanishi, Y. Yoshikawa, and H. Ishiguro, “Wingman-Leader Recommendation: An Empirical Study on Product Recommendation Strategy Using Two Robots,” *IEEE Robotics and Automation Letters*, vol. 9, no. 3, pp. 2272-2278, 2024.

[21] J. Hurtienne, and D. Arnold, “The Naked Truth?,” in Companion of the 2020 ACM/IEEE International Conference on Human-Robot Interaction, Cambridge, United Kingdom, pp. 269–271, 2020.

[22] Z. Ye, “Fashion and Sustainable Practices: Fashionable Companion Robots,” in Creativity and Cognition, pp. 694-697, 2022.

[23] N. Yoshida, S. Yonemura, M. Emoto, K. Kawai, N. Numaguchi, H. Nakazato, S. Otsubo, M. Takada, and K. Hayashi, “Production of character animation in a home robot: A case study of lovot,” *International Journal of Social Robotics*, vol. 14, no. 1, pp. 39-54, 2022.

[24] Z. Ye, W.-C. Chen, and S. Sabanovic, “Dressing up AIBO: An Exploration of User-generated Content of Robot Clothing on Twitter,” in Proceedings of the 11th International Conference on Human-Agent Interaction, pp. 81-89, 2023.

[25] Y. Tamura, M. Shiomi, M. Kimoto, T. Iio, K. Shimohara, and N. Hagita, “Robots as an interactive-social medium in storytelling to multiple children,” *Interaction Studies*, vol. 22, no. 1, pp. 110-140, 2021.

[26] M. Alemi, A. Taheri, A. Shariati, and A. Meghdari, “Social Robotics, Education, and Religion in the Islamic World: An Iranian Perspective,” *Science and Engineering Ethics*, vol. 26, no. 5, pp. 2709-2734, 2020.

[27] Y. Okada, M. Kimoto, T. Iio, K. Shimohara, and M. Shiomi, “Two is better than one: Apologies from two robots are preferred,” *Plos one*, vol. 18, no. 2, pp. e0281604, 2023.

[28] T. Hirayama, Y. Okada, M. Kimoto, T. Iio, K. Shimohara, and M. Shiomi, “What is the speed boundary between patting and slapping by a robot? Investigating perceptions toward robot-robot interaction,” in Proceedings of the 10th International Conference on Human-Agent Interaction, pp. 212-218, 2022.

[29] Y. Okada, R. Taniguchi, A. Tatsumi, M. Okubo, M. Kimoto, T. Iio, K. Shimohara, and M. Shiomi, “Effects of Touch Behaviors and Whispering Voices in Robot-Robot Interaction for Information Providing Tasks,” in 2020 29th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN), pp. 7-13, 2020.

[30] R. LC, M. Benayoun, P. Lindborg, H. Xu, H. C. Chan, K. M. Yip, and T. Zhang, “Power Chess: Robot-to-Robot Nonverbal Emotional Expression Applied to Competitive Play,” in 10th International Conference on Digital and Interactive Arts, Aveiro, Portugal, Portugal, pp. Article 2, 2022.

[31] T. Iio, Y. Yoshikawa, and H. Ishiguro, “Double-meaning agreements by two robots to conceal incoherent agreements to user's opinions,” *Advanced Robotics*, vol. 35, no. 19, pp. 1145-1155, 2021.

[32] T. Arimoto, Y. Yoshikawa, and H. Ishiguro, “Multiple-Robot Conversational Patterns for Concealing Incoherent Responses,” *International Journal of Social Robotics*, vol. 10, no. 5, pp. 583-593, 2018.

[33] H. Nittono, M. Fukushima, A. Yano, and H. Moriya, “The power of kawaii: Viewing cute images promotes a careful behavior and narrows attentional focus,” *PloS one*, vol. 7, no. 9, pp. e46362, 2012.

[34] H. Nittono, “The two-layer model of'kawaii': A behavioural science framework for understanding kawaii and cuteness,” *East Asian Journal of Popular Culture*, vol. 2, no. 1, pp. 79-96, 2016.

[35] S. Kinsella, "Cuties in japan," *Women, media and consumption in Japan*, pp. 230-264: Routledge, 2013.

[36] S. Lieber-Milo, and H. Nittono, “From a Word to a Commercial Power: A Brief Introduction to the Kawaii Aesthetic in Contemporary Japan,” *Innovative Research in Japanese Studies*, vol. 3, pp. 13-32, 2019.

[37] K. Lorenz, “The innate forms of potential experience,” *Z Tierpsychol*, vol. 5, pp. 235-409, 1943.

[38] V. Brooks, and J. Hochberg, “A psychophysical study of" cuteness.",” *Perceptual and Motor Skills*, 1960.

[39] M. Ohkura, "Kawaii engineering," *Kawaii Engineering*, pp. 3-12: Springer, 2019.

[40] Y. Okada, M. Kimoto, T. Iio, K. Shimohara, H. Nittono, and M. Shiomi, “Kawaii emotions in presentations: Viewing a physical touch affects perception of affiliative feelings of others toward an object,” *Plos one*, vol. 17, no. 3, pp. e0264736, 2022.

[41] M. Shiomi, R. Hayashi, and H. Nittono, “Is two cuter than one? number and relationship effects on the feeling of kawaii toward social robots,” *PLOS ONE*, vol. 18, no. 10, pp. e0290433, 2023.

[42] H. Itahara, M. Kimoto, T. Iio, K. Shimohara, and M. Shiomi, “How Does Exposure to Changing Opinions or Reaffirmation Opinions Influence the Thoughts of Observers and Their Trust in Robot Discussions?,” *Applied Sciences*, vol. 13, no. 1, pp. 585, 2023.

[43] H. Nittono, and N. Ihara, “Psychophysiological responses to kawaii pictures with or without baby schema,” *SAGE Open*, vol. 7, no. 2, pp. 2158244017709321, 2017.

[44] H. Wu, and S.-O. Leung, “Can Likert scales be treated as interval scales?—A Simulation study,” *Journal of Social Service Research*, vol. 43, no. 4, pp. 527-532, 2017.

[45] J. S. Downs, M. B. Holbrook, S. Sheng, and L. F. Cranor, “Are your participants gaming the system? screening mechanical turk workers,” in Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Atlanta, Georgia, USA, pp. 2399–2402, 2010.

[46] D. M. Oppenheimer, T. Meyvis, and N. Davidenko, “Instructional manipulation checks: Detecting satisficing to increase statistical power,” *Journal of experimental social psychology*, vol. 45, no. 4, pp. 867-872, 2009.

[47] D. Sakamoto, and H. Ishiguro, “Geminoid: Remote-controlled android system for studying human presence,” *Kansei Engineering International*, vol. 8, no. 1, pp. 3-9, 2009.

[48] D. F. Glas, T. Minato, C. T. Ishi, T. Kawahara, and H. Ishiguro, “Erica: The erato intelligent conversational android,” in Robot and Human Interactive Communication (RO-MAN), 2016 25th IEEE International Symposium on, New York, NY, United States, pp. 22-29, 2016.

[49] M. Shiomi, H. Sumioka, K. Sakai, T. Funayama, and T. Minato, “SŌTO: An Android Platform with a Masculine Appearance for Social Touch Interaction,” in Companion of the 2020 ACM/IEEE International Conference on Human-Robot Interaction, Cambridge, United Kingdom, pp. 447–449, 2020.