A Communication Robot for Playing Video Games Together to Boost Motivation for Daily-use

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Abstract—Nowadays, decreasing opportunities for people to have daily conversations due to the increase in the number of withdrawn young people and households living alone. The lack of daily conversation has been pointed out as a risk that can lead to mental problems such as depression, and serious health problems such as dementia for the elderly. Efforts to encourage daily communication by having communication robots that act as talking partners is attracting attention to solve those problems. One of the challenges of communication robots is the difficulty of maintaining users' motivation to continue using robots. In this study, we propose the communication robot that plays a video game together with a user as an approach to keep the user's motivation high to use the robot. The proposed method not only controls the dialogue content of the robot but also controls the video game situation by manipulating the video game character. In this system, we aim to create an atmosphere where users can enjoy playing video games with the robot together, and the proposed game communication robot can keep their motivation high to use the robot.

Index Terms—component, formatting, style, styling, insert

I. INTRODUCTION

In Japan, one-person households are becoming increasingly nowadays [1]. As a result, the opportunities for daily conversation at home are decreasing. Especially, people who live alone have fewer opportunities for daily conversation at home. In addition, the number of young people who are in social reclusion is increasing, and have significantly less communication with other people. Lack of daily conversation has also been reported to be a risk of serious health problems such as depression and dementia [2]. This is not limited to the elderly, but it is a major problem for people of all ages today. Communication robots have been attracting attention to solve this problem as a way to encourage daily life communication [3]–[5]. These communication robots are not robots only for a specific task, but rather robots that can build a trust relationship with humans as a partner. To encourage users to communicate with the robot on a daily basis, it is necessary to maintain a high level of motivation for daily use, where users want

to continue using the communication robot in daily life. In recent years, many robots have been developed to engage in completely free thematic chats, and the unnaturalness and semantic breakdowns of conversations are being improved. However, it is difficult to maintain motivation for daily use of robots because it is hard to keep in conversation over a long period. The important features are interesting communication as well as natural conversation [6].

II. RELATED WORK

As a communication robot with natural interaction and interesting conversation, a TV chat robot [7]–[9] was proposed to talk with users while watching TV together. The TV chatting robot can provide an environment where users can naturally interact with the robot as if they were watching TV with user's friends. This is because the robot can talk to user while watching the same TV together. The robot's talk based on TV content also has the advantage of making robot easier to create natural conversations. In a completely free-themed chat, it is difficult to continue talking without breaking the flow of the conversation, and it is also difficult to provide a variety of topics to entertain the user. On the other hand, the common topic of TV programs makes it possible to have natural conversations. In addition, since the program itself is in line with user's taste, it is easy to have conversations related to what user finds interesting.

Hoshi et al proposed TV chat robots through TV subtitle extraction, speech recognition and video object detection that objects on the TV are detected and used as keywords [9]. Next, words with high similarity to the keywords extracted from the dictionary. Finally, the system generates a sentence by applying words to a template created based on past subtitle data. Then, the robot looks at the user and makes gestures based on the directional estimation using a camera and a microphone to make the conversation natural.
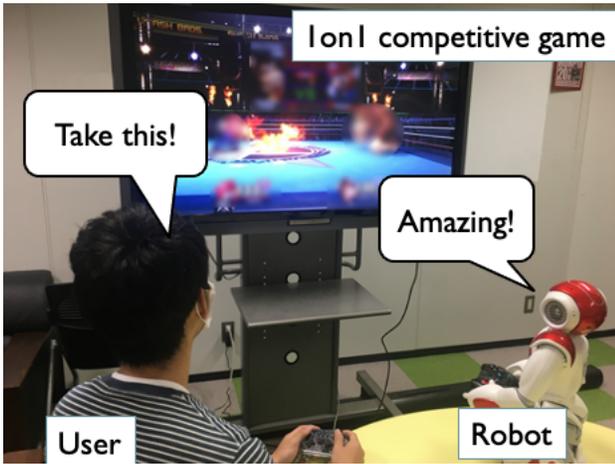
Fig. 1. The scene of playing game with the game communication robot.

Fig. 2. The system structure of the game communication robot.

Moreover, Minami et al and Nishimura et al use social media comments about the TV program to generate conversations, it is possible to realize diverse and interesting conversations that will keep users interested to communicate with robots [7], [8]. In those systems, the TV chatting robot realized natural interaction and interesting conversations, which contributed to increasing users' motivation to continue using the system.

III. GAME COMMUNICATION ROBOT

In addition to the TV chatting robot in the related work, we propose the communication robot that plays TV games with a user. The main goal of this study is not to encourage users to have more conversations during playing games but to keep users' motivation high using robots. Figure 1 shows a scene of an actual video game being played using the proposed robot. The user plays a game character on the left, and the robot that connects with the PC plays another character on the right. Figure 2 shows an overview of the configuration of the proposed system. The input to the system is the video sent from the game console and the video from the camera that captures the user's expressions and reactions. The video from the game console is used to obtain information about the game situation using object detection. For example, the positions of each character in the game and the amount of damage received are extracted as features to represent the game situation. This information is used to generate dialogue text and to control the video game character. The user's facial expressions and reactions are used to estimate the user's emotions. Moreover, estimated emotions are used to modify the dialogue text and video game character operations.

The proposed robot does not only watch the TV game together like the TV chatting robot but also controls the video game characters by itself. Therefore, the proposed method consists of two major controls: "dialogue" and "game development". In this study, we will use the video game called "Super Smash Bros. Ultimate", a one-on-one competitive game for Switch that is a video game console developed by Nintendo Co., Ltd.
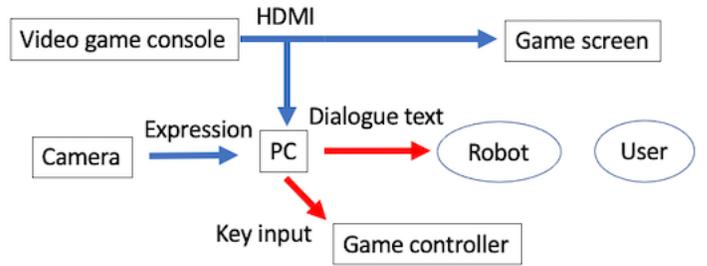
A. Dialogue

The proposed robot performs dialogue based on the video game scene. For example, the robot creates the dialogue when the user's character makes an attack movement, or plays a happy statement when the robot defeats the user's character in the video game. Moreover, the robot sometimes praises the user's play-action that makes the user feels good. In addition to that, the dialogue texts are changed according to the user's preference. If the user wants to play peacefully and enjoyably, the dialogue can be gentle, and if the user wants to fight fiercely and passionately, the dialogue can be provocative. The robot also reacts with the content of dialogue to lets the user understand and create an atmosphere playing a video game together with the robot.

B. Game Development

The proposed robot can control the flow of the video game to a certain extent because the robot itself controls the game character. Therefore, we can create a game development that the user can enjoy playing and making friends with the robot. To do this, first we investigate how people play games with each other to find out types of game development they like. For example, we consider a game development in which the player wins comfortably by winning in an upset, or inflicts heavy damage by hitting a series of moves. We believe that by intentionally creating such game developments to extent users do not feel unnatural, then they will be able to play the game comfortably and enjoyably. In addition, the gameplay is changed according to characteristics and tastes of the user. If the user is not familiar with the game, the level of the robot's game character control will be lower. If the user is unfamiliar with the game but wants he/she to fight against stronger opponents, the level of the robot's game character control will be higher.

IV. CONCLUSION AND FUTURE WORK

In this study, we proposed a communication robot that plays video games together with a user to increase the opportunity to have a daily conversation. By having fun playing with the robot and becoming friends with the robot, we aim to increase the motivation to continue using the communication robot. For this purpose, our system aims to control not only the speech content but also the game development. For future

studies, three projects are in our minds. First, in order to improve the accuracy of detecting characters on the game screen, prototypes will be improved, and to create algorithms for dialogue and game control. Second, an investigation between conversations and facial expressions of people who play a game together. Third, investigation of the changing relationship between conversation and users' feelings in a different game scene. Based on these findings, a preliminary experiment will conduct to investigate the usability of the proposed communication robot will be the next step.

REFERENCES

[1] J. C. Office, "Annual Report on the Aging Society: 2017 (Summary)," pp. 1-4, 2017.

[2] J. Holt-Lunstad, T. B. Smith, and J. B. Layton, "Social Relationships and Mortality Risk: A Meta-analytic Review," PLOS Medicine, Vol. 7, pp. 1-20, 2010.

[3] S. Nishimura, D. Kimata, W. Sato, M. Kanbara, Y. Fujimoto, H. Kato, and N. Hagita, "Positive Emotion Amplification by Representing Excitement Scene with TV Chat Agents," Sensors , Vol. 20, No. 24, pp. 1-15, 2020.

[4] K. YoshinoEmail, Y. Murase, N. Lubis, K. Sugiyama, H. Tanaka, S. Sakriani, S. Takamichi, and S. Nakamura, "Spoken Dialogue Robot for Watching Daily Life of Elderly People," Increasing Naturalness and Flexibility in Spoken Dialogue Interaction. Lecture Notes in Electrical Engineering, Springer, Vol. 714, pp. 141-146, 2021.

[5] T. Iio, Y. Yoshikawa, and H. Ishiguro, "Starting a Conversation by Multi-Robot Cooperative Behavior," In Proceedings of the International Conference on Social Robotics, Springer: Cham, pp. 739–748, 2017.

[6] K. Miyazawa, T. Tokoyo, Y. Masui, N. Matsuo, and H. Kikuchi, "Factors of interaction in the spoken dialogue system with high desire of sustainability," Trans. IEICE (A), Vol. 95, No. 1, pp. 27-36, 2012.

[7] H. Minami, H. Kawanami, M. Kanbara, and N. Hagita, "Chat robot coupling machine responses and social media comments for continuous conversation," IEEE International Conference on Multimedia and Expo Workshops (ICMEW), pp. 1-6, 2016.

[8] S. Nishimura, M. Kanbara, and N. Hagita, "Atmosphere Sharing with TV Chat Agents for Increase of User's Motivation for Conversation," Published in Human Aspects of IT for the Aged Population, pp. 482-492, 2019.

[9] Y. Hoshi, Y. Kaneko, M. Uehara, Y. Hagio, Y. Murasaki, S. Nishimura, and M. Yamamoto, "Utterance Function for Companion Robot for Humans Watching Television," IEEE International Conference on Consumer Electronics (ICCE) pp. 1-5, 2020.