Promoting Model-Based Self-Review of Presentation with Robot

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ABSTRACT

Self-reviewing presentation is essential for researchers in order to improve presentation. In general, they could use a presentation video for self-review. However, they would feel quite uncomfortable due to their looks and voice on the video. To address this issue, in our previous work, we implemented a presentation avatar as virtual character on PC, which reproduces the presentation researchers make, and which reduce such uncomfortableness. In the case study with the presentation avatar, we ascertained that it promoted self-review more significantly than presentation video. On the other hand, we also ascertained that unskillful researchers had difficulties in finding out points to be modified about nonverbal behavior, and had difficulties in minutely self-reviewing their presentation. In this paper, we propose a presentation robot, which promotes their engagement and awareness of points to be modified in self-reviewing. In order to allow them to minutely self-review their own presentation, in addition, we have built a model of presentation behavior, whose purpose is to design a checklist including points to be reviewed. The results of a case study with the system suggest the potential of the presentation robot for promoting engagement in self-reviewing presentation.

KEYWORDS

Humanoid robot, Presentation model, Self-review, Presentation behavior, Avatar

1 INTRODUCTION

Presentation is very important for researchers. They always need to present their work properly. Proper presentation requires them to conduct rehearsal to improve their presentation before actual presentation. There are two types of rehearsal, which are rehearsal with peers and self-rehearsal. In the rehearsal with peers, the researchers could obtain reviews of their presentation from the peers including more skillful lab members [1]. In self-rehearsal, on the other hand, the researchers need to make presentation and review it by themselves to find out points to be modified.

In this work, we have focused on how to help unskilled researchers self-review their presentation. In self-rehearsal, researchers usually make presentation to themselves with their PC. However, they often miss finding some points to be modified, because they need to review it in concurrent with making their presentation. On the other hand, there is another way for self-reviewing, in which they could make a video of their presentation and then check it out. Although it allows them to direct more efforts to review, they would feel quite uncomfortable due to their looks and voice on the video. This uncomfortableness prevents the researchers from self-reviewing.

In our previous work, we have developed a presentation avatar (P-Avatar for short) system, which acts as a virtual character for reproducing the presentation researchers make so that it allows them to self-review their own presentation with less uncomfortable sense [2]. The results of the case study with the system suggested that P-Avatar promoted their self-review more significantly than presentation video [2]. However, we also ascertained that unskillful researchers still had difficulties in finding out points to be modified particularly about nonverbal behavior such as pointing gesture and eye direction [2]. In addition, they would also have difficulties in minutely self-reviewing their presentation since they have insufficient knowledge about what to review [2].

In order to address these issues, we propose a presentation robot (P-Robot for short) which reproduces presentation made by researchers. The embodied reproduction with P-Robot could promote their engagement in self-reviewing and their awareness of points to be modified particularly about nonverbal behavior. We also propose a model of research presentation behavior with slides, whose purpose is to design a checklist including points to be reviewed. It allows minutely model-based self-review of presentation.

2 SELF-REVIEW

2.1 Presentation Rehearsal

We consider that rehearsal can be viewed as a cyclic process involving three phases, which are preliminary presentation, review, and modification. In the phase of preliminary presentation, learners rehearse presentation with a presentation document (P-document for short) such as PowerPoint/Keynote file. In the review phase, they receive reviews from peers, or they check out their presentation by themselves to find out points to be modified. In the phase of modification, the learners modify the P-document, oral explanation, gesture, etc. with the review results. By repeating these phases, the learners can improve their presentation before actual presentation.

Figure 1: Presentation Robot

Among these phases, the review phase is particularly important. Although peer review is an instructive way for improving presentation, conducting self-review before peer review is also important. Learners could learn from the comparison between the results of self-review and the ones of peer review, which allows them to improve their skills in self-review, and to contribute to improving presentation. Self-review is accordingly indispensable particularly for unskilled researchers.

In self-reviewing, they could make a video of their presentation and then check it out for minute self-review. On the other hand, they would feel quite uncomfortable due to their looks and voice on the video. Such uncomfortable sense would occur from discrepancy between the looks/voice learners expect and the recorded looks/voice. It is accordingly quite difficult for them to review their own presentation with the uncomfortable sense. Even though they could overcome the uncomfortable sense, in addition, there would be a limit to finding points to be modified. In general, it is quite difficult for most learners to review their own presentation compared with reviewing presentation made by others. An objective perspective on presentation contributes to gaining awareness of points to be modified. But, it is quite hard to hold such perspective in self-review.

In order to resolve the above problems, we have designed P-Avatar, which reproduces their presentation, and which allows the learners to review the presentation with less uncomfortable sense.

2.2 Presentation Avatar

2.2.1 Self-Review Promotion. In order to remove uncomfortable sense brought about in checking out a presentation video to promote self-reviewing the presentation, we designed P-Avatar. We are currently considering P-Avatar virtual character running on computer and humanoid robot operating in real world. P-Avatar has some requirement for promoting self-review. First, looks and voice of P-Avatar need to be completely different from learners' ones so that they do not receive any uncomfortable feeling. Second, P-Avatar needs to keep their utterance and reproduce their behavior as exactly as possible so that it allows learners to self-review accurately.

2.2.2 Presentation Avatar as Virtual Character. Based on the above discussion, in our previous work [2], we implemented P-Avatar system, in which P-Avatar is a virtual character as shown in Fig. 1 [2]. In self-rehearsal with P-Avatar system, learners first make preliminary presentation. P-Avatar records the slides used, timing of slide transition in using their P-document, and their voice/nonverbal behavior. P-Avatar then reproduces the presentation with the recorded data as exactly as possible. But, the voice tone is changed with P-Avatar's one. The learners then check out the reproduced presentation. In this way, the presentation reproduction allows the learners to gain more awareness of points to be modified in self-review. The system uses the secondary creation of the character "Hatsune Miku" [3] of Crypton Future Media, INC as P-Avatar shown in Fig. 1.

We have conducted the case study using the P-Avatar system, in which we compared self-review with presentation video and self-review with the P-Avatar system [2]. The results suggest that P-Avatar has a potential for promoting self-review significantly to improve presentation [2].

However, we also ascertained that the virtual character as P-Avatar had difficulties in providing learners with adequate awareness of points to be modified for nonverbal behavior including pointing gesture and face orientation from the P-Avatar's gestures [2]. In addition, they would also have difficulties in minutely self-reviewing their presentation since they have insufficient knowledge about what to review [2].

Table 1: Features of Robot and Virtual Character

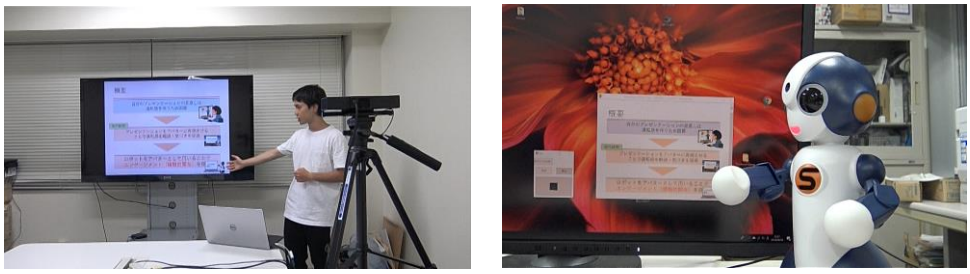
	Robot	**Virtual Character**
Embodiment	3D	2D
Motion	Segmented	Continuous

2.3 Using Robot as P-Avatar

Towards these issues, we use a robot as P-Avatar, with which nonverbal presentation behavior could be embodied. Table 1 shows the features comparison between the robot and the virtual character. Related work on comparing robot and virtual character suggested that robot provides more acceptable embodiment of human than virtual character. Kidd C et al. also pointed out that robot is more engaging, credible, informative in human interaction than virtual character because of its physical embodiment [4]. Tanaka T, et al. indicated that robot had high noticeability, and its motion with pointing gesture would be effective in directing human's attention [5]. Such embodiment could contribute to promoting engagement in self-reviewing. In addition, continuous motion of gestures made by learners is also segmented and transformed into robot gestures. The robot could accordingly make the original gestures more discriminable.

From these features of robot, P-Robot is expected to promote awareness of points to be modified particularly about nonverbal behavior.

3 PRESENTATION ROBOT



(a) Capturing and Recording (b) Reproduction with P-Robot

Figure 2: Presentation Robot

3.1 Overview

The main purpose of P-Robot is to promote engagement and awareness of points to be modified in self-review with embodied reproduction, in addition to removing uncomfortable sense. P-Robot promotes model-based self-review with the checklist, which is obtained from the model of research presentation behavior mentioned in the next section.

Presentation behavior made by learners is first captured and recorded with Kinect, and then reproduced by P-Robot. The learners are expected to review the reproduced presentation with the checklist.

3.2 Presentation Robot System

We have developed a P-Robot system. It captures and records presentation learners make with Kinect as shown in Fig. 2 (a). P-Robot reproduces their presentation behavior with the recorded data, in which the recorded gesture and utterance are kept, and in which the voice tone is changed. Such reproduction allows P-Robot to enhance embodiment of their gestures to promote engagement in self-reviewing and their awareness of points to be modified.

Let us demonstrate in detail how to reproduce the presentation with P-Robot. In the presentation recording, the system displays a slide of PPT file using PowerPoint. Learners can make the transition from the current slide to the next/previous one via keyboard. The system records the slide transition timing. Kinect captures position coordinates of 25 joints learners have and face orientation except facial expression and finger motion during their presentation. The frame rate of Kinect is 30 fps. Based on the captured data, movement of P-Robot is generated in real time. The microphone equipped with Kinect also records their oral explanation.

When the learners finish their presentation, the system generates the recorded data of voice, motion including gesture, and slide transition timing. P-Robot uses the recorded data to reproduce the presentation. As for oral explanation, the system transforms the voice tone by adjusting the value of fundamental frequency and formant frequency. The fundamental frequency indicates voice height. The formant frequency also indicates resonance determined by the shape of a vocal tract or an oral cavity, and characterizes individual voices.

When they replay the presentation, the gestures recorded are projected as movement of P-Robot simultaneously with the transformed voice as shown in Fig. 2 (b). Sota as P-Robot has 8 joints including neck (yaw, pitch and roll), shoulder, elbow and hip, and has no fingers. Due to such limitation of Sota, P-Robot reproduces hand gesture, face orientation, and body direction. Under this limitation, P-Robot reproduces presentation as exactly as possible. The presentation slides are displayed on PowerPoint running in windowed mode, which receives the data about slide transition timing from P-Robot via local wireless network, and which makes the transition. The learners can also adjust P-Robot's pointing directions to slide contents by changing size/position of slide. In self-reviewing, the learners can stop and replay the reproduction via a controller on the browser.

4 MODEL OF RESEARCH PRESENTATION BEHAVIOR

Referring to related work on presentation for research, we have designed a model of presentation behavior as shown in Fig. 3 [7, 8]. In the model, there are three layers, which are intentions of presentation behavior, presentation behavior, and components of presentation behavior. The model illustrates how behavior intentions could be accomplished with behaviors involving a number of their components. In case a learner intends to promote comprehension of the slide contents, for example, the intention could be accomplished with presentation behavior for emphasizing important parts in the slide, which includes several components: decorating the important parts in the slide as text decoration, pointing to them as deictic hand gesture, increasing voice volume for them as paralanguage, etc.

Following this model, we have designed a checklist including points to be reviewed. Following such checklist during self-review, learners can ascertain whether they conduct behavior for attracting attention to slide contents, behavior for promoting comprehension of the slide contents, etc. They can also ascertain the suitability of the slide contents depending on their intention. Such self-review allows them to minutely review their presentation and to enhance their awareness of points to be modified.

5 CASE STUDY

We had a case study whose purpose was to ascertain whether P-Robot could promote model-based self-review compared to

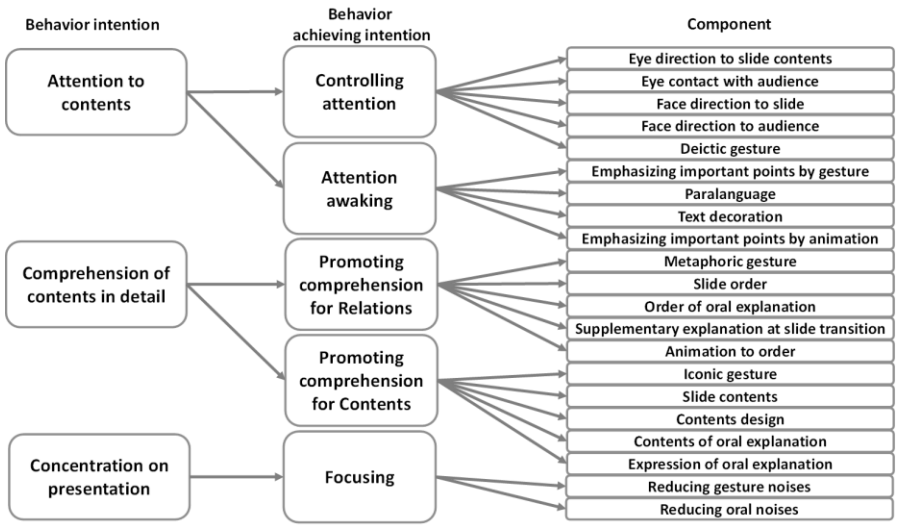


Figure 3: Model of Research Presentation Behavior

presentation video as general way to self-review.

The participants were 6 graduate students in informatics and engineering. We set two conditions: self-review with presentation v ideo, and self-review with P-Robot. This study included 2 sessions referred as Session I (presentation) and Session II (self-review). Before Session I, all participants were required to prepare their PPT document including the contents of their research. In Session I, they were first required to make presentation, which was recorded by video camera and Kinect. In Session II, each participant conducted self-review twice with the checklist under two conditions.

In order to ascertain whether P-Robot could promote engagement and remove uncomfortable sense more than the presentation video, we compared engagement scores and uncomfortable sense scores from the answers to questionnaires which were conducted after each conditions. In order to ascertain whether P-Robot could enhance awareness of points to be modified more than presentation video, we also compared the numbers of points found in Session II, which we summed up from annotations made in the handouts.

The results suggest that P-Robot contributes to promote engagement in self-reviewing and to remove uncomfortable sense. However, we could not confirm that P-Robot promoted awareness of points to be modified. The possible reason is some inaccurate reproduction of P-Robot, because the system could not sometimes capture face orientation due to difficulty of face tracking API. Although the other gesture was reproduced accurately, there is possibility that some inaccurate gesture prevented the participants from becoming aware of points to be modified, and caused distrust of reproduction. We accordingly need to refine the reproduction with P-Robot or reconsider using more suitable robot for reproduction, and exactly ascertain whether P-Robot could promote awareness of points to be modified.

6 CONCLUSIONS

In this work, we have proposed P-Robot and developed the P-Robot system for promoting engagement in self-review. We have also designed the model of research presentation behavior to design the checklist for self-review, which allows minute self-review of presentation. From the results of the case study, P-Robot could promote engagement in self-reviewing.

In future, we need to refine the P-Robot system so that it can properly reproduce gesture particularly about face orientation and pointing gesture, and to consider what kind of robot is more suitable for model-based self-review. We will also conduct another case study comparing P-Robot and virtual character.

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REFERENCES

[1] R. Okamoto and A. Kashihara, “Construction of Presentation Review Environment with Realtime-created Hyper Video Technique,” IEICE Technical Report Order Information. Educational Technology, vol. 106, no. 583, pp. 133-138, 2007.

[2] K. Inazawa and A. Kashihara. 2017. A Presentation Avatar for Self-Review. *The 25th International Conference on Computers in Education*. 345-354 (Dec. 2017).

[3] Crypton Future Media, INC., “About HATSUNE MIKU | CRYPTON FUTURE MEDIA,”

[4] C. Kidd, and C. Breazeal, “Effect of a robot on user perceptions,” Intelligent Robots and Systems. 2004 IEEE/RSJ International Conference. vol. 4, 2004.

[5] T. Tanaka, K. Fujikake, T. Yonekawa, M. Yamagish, M. Inagami, F. Kinoshita, H. Aoki, and H. Kanamori, “Driver Agent for Encouraging Safe Driving Behavior for the Elderly,” HAI 2017 5th International Conference on Human-Agent Interaction, pp. 71-79, 2017.

[6] Vstone Co.,Ltd. 2017. Vstone Co.,Ltd. Retrieved from https://www.vstone.co.jp/english/index.html.

[7] T. Ishino, M. Goto, & A. Kashihara. 2017. Lecture Understanding Support by Presentation Substitution using Robot. Human-Agent Interaction Symposium 2017, 23 (2017).

[8] M. Goto, T. Ishino, K. Inazawa, M. Matsumura, T. Nunobiki, and A. Kashihara. 2017. A Presentation System withRobot for Recomposing Presenter Behavior. Japanese Society for Information and Systems in Education 2017 fifth time workshop, 32(5), 121-128 (2017).