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Improving Skill for Self-Reviewing Presentation with Robot

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Abstract: Presentation is very important for researchers to present their work. Proper presentation requires them to review it before actual presentation, which contributes to refining their presentation. In this work, we have focused on self-review, in which researchers review their presentation by themselves. A general way of self-review is to make a video of presentation, and then check it out. However, it brings about uncomfortable feeling due to looks and voice on the video, which prevents self-reviewing. We have accordingly developed a robot as presentation avatar, which reproduces presentation novel researchers (as learners) make. On the other hand, we have also confirmed that learners often overlook points to be modified in their nonverbal behavior reproduced by the robot. The main issue addressed in this paper is how to improve self-review skill with presentation robot. Our approach to this issue is to diagnose learners' presentation by means of the presentation behavior model, and to help them compare their self-review results with the diagnosed results. Such comparison allows them to promote awareness of unsuitable/insufficient points in their self-review, which contributes to self-review skill development. In this paper, we demonstrate robot presentation comparison with two robots, in which one robot reconstructs their presentation with self-review results and the other one reconstructs it with diagnosed results. This paper also reports a case study with the system whose purpose was to ascertain whether robot presentation comparison contributes to promoting awareness of unsuitability/insufficiency in self-review. The results suggest the possibility of self-review skill development.

Keywords: Presentation, Nonverbal Behavior, Self-Review, Skill Improvement, Diagnosis, Robot

1. Introduction

Presentation is one of important activities for researchers to present their work. Proper presentation requires them to review it before actual presentation, which contributes to refining their presentation. Since it is particularly important to perform nonverbal behavior such as gesture and paralanguage according to presentation intention (Goto et al., 2018), it is essential to review nonverbal behavior in addition to presentation slides.

There are two types of reviews, which are self-review and peer review. In self-review, researchers review their presentation by themselves. In peer review, researchers could obtain reviews of their presentations from their peers including more skillful lab members. Conducting self-review before peer review allows researchers to compare between self-review results and peer-review ones, and to become aware of points to be modified that could not be unaware in self-review, which contributes to improving their self-review skill.

We have been addressing the issue how to help novice researchers as learners self-review their presentation to become aware of points to be modified in their presentation (Inazawa & Kashihara, 2017, 2018). As a general way of self-review, learners could make a video of their presentation, and then check it out. However, they would feel quite uncomfortable due to their looks and voice on the video. This uncomfortableness prevents them from self-reviewing (Inazawa & Kashihara, 2017). We have accordingly developed a robot as presentation avatar, which reproduces presentation learners make. We have also designed a model of presentation behavior to provide a checklist including points to be reviewed, whose purpose is to help learners check if their nonverbal behavior is conducted as

intended during presentation reproduced by the robot. The model illustrates how presentation intentions could be accomplished with nonverbal behavior. The results of the case study suggest that the robot avatar can significantly reduce uncomfortable feeling in self-review, and that the checklist facilitates awareness of points to be modified (Keisuke Inazawa & Akihiro Kashihara, 2017, 2018).

On the other hand, we have also confirmed that learners often overlook points to be modified in their nonverbal behavior even if they are provided with the checklist. In order to resolve this problem, it is necessary to improve their self-review skill so that they can become aware of unsuitability and insufficiency in self-review, and obtain new perspectives in self-review.

The main issue addressed in this paper is how to improve self-review skill with presentation robot. Our approach to this issue is to diagnose nonverbal behavior in presentation by learners with the presentation behavior model, and to help them compare their self-review results with the diagnosed results. In this paper, we demonstrate a self-review system with two robots, in which one robot reconstructs their presentation with self-review results and the other one reconstructs it with diagnosed results. They could compare nonverbal behavior conducted by the two robots to become aware of unsuitability and insufficiency of their self-review.

This paper also reports a case study with the system whose purpose was to evaluate the self-review improvement with two robots. The results suggest the possibility that it promotes awareness of unsuitable and insufficient points in self-review.

2. Self-Review System

2.1 Framework

Figure 1, shows the framework of the self-review system for promoting awareness of unsuitability and insufficiency in self-review. It has three phases, which are recording, diagnosis, and presentation comparison by means of two robots. In phase 1, the system requires learners to make presentation with their presentation documents (P-documents for short) including slides. It also captures the presentation data including P-documents, motion, and voice by means of PC and Microsoft Kinect (Microsoft Corporation, 2018).

In phase 2, the system diagnoses the presentation (the captured data) by following the presentation behavior model shown in Figure 2 (Inazawa & Kashihara, 2018), which we have designed by referring to related work on presentation for research (Nancy, 2008; Karia, 2014; Kurihara et al., 2007; Zhao et al., 2015; Chollet et al., 2015; McNeill, 1992; Kamide et al., 2014; Melinger & Levelt, 2004). In presentation, it is necessary to achieve presentation intentions such as attention awakening and attention control by means of presentation behavior. The model accordingly represents the correspondence of presentation intentions to nonverbal behavior for achieving them. In the model, there are three layers, which are presentation intentions, behavior category (corresponding to detailed

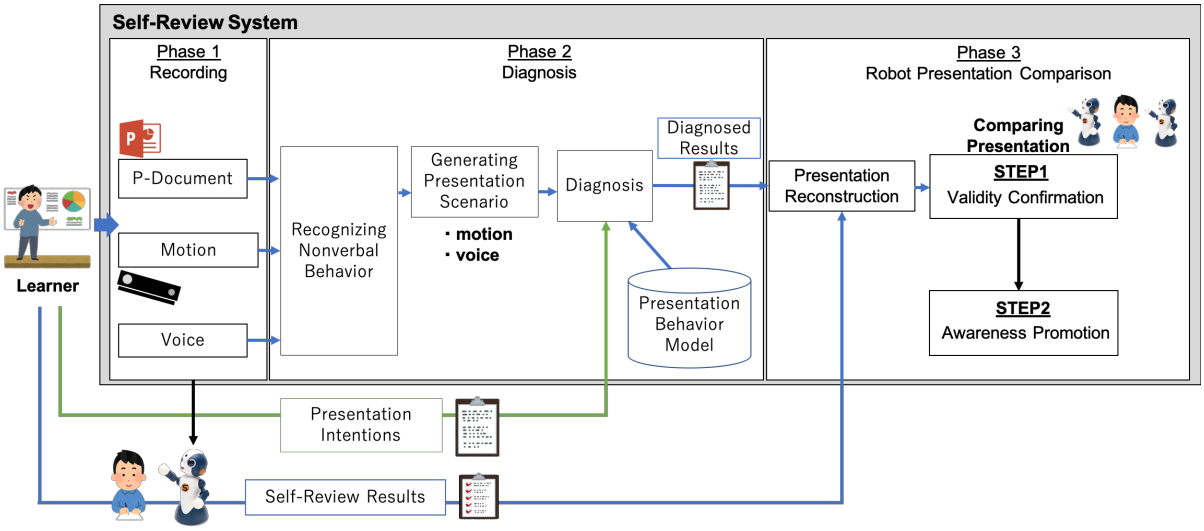

Figure 1. Framework for Improving Self-Review Skill.

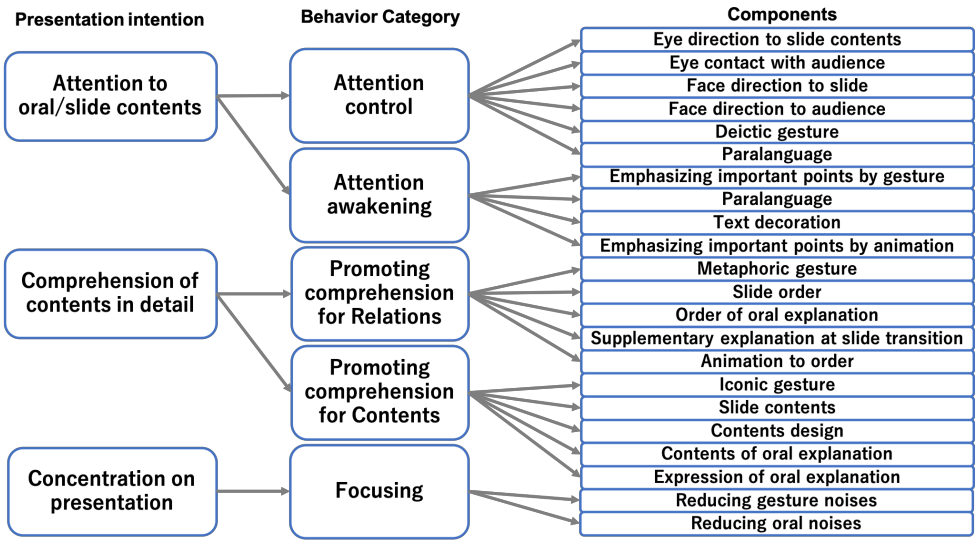

Figure 2. Presentation Behavior Model.

intentions), and components of presentation behavior. Each behavior category represents nonverbal behavior achieving its corresponding intention, which consist of a number of its components. Using the model, the system determines whether learners' nonverbal behavior is appropriate for achieving their presentation intentions.

On the other hand, it is hard to infer the intentions from the captured data. Before phase 2, the system accordingly requires learners to use the checklist shown in Figure 3 to enter their intentions in presenting each slide. Using the captured data and entered intentions, the system attempts to extract unsuitable/insufficient nonverbal behavior. We currently restrict presentation intentions to detailed ones related to "attention to contents". We also restrict nonverbal behavior to the one obtained from the corresponding components involving gestures (face direction, deictic gesture), paralanguage (voice volume, pitch), and text decoration associated with the gestures. In the self-review, learners are accordingly expected to use the checklist to tick the review points as to face direction, deictic pointing, paralanguage, and text decoration.

In phase 3, the system first requires learners to self-review using the robot system and checklist we have developed so far (Inazawa & Kashihara, 2018). In this self-review process, the robot reproduces the recorded presentation, and expects them to check if their nonverbal behavior is suitable/sufficient for achieving their presentation intentions entered. If they find out unsuitable/insufficient points, they are expected to tick them in the checklist. We call this initial self-review. Second, the system uses two robots to help learners think the differences between their initial self-review results and the diagnosed results via comparison of presentation conducted by the two robots.

This phase is composed of two steps. In step 1, one robot reproduces presentation learners make in phase 1, and the other robot reconstructs their presentation with their initial self-review results. The system expects learners to reflect on their nonverbal behavior reconstructed to confirm the validity of their initial self-review. In step 2, one robot reconstructs their presentation with the initial self-review

Presentation Intention	Behavior Category	Components	Review Points	Review
Attention to oral/slide contents	Attention Control	Face Direction	Directing face to slide	
		Deictic Pointing	Pointing to slide contents	✓
	Attention Awakening	Paralanguage	Emphasizing important points by volume/pitch	
		Text Decoration	Emphasizing important points by color/bold/under line	✓

Figure 3. Checklist.

results, and the other one reconstructs it with the diagnosed results. The system also expects them to become aware of unsuitability and insufficiency in their initial self-review.

2.2 Presentation Diagnosis

Using captured data including gesture (face direction and deictic pointing), oral explanation (contents of speech and paralanguage), and slide contents, the system recognizes nonverbal behavior. As for gesture, the system classifies the face direction into three according to face angle recognized by Kinect: screen direction, audience direction and looking down. The system also identifies the pointing position on the screen from the pointing gesture recognized by Kinect. The screen is divided into nine regions. The pointing position is identified as one of the regions.

As for oral explanation, the system converts the oral contents to text using NTT TechnoCross Voice-Series as speech recognition engine. It also obtains the paralanguage using Praat that is an application software extracting volume/pitch of voice during explanation.

In addition, the system obtains text/figures/tables and their positions on each slide from P-document. It also extracts the information of text decoration, which are used to diagnose nonverbal behavior. In entering presentation intentions on slides, learners are required to attach the labels of attention control/attention awakening to text/figure/table to which they want to attract attention.

The recognized nonverbal behavior and entered intentions are stored with the time sequence as presentation scenario. Using this scenario, the system then diagnoses the unsuitable/insufficient points. The system decides whether gestures/paralanguage/text decoration are appropriate for attracting attention to text/figures/tables embedding the presentation intentions.

2.3 Robot Presentation Comparison

In robot presentation comparison, the system uses Sota (Vstone Co.,Ltd., 2017) produced by Vstone as presentation robots. The Two Sotas reproduce/reconstruct presentation conducted by learners, and expects them to find out unsuitable/insufficient points in their self-review. Learners watch presentations conducted by two robots. They could also pause and redo these presentations during watching.

In reconstructing presentation with initial self-review results, the system replaces nonverbal behavior learners self-reviewed as inappropriate with the one appropriate for achieving the presentation intention, which allows the robot to conduct the reconstructed presentation. On the other hand, there are cases where nonverbal behavior learners self-reviewed as inappropriate is diagnosed as appropriate by the system. Such self-review called over-review is not considered in presentation reconstruction. In reconstructing presentation with diagnosed results, in addition, the system replaces inappropriate nonverbal behavior in the same way.

In demonstrating reproduced presentation, Sota executes the captured nonverbal behavior according to its time sequence. However, Sota reproduces captured oral explanation with higher pitch than original, whose purpose is to reduce uncomfortableness in self-review. In demonstrating reconstructed presentation, Sota also executes the presentation scenario that stores recognized nonverbal behavior and its time sequence. Sota faces forward (to audience) to explain with voice having the same speed as learners, but changes its face direction to the slide and points to the corresponding region during explaining the text/figure/table embedding presentation intention. Sota also changes the voice with higher pitch and more volume.

3. Case Study

3.1 Preparation and Procedure

We had a case study whose purpose was to ascertain whether robot presentation comparison could be beneficial for promoting awareness of unsuitability/insufficiency in self-review. Comparing initial self-review results and self-review results confirmed/modified from the robot presentation comparison, we ascertained the benefits of the self-review system.

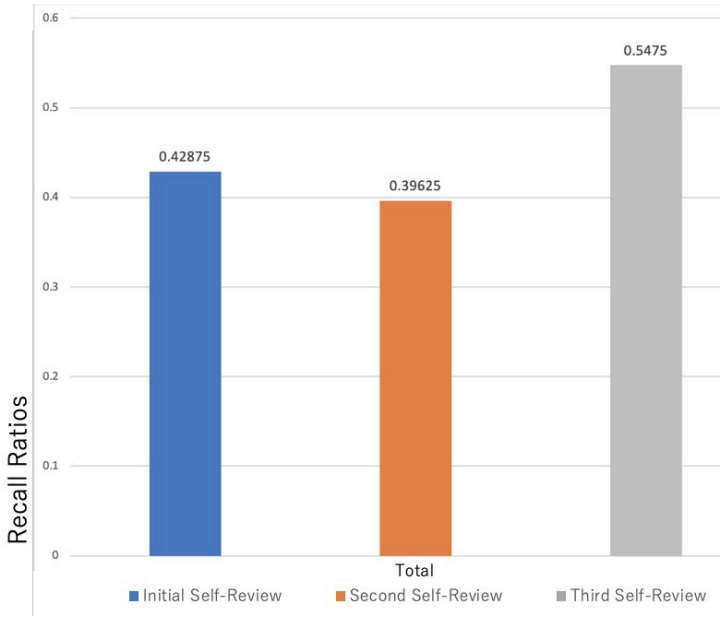

Figure 4. Average Recall Ratios for Self-Review.

We conducted this study in the following procedure with 8 participants who were graduate and undergraduate students in informatics and engineering. First, we explained to them how presentation should be conducted with nonverbal behavior according to the presentation behavior model. The participants were then required to prepare their presentation with a P-document we provided in advance. In the presentation preparation, they could decorate texts in the P-document. The participants were also required to enter presentation intentions (attention control and attention awakening).

The presentation was recorded. After a 10-minute interval, they were required to use the checklist to self-review their presentation reproduced by one robot (Initial self-review). After a 10-minute interval, they were twice required to compare presentations conducted by the two robots, and to self-review with checklist. In the first step, they compared their presentation reproduced and the one reconstructed with the initial self-review results (Second self-review). In the second step, they also compared the reconstructed presentation and the presentation reconstructed with the results diagnosed by the system (Third self-review). After each comparison, the participants were required to answer several questions.

To evaluate to what extent the participants could become aware of points to be modified as to nonverbal behavior for achieving their presentation intentions, we calculated the recall ratios of modified points found in the initial, second, and third self-review. Recall ratios were calculated as the ones of the number of modified points found by the participants to the number of modified points diagnosed by the system. The hypotheses we set up in this study were as follows:

H1: The first comparison allows the participants to confirm their initial self-review,
H2: The second comparison allows them to become aware of unsuitable/insufficient points in their initial self-review, and
H3: The self-review system allows them to improve their initial self-review.

3.2 Results

Figure 4 shows the average recall ratios in each self-review. The p-value corresponding to the F-statistic of one-way ANOVA is higher than 0.10 which suggests there was no significant difference between these self-reviews. However, Figure 4 shows a decrease in recall ratios from the initial self-review to second self-review. This suggests that the first comparison of robot presentation promotes not confirming but reconsidering the initial self-review for the worse. This does not support H1.

As shown in Figure 4, there was an increase in recall ratios from the second self-review to third self-review. This suggests that the second comparison promotes awareness of unsuitable/insufficient points in the initial self-review, which supports H2. In addition, Figure 4 shows an increase in recall ratios from the initial self-review to third self-review. This tends to support H3.

4. Conclusion

In this paper, we have proposed a self-review system that allows novice researchers to become awareness of unsuitable and insufficient points in self-reviewing nonverbal presentation behavior with two robots. The self-review system diagnoses nonverbal behavior in learners' presentation with the presentation behavior model, and helps them think the differences between their initial self-review results and the diagnosed ones via the robot presentation comparison, in which one robot reconstructs their presentation with initial self-review results and the other one reconstructs it with diagnosed results.

From the results of the case study, the robot presentation comparison could promote awareness of unsuitable and inappropriate points in self-review, which contributes to improving self-review skill. On the other hand, some participants could not take notice of differences between nonverbal behavior conducted by two robots, which suggests the necessity of more active support in robot behavior comparison.

In addition to such active support, in future, we will address the issue how to exaggerate nonverbal behavior, with which the differences between nonverbal behavior conducted by two robots could become more obvious.

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