DEVELOPMENT OF A SUPPORT APPLICATION AND A TEXTBOOK FOR PRACTICING FACIAL EXPRESSION DETECTION FOR STUDENTS WITH VISUAL IMPAIRMENT

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ABSTRACT

Until now, when practicing facial expression recognition skills in nonverbal communication areas of SST, judgment of facial expression was not quantitative because the subjects of SST were judged by teachers. Therefore, we thought whether SST could be performed using facial expression detection devices that can quantitatively measure facial expressions. In this research, we developed an application software using a facial expression recognition device connected to a smartphone and a practice book. With opening the book, one situation is described. A student makes a facial expression as he/she thinks is best. Our application judge's the expression and gives feedback of whether it is proper or not. A total of 28 students practiced it at two visual support schools and a class guidance classroom. As a result, all of the students were able to repeatedly make their intended face expression each time they tried. And from the observations and interviews with the students, we found the students were pleased and proud with the result.

1. INTRODUCTION

Today it is known that utilizing ICT equipment in special support education can be expected to have educational benefits such as improving learning or living difficulties of students with disabilities and leading to active social participation. According to a survey conducted by Miyagi University of Education on the status of ICT equipment usage in classrooms targeting students with developmental disabilities, there are 55% of classes utilizing PCs, with more than half found to be teaching using PCs. However according to the survey on usage, it turned out that it was used in 88% of "support of study subjects", 31% by "school life support" and 26% by "information sharing". For this reason, PC usage in special support services in resource rooms are mostly occupied by utilization in the support of subjects of learning, and there are present circumstances that utilization in support of school life is not yet popular. According to the survey results on the actual state of educational information at schools conducted by the Ministry of Education, Culture, Sports, Science and Technology, the average WLAN maintenance rate in ordinary classrooms is 26.1% nationwide. It was also revealed that the WLAN is not maintained in the ordinary classroom at the rate of 3 out of 4 schools, and the application that requires communication with tablet terminals etc. cannot be utilized.

Additionally, in the field of special support education, SST (social skill training) is being implemented as support for this school life. According to Onuki et al. (2004), the area of SST can be divided into 5 areas, 17 skills. Until now, when practicing facial expression recognition skills in nonverbal communication areas of SST, judgment of facial expression was not quantitative because the subjects in SST were judged by teachers. Therefore, we thought whether SST could be performed using facial expression detection devices that can quantitatively measure facial expressions.

In recent years, Kinect of Microsoft Corp. and Human Vision Components-Consumer (HVC-C) of OMRON Co., Ltd. released technology having facial expression detection functionality. Both of them have the feature that makes it is possible to quantitatively identify facial expressions, and in addition to the expression detection function, it is also possible to acquire information such as body information, sex, age, etc. with motion capture and gaze tracking. In addition, since these development environments are also open source, it is now possible to develop applications using equipment having facial expression detection functions, and various applications are being developed. However, practice using devices equipped with this facial expression detection function in educational environments is mostly for sensing movement of the body, and practice using facial expression detection function is not yet widespread.

From the above, it can be considered that a device with facial expression detection function can be used in the field of facial expression recognition technology in SST nonverbal communication area. By using SST equipped with facial expression detection function, it is thought that utilization of ICT equipment and popularization of facial expression detection equipment in lifestyle habit situations will be achieved. Also, it is considered necessary to operate a system that operates even in environments where information communication with outside schools and classrooms in Japan is restricted, and can use facial expression training without restrictions in other places.

Therefore, in this research, we aim to develop a simple feedback method using facial expression recognition device for SST and SST teaching material, and to develop applications to support facial expression exercise practice.

2. OUTLINE OF THE SYSTEM

2.1 About Facial Expression Recognition Device

In the past, research has been conducted to make artificial intelligence deeply learn every expression in order to improve accuracy as a method of detecting facial expressions. However, in such research, it can be said that it is generally difficult to utilize it in educational environments because it requires a huge expression sample set to let artificial intelligence learn, and takes time to make deep learning. Therefore, in this research, we emphasized easy detection of facial expression and decided to adopt OMRON HVC-C, a facial expression recognition device that is on the market. With this facial expression recognition device, not only facial expression estimation but also impression parameters such as "positive degree" and "negative degree" can be acquired. However, in the device standard specification, since the prediction result of the expression is greatly different from the actual expression, the original adjustment is performed in consideration of the impression parameter.

2.2 About the Expression Practice Application

We developed an expression practice application using the facial expression detection device as mentioned above. This facial expression training application adopts the basic training model of SST and evaluates to which expression the personal expression is close to and the degree of expressiveness. The flow of this system is shown in Figure 1. At first, thinking about the facial expression that matches the question. Next, making facial expression and detect it with HVC - C. Then, the application feedbacks the results detected by HVC-C by means of both of voice and text information. One set of the practice consists of 10 questions. All of the questions are as shown in Table 1.

This application will be practiced with the cooperation of the school and for five students in Sendai City GoJo Junior High School Commuting Classroom, six students in Miyagi Prefectural Vision Support School and 17 students in Yamagata School for the Blind School of Yamagata Prefecture.
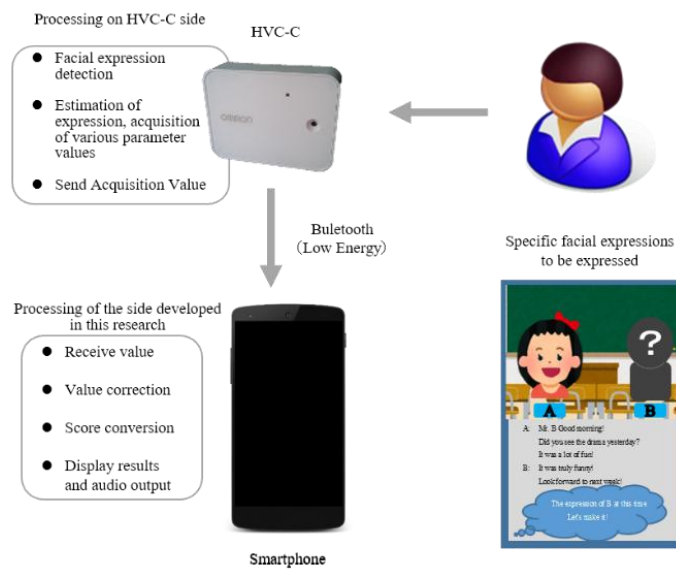
Figure 1. Outline of a face detection system and procedure

Table 1. Contents of a question

Situation		Contents
Conversation with my mother	Mom:	How long are you going to sleep! Get up early!
Teacher's remarks	Teacher:	How long are you talking! Get on your seat!
Usual conversation with a friend	D:	How was the result of the math test?
(Results of examination)	B:	It was 100 points! Perfect!
Usual conversation with a friend	D:	How was the result of the math test?
(Results of examination)	B:	I couldn't do it at all ... It was a shock ...
Usual conversation with a friend	A:	Good morning! Did you see the drama yesterday?
(TV drama program)		It was a lot of fun!
	B:	It was really interesting! Look forward to next week!
Usual conversation with a friend	A:	That was funny. But, the hero was to be taken ill...
(TV drama program)	B:	That's right. It was a shock ...
Usual conversation with a friend	C:	Good morning! This is a note when you were absent yesterday.
(I was absent)	B:	Borrow C note. Thank you very much.
Usual conversation with a friend	E:	Physical education is swimming. Change clothes in swimwear.
(Physical education class)	B:	Physical education is swimming ...I can't swim, I do not want.
Usual conversation with a friend	C:	Good morning! Did you do your homework in Japanese?
(Homework)	B:	Huh, did you have homework? I heard it for the first time ...
Usual conversation with a friend	A:	The actor X got married! Did you know?
(Famous actor's marriage)	B:	Really? Surprised!

3. RESULT

Firstly, from observations made of the practice sessions and through interview survey results with the teacher and students at the time of application at Commuting Classroom, we found that the cooperating students were able to repeatedly make the intended expression every time they practiced. Secondly, from further observations and interview surveys conducted during the practice sessions at Vision Support School, we found that the cooperating students were pleased with their expressions and that this promoted understanding of what kind of impression the usual expression gives to others, gaining confidence that they were able to express intended facial expressions. The surveys also found that practicing expressions with a machine partner has less resistance to practice than doing practice in face to face with an instructor. However, as this practice was temporary, we wondered what kind of transformation could be seen in expressing facial expressions through a medium to long term use of continuous practicing, and whether such long term use

would cause a reduction of the sense of resistance, and the need to create a problem tailored to the tendency of the targeted student's good or weak facial expression. Therefore, based on the premise that it can be practiced in the medium to long term with no sense of resistance, it is considered necessary to have a system for automatically generating problems based on the basic training model, and a system for managing the results of exercises.

4. FUTURE WORKS

Recently, learning from the instructors does not occur face to face, but there are also forms of teaching that utilize ICT-based e-learning and MOOCs (Massive Open Online Courses). However, these learning approaches are mainly aimed at acquiring knowledge. Meanwhile, Itagaki et al. (2017) also developed an e-learning material for the skills of kana. As next steps, we also need to develop e-learning teaching materials and LMS (Learning Management System) equipped with a system that records and manages the results of expression facial expression practice for grasping how facial expression skills have improved.

5. CONCLUSION

In this study, we developed a facial expression detection software and a situation exercise book. A total of 28 students used the software and we observed the situations and interviewed them. The results we could find followings.

- Each time students practiced, they were able to make the facial expression they intended on their own.
- Students were found to be pleased about their facial expression.
- Students were found to be able to gain confidence by expressing their intended facial expression.
- Students were able to practice with less sense of resistance than they practiced with an instructor/teacher in person.

On the other hand, the followings was observed:

- Assessment from long term practice.
- How to keep students' motivation in continuous practice.
- Developing making situations functions adaptably with each student.

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