UTILIZING IT TECHNOLOGIES IN FUTURE EDUCATION ENVIRONMENT

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Abstract
In this talk, we will explain the latest educational environment using ICT technologies including wearable devices. In particular, we will introduce a system that recognizes learners' comprehension and understanding level by using an eye gaze tracker. Also, we will explain a review support system based on learning logs. Those systems are effective not only for learners but also for the teachers because they can use for the improvement of teaching methods itself.

Keywords*: ;learning analytics, eye tracker, review support*

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INTRODUCTION

In recent years, various IT technologies have been introduced into the educational environment. In addition to personal computers and the Internet, various cloud services are widely used. In American elementary schools, the Chrome Book is distributed to all students, and G Suites (Gmail and Google docs / Slides) are used for both daily classwork and homework. Elementary school students edit one presentation material on the cloud simultaneously in a group. They continue editing on a personal computer at home. In addition, typing and other services on the cloud were used, and the homeroom teacher is able to see the learning status of all the students in real-time. We can say that the future education environment is now drastically updating by IT technologies.

On the other hand, the latest research is going on to change the education itself so far. In particular, the advancement of sensor technology has made it possible to sense the behavior of learners that could not be measured so far, making it possible to obtain a detailed understanding level and find out the difference between students who can and cannot learn. In addition, there is a movement to reflect such behavioral differences in the next-generation teaching guidelines and evolve the teaching way itself.

OUR WORK

The first example is an introduction of research that we are working on in a national project funded by CREST of JST (Japan Science and Technology agency). Our project, Behavior change and harmonious collaboration by experiential supplements, was started in 2016. Multiple universities and institutes participate in this project. As a representative sensor, an eye-tracking device such as Tobii and Pupil is used in several sub-projects. For example, Osaka Prefectural University has succeeded in estimating the TOEIC score using the Eye tracker (Augereau, 2016). This result indicates that it is possible to estimate the level of words and grammatical knowledge from the movement of gaze. In the case of a four-choice problem, it is also possible to estimate the confidence for the choice from the movement of eye gaze (Yamada, 2017). It means that the system can grasp the actual understanding level even the answer with intuition is accidentally correct and it can be used for effective review. Similarly, the German Research Center of Artificial Intelligence (DFKI) utilizes an eye-tracking device to analyze the way of reading textbooks such as physics (Ishimaru, 2018). Their purpose is to clarify the difference in gaze transition between good learners and poor learners. For example, the physics textbook consists of explanations, diagrams, and questions. The system aims to clarify in what order the good students read those contents. It can be able to serve as supplements for teaching to other learners who are not good at physics. Also, it can be used for getting tips on how to teach better. DFKI is currently building a smart classroom called iQL (Immersive Quantified Learning Lab, https://www.iql-lab.de/). In the future, actual high school students will take classes in iQL to be measured and analyzed such behavioral differences. They aim to enhance the way of lectures based on those sensing results.

We also focus on learning logs. Wordometer automatically records the amount of reading by using an eye-tracking device (Kunze, 2013). Vocabulometer records words that you saw in the reading (Augereau, 2018). It allows you to know how many times you have seen each word and how much you have learned the meaning afterward. We are developing a mobile app that automatically creates a word card for review based

on the search history of online dictionary sites (Tokuda, 2019). We have already confirmed that it is easier to memorize words that have been self-searched than to learn unknown words at random. Another example is a learning analytics based on the e-learning system introduced at Kyushu University (Shimada, 2018). Since 2016, Kyushu University has introduced an e-learning system as a university-wide education, which incorporates various learning status tracking systems. For example, lecturers can see which page of lecture materials are often read, which pages are students in the classroom are opening, in real-time. Of course, statistical analysis for each page can be done. It makes it possible for the lecturer to understand which part of the lecture is difficult for the students or which part is too easy, and can dynamically change the explanation time and way.

We also aim to enhance a group discussion because the communication skill becomes more important both in schools and companies. However, it is hard to evaluate the skill. Therefore, we first develop a meeting assesment system based on micro-behavior and expression analysis. Our system automatically analyzes the group meeting recorded by 360-degree camera (Soneda, 2019). The number of nodding, laughing, and blinking are counted person-by-person. Through those statistical values, we aim to estimate the user type and the meeting efficiency.

CONCLUSION

As I said at the beginning, the time will come sooner or later when all materials will be provided online even in elementary school. In that age, the learning status of online content is always measured. The lecture material adaptive for the individual proficiency level and the understanding level will be provided. For the question, AI will make an appropriate response according to levels of learners. The current research is just the start of future learning environment.

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