

Construction of E-Learning System for Programming : Extract Patterns of Mistakes Occur by Language Learners

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Abstract

In this report, we are concerned about the common mistakes made by learners of programming. The spread of information technology has increased demand for programming educations; in Japan, elementary school programming education will be mandated from 2020. The number of school and cram school which give programming lessons are increasing. Following those background, we construct an “e-learning system for programming” and provide learning contents for learners.

In this study, we extract patterns of mistakes prone to occur when C language learners write source code, as a preparatory stage for learning content creation. In order to provide the basis for creating learning support contents, error patterns are extracted from the learner's programming edit history. Furthermore, we compare with the characteristic error patterns of Java language.

The lesson is ‘Programming for Numerical Calculation’. In this lesson, students learn how to calculate matrix and solve nonlinear equations using C language. Lessons are conducted in two classes divided by student ID number, the number of students is 54 and 80 respectively. The students are third graders and have already learned the basics of C and Java language. The following specific data collection method was adopted, we set some programming problems in a programming lesson for beginners, which the students had to resolve. The editing history visualization system accumulated all the source codes of the process, such as timestamp of edit and run, differences of

text editing, number of edits to completion etc. We used an editing history visualization system, which is a learning environment for programming, proposed by Aramoto et al.⁵⁾.

In the future, we plan to use the obtained results as a basis to estimate learners' comprehension levels. In addition, we will select and create learning contents. Moreover, we propose improvements to the learning effect by increase the percentage of questions answered correctly.

References

- 1) Ministry of Education, Culture, Sports, Science and Technology in Japan, Promotion of computerization of education , Guide to elementary school programming education, http://www.mext.go.jp/a_menu/shotou/zyouhou/detail/1403162.htm, 2019.8.15
- 2) Tomoyuki Sasaki, Tomohiko Saito, Yuko Kuma, Katsuyuki Umezawa, and Shigeichi Hirasawa, "Construction of E-Learning System for Programming ~Construction of e-portfolio," Proceeding of the 17th Annual Hawaii International Conference on Education, pp. 1200-1201, Jan. 2019.
- 3) Tomohiko Saito, Tomoyuki Sasaki, Yuko Kuma, Katsuyuki Umezawa, and Shigeichi Hirasawa, "Construction of E-Learning System for Programming ~Estimation of Comprehension Level from Brain Wave," Proceeding of the 17th Annual Hawaii International Conference on Education, pp. 1209-1211, Jan. 2019.
- 4) Yuko Kuma, Tomohiko Saito, Tomoyuki Sasaki, Katsuyuki Umezawa, and Shigeichi Hirasawa, "Construction of E-Learning System for Programming ~Factorial Analysis for Comprehension Level," Proceeding of the 17th Annual Hawaii International Conference on Education, pp. 1214-1215, Jan. 2019.
- 5) Michitaka Aramoto, Manabu Kobayashi, Makoto Nakazawa, Michiko Nakano, Masayuki Goto, and Shigeichi Hirasawa, "Learning analytics via visualization system of edit record ~System configuration and implementation," in Proc. Of the 78th National Convention of IPSJ, pp. 4-527-528, 2016.