

氏名	KHIN KHIN ZAW		
授与した学位	博士		
専攻分野の名称	工学		
学位授与番号	博甲第	5729	号
学位授与の日付	平成30年 3月23日		
学位授与の要件	自然科学研究科 産業創成工学専攻 (学位規則第4条第1項該当)		
学位論文の題目	A Study of Exercise Problems in Java Programming Learning Assistant System (Java プログラミング学習支援システムの演習問題に関する研究)		
論文審査委員	教授 船曳 信生	教授 田野 哲	教授 野上 保之
学位論文内容の要旨			
<p>In this thesis, we present the five contributions on advancements of exercise problems in <i>Java Programming Learning Assistant System (JPLAS)</i>. Firstly, we present the extensions of the <i>blank element selection algorithm</i> to change the number of blank elements to control the difficulty level of the generated problem and to additionally blank key elements such as conditional expressions. Secondly, we propose the <i>core element fill-in-blank problem</i> to enhance the code reading studies by novice students. Thirdly, we propose the <i>value trace problem</i> as a new type of fill-in-blank problem. Fourthly, we study the <i>workbook design</i> for the three <i>fill-in-blank problem</i> for use in Java programming course to enhance self-studies of Java programming by students and to help preparing assignments for JPLAS by teachers. Finally, we propose the <i>informative test code</i> approach for the code writing problem in JPLAS.</p> <p>This thesis is described as follows:</p> <p>Chapter 1 introduces the background and the contribution of the study in this thesis.</p> <p>In Chapter 2, we review the software architecture and two problems in JPLAS.</p> <p>In Chapter 3, we propose the extensions of <i>blank element selection algorithm</i> for fill-in-blank problem in JPLAS.</p> <p>In Chapter 4, we propose the <i>core element fill-in-blank problem</i>.</p> <p>In Chapter 5, we propose the <i>value trace problem</i>.</p> <p>In Chapter 6, we propose the <i>workbook design</i> for the three <i>fill-in-blank problems</i>.</p> <p>In Chapter 7, we propose the <i>informative test code</i> approach for the <i>code writing problem</i>.</p> <p>Finally, in Chapter 8, we conclude this thesis with some future works.</p>			

論文審査結果の要旨

In this thesis, she presents the five contributions on advancements of exercise problems in JPLAS. In the first contribution, she presents the extensions of the blank element selection algorithm to change the number of blank elements to control the difficulty level of the generated problem, and to additionally blank key elements such as conditional expressions. The evaluation results show that these extensions can control the number of blank elements and the problem difficulty, where the solution performance is greatly affected by them.

In the second contribution, she proposes the core element fill-in-blank problem to enhance the code reading studies by novice students. In this problem, to control the importance of blank elements in terms of algorithm/logic implementations, we adopt the program dependence graph (PDG) in the blank element selection algorithm. The evaluation results show the highly correct answer rates, nevertheless the code understanding is necessary to solve the problems. Many students commented that the problems are helpful to understand the behaviors of the algorithms.

In the third contribution, she proposes the value trace problem as a new type of fill-in-blank problem. This problem asks students to trace the actual values of the important variables in a code implementing a data structure or an algorithm. To select the tracing values of the variables, we present the blank line selection algorithm. The evaluation results show that some problems are much more difficult than the element fill-in-blank problem.

In the fourth contribution, she studies the workbook design for three fill-in-blank problems for use in a Java programming course to enhance the self-studies of Java programming by novice students. The evaluation results show that the problem codes including object array and double loops are difficult for the novice students.

In the last contribution, she proposes the informative test code approach for the code writing problem. To help the students to solve harder problems that require multiple classes and methods, the informative test code describes the detailed specifications of the names, access modifiers, and data types of the classes, methods, and arguments. The evaluation results show that all the students could complete the qualitative codes using informative test codes.

From the overall evaluation of this thesis, the applicant has satisfied the qualification condition for the doctor degree in Engineering from the Graduate School of Natural Science and Technology at Okayama University.