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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 Informative Test Code Approach for Code Writing Problem in Java Programming Learning Assistant System (Java プログラミング学習支援システムのコード作成問題のための教育的テストコード手法の研究)
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学位論文内容の要旨	
<p>In this thesis, I study the informative test code approach for the code writing problem in <i>Java Programming Learning Assistant System (JPLAS)</i> in two important topics for novice students, and implement teacher service in the offline <i>desktop-version JPLAS (D-JPLAS)</i>, to contribute to the advancements of Java programming educations. <i>Java</i> has been widely used in various practical application systems in societies due to the high reliability, portability, and scalability.</p> <p>First, the <i>informative test code generation method</i> is studied to help a teacher preparing the test code for the standard input/output with exception handling. In this method, an informative test code can be generated from the given test code template and the reference source code containing the target procedure.</p> <p>Second, the <i>informative test code approach</i> is studied for <i>Java collections framework (JCF)</i> that is a strong and useful architecture for storing and manipulating a group of objects. The informative test codes for <i>List</i>, <i>Set</i>, and <i>Map</i> are generated and evaluated as the most useful interfaces in <i>JCF</i>.</p> <p>Third, the teacher service function in <i>D-JPLAS</i> is studied to summarize the student answers submitted in text files, and analyze them for assessing the performances and giving feedbacks to them.</p> <p>This thesis is organized as follows:</p> <p>Chapter 1 introduces the background and the contributions of the study in this thesis.</p> <p>Chapter 2 reviews the <i>Java Programming Learning Assistant System (JPLAS)</i>, where we discuss the sever platform, the software architecture, the problem types, the user service functions, and the <i>Desktop-version JPLAS</i>.</p> <p>Chapter 3 reviews the <i>informative test code approach</i> for the code writing problem including the concepts and examples and introduce the software metrics to evaluate the quality of generated source codes of students.</p> <p>Chapter 4 presents the <i>informative test code generation method</i> for the code writing problem that asks implementing a source code containing the <i>standard input/output with exception handling</i>.</p> <p>Chapter 5 presents the <i>informative test code approach</i> for studying <i>Java Collections Framework (JCF)</i>.</p> <p>Chapter 6 presents the implementation of the student answer analyzing function in <i>D-JPLAS</i>.</p> <p>Chapter 7 presents previous works related to this thesis.</p> <p>Finally, Chapter 8 concludes this thesis with some future works.</p>	

論文審査結果の要旨

In this thesis, the applicant studied the informative test code approach for the code writing problem in Java Programming Learning Assistant System (JPLAS) in two important topics for novice students, and implemented the teacher service function in the offline desktop-version JPLAS (DJPLAS).

First, the applicant studied the test code generation method to help a teacher preparing the test code for the standard input/output with exception handling. In this method, an informative test code can be generated from the given test code template and the reference source code containing the target procedure.

Second, the applicant studied the informative test code approach for Java collections framework (JCF) that is a library of providing a strong and useful architecture for storing and manipulating a group of objects. The informative test codes for List, Set, and Map were generated and evaluated as the most useful interfaces in JCF.

Third, the applicant implemented the teacher service function in DJPLAS that summarizes the student answers submitted in text files, and analyzes them for assessing the performances and giving feedbacks to them.

These results contributed to the advancements of Java programming educations, where Java has been widely used in various practical application systems in societies due to the high reliability, portability, and scalability.

The applicant has published two journal papers, two international conference papers, and four national conference papers to present the contributions.

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.