A MAJORITY DENSITY APPROACH WITH THE COOPERATION OF MULTIPLE EXPERTS FOR DEVELOPING TESTING AND DIAGNOSTIC LEARNING SYSTEMS BASED ON A CONCEPT-EFFECT RELATIONSHIP MODEL

DECHA WUTI WANICHSAAN

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ABSTRACT

In the past decade, testing and diagnostic learning systems have been considered as a useful tool for analyzing students' conceptual learning problems and providing helpful learning suggestions for them to improve their conceptual learning outcome. Among the existing methods for developing testing and diagnostic learning systems, a multi-expert approach based on a CER (Concept-Effect Relationship) model was proposed using a set of rules to integrate test item–concept relationship opinions from multiple experts. However, there were some drawbacks when integrating the opinions from multiple experts that might affect the quality of learning suggestions for individual students. Furthermore, it was time consuming to reconsider their opinions when conflicting opinions existed. Therefore, in this study, a new method was proposed to overcome the drawbacks of the previous work. In addition, a practical testing and diagnostic system on a “Computer Programming” course for undergraduate students was implemented to demonstrate the effectiveness of this innovative approach. To evaluate students' knowledge, they took an achievement test after receiving the suggestions and learning materials from the system. By analyzing the results of students after receiving learning suggestions from two different systems, it was found that the conceptual learning outcome of the students who received learning suggestions from the proposed system was significantly better than that of those who received guidance based on the previous system implying that the current approach is more effective than the previous one.

KEY WORDS: CONCEPT-EFFECT RELATIONSHIP MODEL / COMPUTER-BASED TESTING / TESTING AND DIAGNOSTIC SYSTEM / EXPERT SYSTEM / MAJORITY DENSITY APPROACH

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