Design of an Online Diagnostic Test Tool for Personalized Learning Based on Componential IRT Approach

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Abstract

Diagnostic test plays an important role in personalized eLearning due to its capability to provide information about students' cognitive states. This paper proposes a novel design of an online diagnostic test tool based on a Componential IRT (CIRT) model that is able to handle multiple concepts/skills involved in an item. Features of the CIRT model are investigated, and an online test component based on the CIRT approach was implemented in a standard-conformant web-based learning system. Applications of the test tool in two practical online courses have been conducted and analyzed through the Chi-Square fitness test with the cross-validation technique. The cross-validation results show that empirically the approach can find a suitable CIRT model for an item, and most items in the test cases can find good-fitting CIRT models. Therefore, the proposed approach is highly potentially effective in providing useful diagnostic information that can be used for personalized learning on the Web.

Keywords: diagnostic test, e-learning standards, item response theory, online assessment, personalized learning

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植基於組成式試題反應理論模式的個人化學習線上診斷測驗工具之設計

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摘要

診斷測驗（diagnostic test）可提供學生認知狀態的相關訊息，因此在個人化學習的領域中扮演著重要的角色。本文基於組成式試題反應理論（componential IRT）的模式，設計一套個人化學習線上診斷測驗工具，以應付多重概念試題的施測需求。本文探討組成式試題反應理論的特色，並據以在現有的學習網站中實做出符合IMS標準的線上測驗工具。我們將本工具應用在兩門實際的線上課程中，並透過卡方適模檢測（Chi-Square fitness test）分析其應用成效。檢測結果顯示本工具可以找到多重概念試題合宜的試題反應模式，因此，本研究所提及的工具可望對於網路個人化學習中提供有用的學習診斷訊息。

關鍵詞：診斷測驗、數位學習標準、試題反應理論、線上評量、個人化學習