透過程式重構的電腦輔助教學設計

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摘　要

　　科學領域的學習是各級學校學生在學習的一個重點，科學領域的能力影響學生在專業獲取及未來職場能力的素質。在本論文中，我們針對科學學習上，提出一個以程式重構的技術，將一個能支援多層級認知學習的電腦輔助教學設計。此設計將電腦輔助教學加入一個解法的程式中，以達到提供學習者能夠做三維空間的學習方法。此三維學習空間包括認知層級維度、知識推理脈絡維度與抽象具象對應維度。我們在認知維度上支援理論層、解法層與操作層的認知學習。在程式重構形成解法中的關注點上，加入多層級的電腦輔助教學功能與程序控制。我們並展示此方法可於實際的科學解法的程式做所需的電腦輔助教學功能設計。

關鍵詞: 電腦輔助教學、關注點、學習、程式重構、解法

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Computer-Aided Instruction Design with Program Refactoring

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Abstract

Learning in science domains is a focus of students in all levels of schools.　Their capability in science domains affect their specialty acquisition and quality of their professional assets.　In this paper, we propose a computer-aided instruction design supporting multi-level cognition learning with program refactoring.　The design is applied to add computer-aided instruction into a solver program.　It enables learners to perform study in a three-level learning space.　These levels include the cognition dimension, the knowledge deduction dimension, and the abstract-physical mapping dimension.　We support the cognition dimension with study at theory, solving, and operation levels.　On focus points forming by program refactoring of the solver program, we can add these multi-level computer-aided instruction functions and process control.　We demonstrate the method to be applied on science solving program to add desirable computer-aided instruction design.

Keywords: computer-aided instruction, focus point, learning, program refactoring, solving method

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