Formalization of Higher-level Intelligence through Integration of Intelligent Tutoring Tools

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Abstract

In contrast with a traditional Intelligent Tutoring System (ITS), which attempts to be fairly comprehensive and covers enormous chunks of a discipline's subject matter, a basic Intelligent Tutoring Tool (ITT) (Patel & Kinshuk, 1997) has a narrow focus. It focuses on a single topic or a very small cluster of related topics. An ITT is regarded as a building block of a larger and more comprehensive tutoring system, which is fundamentally similar with the emerging technology “Learning Objects” (LOs) (LTSC, 2000a). While an individual ITT or LO focuses on a single topic or a very small cluster of knowledge, the importance of the automatic integration of interrelated ITTs or LOs is very clear. This integration can extend the scope of an individual ITT or LO, it can guide the user from a simple working model to a complex working model and provide the learner with a rich learning experience, which results in a higher level of learning.

This study reviews and analyses the Learning Objects technology, as well as its advantages and difficulties. Especially, the LOs integration mechanisms applied in the existing learning systems are discussed in detail. As a result, a new ITT integration framework is proposed which extends and formalizes the former ITT integration structures (Kinshuk & Patel, 1997, Kinshuk, et al. 2003) in two ways: identifying and organizing ITTs, and describing and networking ITTs. The proposed ITTs integration framework has the following four notions:

(1) Ontology, to set up an explicit conceptualisation in a particular domain,
(2) Object Design and Sequence Theory, to identify and arrange learning objects in a pedagogical way through the processes of decomposing principled skills, synthesising working models and placing these models on scales of increasing complexity,

(3) Metadata, to describe the identified ITTs and their interrelationships in a cross-platform XML format, and

(4) Integration Mechanism, to detect and activate the contextual relationship.
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