Chapter 3.5
A SCORM Compliant Courseware Authoring Tool for Supporting Pervasive Learning

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ABSTRACT

The sharable content object reference model (SCORM) includes a representation of distance learning contents and a behavior definition of how users should interact with the contents. Generally, SCORM-compliant systems were based on multimedia and Web technologies on PCs. We further build a pervasive learning environment, which allows users to read SCORM-compliant textbooks with multimodal learning devices. Respecting the learning contents for supporting such learning environment, an efficient authoring tool was developed for serving this goal. Some specific tags were defined to specify the corresponding information or interactions that cannot be performed in the hardcopy books. These tags can be printed in SCORM-compliant textbooks and recognized by Hyper Pen to facilitate the affinity between the physical textbooks and digital world. Therefore, users can read the SCORM-compliant hardcopy textbooks in a traditional manner. The authored course contents will be the same while applying to the multimodal learning devices with different layouts.

IINTRODUCTION

From time immemorial, the pedagogy evolved in line with its contemporary technologies and requirements. The innovation of the evolutional education is not only on the instructional methods, but also on the learning contents. With the widespread deployment of information technologies and network services, the trend of education nowadays is toward diverseness and convenience. An obvious example is distance learning. However, distance learning does not on its complete substitution for traditional education. Instead, the

two paradigms should work together to realize a better future educational style.

Most conventional learning models focus on the physical world only, and thus the interesting multimedia learning content cannot be used in the learning process. On the contrary, recent learning technology focuses on digital input/output. It will cost large amount of effect to transform all physical contents into digital contents. A natural way to fully utilize contents resources is to use both physical and digital contents, simultaneously. The advantages of physical contents include easy thinking, comfortable reading, rich content in library and familiar learning experience. On the other hand, the advantages of digital contents include fast searching, easy sharing, supporting interesting multimedia, and high interactivity. Thus, if advantages of both sides can be put together, the learning performance will be improved. Fortunately, there are pen-like OCR devices available to allow users to scan through textbooks. In our project, we call these types of pen devices the *Hyper Pens*. The name of Hyper Pen comes from the fact that a hyper jump is performed from one is using the device in the physical world for reading, to a virtual world in an electronic device which pronounces a vocabulary, or even shows motion pictures on a computer.

The key factor of the successful distance learning popularization is based on the well-developed e-learning standards. In addition, from the aspect of constructing learning materials, the shareability and the reusability of the various learning contents are the main issues for saving the cost of building the e-learning materials. As a result, we aim to provide an authoring tool for instructors to construct learning courseware based on SCORM (*http://www.adlnet.org*) specification for supporting pervasive learning environment with multimodal learning devices. Thus, we call this new definition of Hyper Pen-based learning mechanism as the *Hard SCORM* (Wang, Chang, Sie, Chan, Tzou, & Shih, 2005). Two important issues arose in building up such SCORM-compliant

instructions. They are the conformance with the SCORM specification, and the content layouts for applicable learning devices. We proposed an effective courseware authoring tool, named the Hard SCORM Authoring Tool, for solving these issues. By using the Hard SCORM Authoring Tool, instructors are allowed to aggregate the various learning objects and to pack them into deliverable courseware. The courseware can be easily accessed by different devices including Hyper Pen, which recognizes a set of Hard SCORM tags.

In the following sections, we would like to present a brief survey on the related researches, starting from a detailed introduction of SCORM. The relevant third party authoring tools and some interesting Human-Computer Interaction researches for the affinity between physical and digital worlds are discussed. The architecture of our proposed Hard SCORM project and a formal definition of the Hard SCORM tags are also addressed. The implementation of our proposed Hard SCORM Authoring tool and some experimental results of our proposed ideas are illustrated as well. Finally, we give a brief conclusion and the future works as shown in the last section.

RELATED WORKS

As previously mentioned, the shareability and the reusability facilitate the constructing of various learning contents. A well-defined e-learning standard, named "SCORM," was designed to serve this goal. In addition, there exist many applications for generating the learning content in the distance learning environment, and here we outline the features of other SCORM-compliant authoring tools. Furthermore, some interesting researches on the interactions between the physical world and the digital world in computer and cyberspace are addressed to bridge the gap for the affiliation.

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