Multimedia Assessment Platform base on IMS QTI Specification

Yung-Hui Chen[1], Neil Y. Yen[2], Martin M. Weng[2]
[1]*Department of Computer Information and Network Engineering, Lunghwa University of Science and Technology*
[2]*Department of Computer Science and Information Engineering, Tamkang University*
neil219@gmail.com

Abstract- In the traditional e-learning environment, the learning content and the assessment content could be considered as the two sides of coin. With the development and improvement of the internet technologies and the multimedia resources, instructors could make use of the multimedia resources to generate the rich assessment content and increase the interaction between the instructors and students. Besides, the assessment content should be generated in a well-format in order to make sure the content of the assessment could be reused in the future. In this paper, we proposed a assessment management system for both instructors and students. Instructors could generate the assessment content based on the IMS QTI specification and integrate the multimedia resources. Students could receive the assessment and evaluate him/her in this system.

Keywords: IMS QTI, authoring, assessment, AMS, infrastructure

1. Introduction

The e-learning mode makes people learn things conveniently and efficiently. In the traditional education aspect, instructors could generate the flexible and adaptive learning materials or assessment content to organize well-formed learning activities for the students. However, it is not an easy way for instructors to modify the learning/assessment content or style immediately in the distance learning. That is, the learning materials or assessment content have to be perfectly organized in advanced in the e-learning environment.

With the development of the internet technologies and the multimedia streaming, instructors become more and more willing to utilize the multimedia resources to create the learning materials instead of the traditional text resources. In addition to the learning content, the other one essential part of the whole learning activities is about the assessment content. In the traditional examination, the instructors would make use of the retired test items to generate the new examination paper and then deliver them to each student. The most important of all is that the examination content is all made of the text content. In order to increase the interaction between instructors and students by using the assessment content, the usage of the multimedia resources like pictures, audios, videos, .. Etc would become a more and more critical element for raising the interests of students.

On the other hand, how to provide a well-organized assessment to the students is another issue that we have to solve. Eventually, there is a specification named QTI (Question and Test Interoperability)[5] proposed by IMS Global Learning Consortium to meet this purpose. It provides a format for the system developers could construct a platform to assist the instructors in generating the assessment content.

In this paper, we would like to develop a assessment management system (AMS) based on the IMS QTI specification. Furthermore, we also integrate the multimedia resources to help instructors generate the assessment content. Besides, in order to evaluate the assessment; the proposed AMS also have a run-time environment for students to access in and to take the examination.

The organization of this paper is as follows: Section 1 introduced the motivation and the overview of this paper. Section 2 introduced the relevant research issues that previous professors have done before and the IMS QTI specification. And the proposed system architecture and the implementation of the system would be discussed in the Section 3. We would give a short conclusion and the future works in the Section 4.

2. Related Works

As we mentioned above, in order to achieve the purposed assessment system, we have to integrate the previous research works done by other researchers. We will first introduce the IMS QTI specification briefly and point out the essential elements of the specification we will

utilize in our works. After the introduction of the QTI specification, we will extract the information of other works in the second paragraph.

2.1 IMS QTI specification

After an online learning activity finished, some particular mechanisms should be involved to evaluate the learning competency. The IMS QTI (Question & Test Interoperability) specification defines the format of assessment and test, and then produces relative reports about learners to instructors. The two main factors composed the QTI specification as follows:

- ASI (Assessment, Section, Item) module for defining the type of assessment, the organization of assessment, and the grades calculating method and
- Result Reporting module for representing the result of assessment.

2.2 Survey on Research Topics and Relative Assessment System

Thomas and Loay[4] discussed about the online assessment behavior of students in university of Louisville with the course ECE 2002 Network Analysis I, the online behavior of the students was monitor using web-based parameter-passing strategies and cookies and they found that most of students repeated the tutorials a sufficient number of time to get perfect scores, on the other hand, students have more opportunity to repeated tutorials for additional practices. In anecdotal reports, students praise the effectiveness of the online tutorials and rate them highly as an efficient component of their learning.

Mario et al[3], want to reduce the workload of teachers and to improve the effectiveness of face-to-face courses, it is desirable to supplement them with Web-based tools, and also presents the approach for supporting computer science education with software components which support the creation, management, submission, and assessment of assignments and tests, including the automatic assessment of programming exercises. This components includes LlsMultipleChoice, ECAssignmentBox, ECAutoAssessmentBox and which extend a general purpose CMS with educational content types for tests.

Robert et al[2], presents a novel methodology for modeling collaborative learning as multi-issue agent negotiation using fuzzy constraints. Agent negotiation is an iterative process through which the proposed methodology can aggregate students' marking to reduce personal bias. In the framework, students define individual fuzzy membership functions based on their evaluation concepts and agents stand for students to negotiate with each other in the assessment process, and they have an example application to negotiate the assessment among three students is provided to illustrate the assessment process of the framework.

C. M. Chen and Y. Y. Chen[1] proposed an issue that how to perform the learning performance assessment in the web-based learning field, and proposes a learning performance assessment approach which combines four computational intelligence theories including grey relational analysis, K-means clustering method, fuzzy association rule mining and fuzzy inference to perform this task based on the learning portfolio of individual learner, and the experimental results indicate that the evaluation result of proposed method is positive relevance with those of summative assessment.

3. Proposed System Architecture and Implementation

In this paragraph, we would firstly illustrate the proposed system architecture and then the implementation would be shown in the second paragraph.

3.1 System Architecture

To achieve the proposed assessment management system with multimedia content, our proposed system architecture would be shown in **Figure 1**.
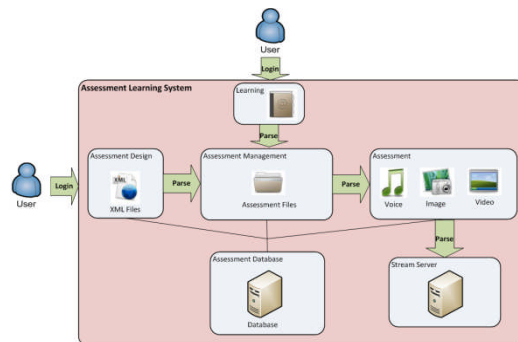

Figure 1. The architecture of proposed AMS.

The instructors and the student or learners access to the assessment management system first. The instructors could utilize the multimedia resources we prepared in our database or assign a resources URL to generate the assessment content. After the generation of the assessment content, the system would bind the xml format file to storage the content.

The students assess the system then could choose the assessment types to take the examination or assigned by the instructors.

About the storage or play of the multimedia resources, we also constructed a streaming server to provide this problem a well solution.

The proposed streaming server could reduce the cost of time that instructors uploaded the multimedia resources and the retrieval time when students took the exams.

3.2 System Implementation

After the introduction of our proposed system architecture, we tried to implement this architecture to evaluate the system feasibility. In the authoring aspect, we make use of the six widely-used assessment topics to assist instructors to generate the assessment content. The **Figure 2** shows the interface of the assessment authoring process.

The functionalities of the system are based on the web browser. The instructors and the students could easily access the system through the mouse clicking. In our proposed assessment management system, the instructors might be a student. Through this system, we could make teaching and learning is more closely. That's what we say the learning is also teaching.

Figure 2. The assessment authoring interface

In order to make sure that the assessment content could be reused in every assessment systems through internet, the common format based on the IMS QTI specification is necessary. In our system, the proposed six assessment types are as follows:

- True / False
- Single Choice
- Multiple Choices
- Short Essay
- Fill in Blank
- Pattern Match

Supposed that the instructor generate a True / False assessment content, the system would automatically generate a xml (eXtension Markup Language) file to record and storage the content. The xml file format is shown in **Figure 3**.
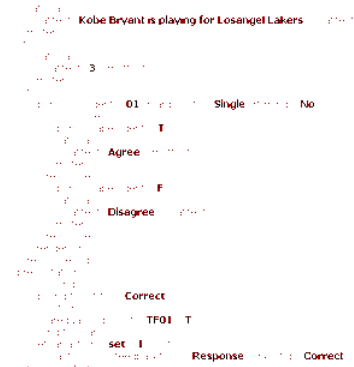

Figure 3. True / False file format.

After the generation of the assessment file, the system would store these generated assessment content into the database and the multimedia resources into the streaming database. After the assessment content, our proposed system also provides a friendly user interface to assist instructors in building an examination. That is, instructors could choose the probably assessment content and then combine them together to generate a new examination.

4. Conclusion and Future Works

The learning content and assessment would be considered as two sides of coin. Well-organized learning activities should be corresponded with a well-format assessment. In our proposed assessment management system, we make use of the multimedia resources like pictures, audios and videos to increase the learning interests while examination process. The reusability of the assessment content is the other part that we focused on. In order to serve the reusability of the assessment content, we adopted the IMS QTI specification to be the basic assessment format to generate the examination or assessment items. Based on this specification, our proposed assessment management system not only could assist instructors to create and generate the assessment content but also could assist students in receiving the assessment content and evaluate himself/herself in the same platform.

Based on our works in this paper, we also have to make our assessment management system more flexible. In the future, we would like to integrate the learning content with the assessment to increase the interaction between them. Besides, we would also like to increase the assessment run-time for the purposed system to assist the students in our system could take more kinds of assessment types.

References

[1] Chih-Ming Chen, Yi-Yun Chen. "Learning Performance Assessment Approach Using

Learning Portfolio forE-learning Systems". Fifth IEEE International Conference on Advanced Learning Technologies 2005

[2]   K. Robert Lai, Chung Hsien Lan. "Development of an Assessment Agent to Promote the Learning Effectiveness in a Computer Supported Collaborative Learning Environment". Fifth IEEE International Conference on Advanced Learning Technologies 2005

[3]   Mario Amelung, Michael Piotrowski, Dietmar Rösner. "EduComponents: Experiences in EAssessment in Computer Science Education". Innovation and Technology in Computer Science Education 2006

[4]   Thomas G. Cleaver, Loay M. Elbasyouni. "Student Online Assessment Behaviors". IEEE TRANSACTIONS ON EDUCATION, VOL. 48, NO. 3, AUGUST 2005

[5]   IMS Global Learning Consortium. IMS Learner Information Packaging Information Model v2.0 Draft 2. Retrieved September 21st, 2008 at http://www.imsglobal.org/question/index.html