Development of Learning Management System and SCO Presentation Program Based on SCORM

Hiroyuki Watanabe, Shinichiro Koga, Katsuhiro Kato
College of Engineering, Nihon University
hiroyuki@ee.ce.nihon-u.ac.jp, and kkatoh@ee.ce.nihon-u.ac.jp

Abstract

During this research, a CAI system prototype, by which the courseware of the computer networks can be learned, was developed. By developing this system, through the SCO presentation program based on SCORM, which uses the JavaScript and the JavaApplet, self-learning is possible even if the LMS client cannot connect to the LMS server. Furthermore, the SP-chart of arbitrary score and the caution indexes for the students can be presented from the database by the LMS system based on SCORM.

1. Introduction

Recently, the interoperability of the CAI system and the reusability of the contents have been realized by the developments of the LMS (Learning Management System) and the SCO (Sharable Contents Object) presentation program based on SCORM (http://www.adlnet.org/). When self-learning is possible through the SCO presentation program, even if the LMS client cannot connect to the LMS server or the contents cannot be published due to copyright issues, the reusability of the contents can be expanded. Furthermore, when the SP-chart and the caution indexes are presented from the student’s score and learning time by the LMS based on SCORM, the students are able to effectively know their weak point and the teacher has the ability to know the students’ level of understanding.

Web-CT (http://www.webct.com/) is one of the typical LMS based on SCORM. However, the SCO presentation program does not present the contents by itself, because the SCO presentation program, which is the client, needs the data running on the LMS server and the problems are controlled with only the JavaScript in the SCO. Furthermore, the Web-CT cannot present the SP-chart, because the score of the normal SP-chart takes the values of 0 and 1. However, the score for the SCORM takes the values from 0 to 100. Therefore, ideas are needed for the making of the SP-chart of the SCORM.

During this research, a CAI system prototype, by which the courseware of the computer networks can be learned, was developed. By developing this system, the problems could be presented by only the client using JavaScript and JavaApplet. The SP-chart arbitrary score analysis method is used for the score of SCORM, and the SP-chart could be presented graphically by using the style sheet.

2. Construction of CAI system

Fig.1 shows the construction of the CAI system. This system runs on a UNIX with the database server. The LMS system, highlighted by the dotted line, is constructed of the LMS server and the LMS client.

The LMS server provides the courseware information to the LMS client and manages the student’s score and learning time. The database server provides the information corresponding to the searched data to the LMS server. Because this system uses the database, the data that is being searched for, does so much more efficiently.

The LMS client presents the courseware list or items list having gotten the data from the LMS server. The LMS client and the LMS server communicate using the original protocol. However, for the relaying of the API adapter in LMS client, the SCO is able to communicate with the LMS server by SCORM protocol.

The contents are presented on the SCO. When a student clicks the start button, the LMS server initializes...
the data for the SCO by the JavaScript. Even if the LMS client cannot connect to the LMS server, the SCO presentation program presents the problems by the JavaApplet. When courseware is selected, the JavaApplet in the SCO reads the control file, which controls the objects and is written by XML, and a problem with an answer key is presented. When the student clicks the answer check button, the result of the answer check is presented, and the next problem/hint screen corresponding to the score of the student is presented by the JavaApplet. When the final problem is finished, the student’s score and learning time are sent to the LMS server by the JavaScript.

3. Results

The courseware of the computer networks’ learning, which is constructed of problems with ATM, LAN, TCP/IP, etc., was made for the prototype of this system.

3.1. Presentation of SCO

The right frame in Fig.2 shows the problem screen that is presented by the SCO presentation program. In the problem screen, the ATM problem is presented in the upper frame and an answer key is presented in the lower frame. The left frame in Fig.2 shows the items list that was presented by the LMS client. Even if the contents based on SCORM are produced by using the other tools, such as Home Page Builder by IBM, the problem screen could be presented and the student’s score and learning time could be sent by the LMS system.

3.2. Presentation of SP-chart

Fig.3 shows the score SP-chart of the ATM problems. The S-curve is the cumulative curve of the score for the problems. Because the score is normalized from 0 to 100 for SCORM, the SP-chart is made using the SP-chart arbitrary score analysis method. The S-curve and P-curve are shown in bold lines, within the numerical values in the table, as a graph, made by the style sheet.

Fig.2 Presentation of problem screen by SCO presentation program

Fig.3 Score SP-chart

3. Conclusion

The SCO presentation program based on SCORM and the LMS system running on a UNIX was developed. By developing this system, the courseware of the computer networks’ learning was presented, and the SP-chart could be presented from the student’s score and learning time. Furthermore, it showed that this system has the following features:
1. Because the LMS system uses the database on a UNIX, this system can be used in all classes regardless of class size.
2. Because the SCO presentation program has been developed using both the JavaScript and the JavaApplet, the presentation of the problem or the hint, corresponding to the level of understanding of the students, can be easily presented.
3. Even if the LMS client cannot connect to the LMS server, students are able to do self-learning with the standalone with the SCO presentation program.
4. Because the SP-charts for the SCORM can be created from the student’s score and learning time, the teacher has the ability to know the students’ level of understanding and in what items they are typically having problems.