

Reading SCORM Compliant Multimedia Courses Using Heterogeneous Pervasive Devices

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ABSTRACT

The Sharable Content Object Reference Model (SCORM) provides some important representation for distance learning content and the learning behavior. In general, SCORM-Compliant learning content can be viewed via the Web browsers. In this paper, we built an environment which allows people to read SCORM-Compliant course materials on hardcopy papers with a pen-like OCR device. A computer, a PDA, or a cellular phone can be used in conjunction with the pen device for multimedia presentations. Our project is called the Hard SCORM. Consequently, users can read textbooks in a traditional manner while behavior of reading is incorporated with the SCORM specification.

Categories and Subject Descriptors

K.3.1 [Computer Uses in Education]: Distance learning

General Terms

Algorithms, Experimentation, Design, Human Factors

Keywords

SCORM, Web Service, Distance Learning, Mobile Devices, SOAP

1. INTRODUCTION

Distance learning technologies have won wide acceptance among people and brought our education society to a new perspective of future education. However, we believe that, not everyone uses computer, even it is so popular today. It is possible that some people still prefer reading on hardcopy books. An obvious example is senior people. It is possible that they still prefer reading on hardcopy books. How do we bridge the gap between the physical world and the digital world, in terms of creating convenient devices and software for easy distance learning? Human-computer interaction becomes an important discussion issue. Essentially, advanced hardware and communication technologies need to be used in conjunction with distance learning platforms. In our project, we adopt the pen-like OCR devices to achieve the affinity and call them 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 performs

the digital content. One contribution of this paper is to bridge the gap between the physical and the virtual worlds, by providing such a Hyper Pen associated distance learning platform for senior people to learning from computer in a seamless manner.

The purpose of the SCORM run-time environment is to establish a standard protocol for the courseware to talk to its underlying Learning Management System (LMS). With a vision to frontier learning and advanced computer technology, we aim to provide environments which allow easy access of learning materials. Our systems enable a comprehensive pervasive learning environment, which is the dream paradise of future distance learning. The paradise allows “learning anywhere.” The pervasive learning society enabled by our system relies on a sophisticated software platform and advanced mobile devices.

2. THE HARD SCORM TAGS

Figure 1 shows a section of Hyper Pen navigation on a textbook. The student is using a Hyper Pen to read textbook. A PDA is used to see multimedia presentations (such as video). And a backend computer had audio message to guide the student to follow the sequence and navigation definition of a SCORM-compliant courseware.



Figure 1: Using Hard SCORM LMS

In order to allow Hyper Pen and LMS to communicate, we need to define a set of Hard SCORM tags, which can be recognized by Hyper Pen on the hardcopy books. The definition of Hard SCORM tags should consider effective interaction and fit with the navigation specification of SCORM. Hyper Tags are divided into four categories. The Navigation Tags can be used to control the navigation behavior. The Reference Tags can trigger the multimedia resources which can not be displayed on the hardcopy papers. The Answer Tags take responsibility for the assessments which can be recorded by a SCORM LMS. And the Auxiliary Tags can turn on/off or control Hard SCORM. The activation of these tags will change SCORM variables in an activity tree while the LMS is running.

3. DESIGN AND IMPLEMENTATION

The Advanced Distributed Learning (ADL) initiative combines several specifications and proposed the Sharable Content Object Reference Model (SCORM). The specification of SCORM run-time environment includes the procedures and responsibilities for courseware to communicate with a LMS. Web service framework is extremely suitable because it reduces the overhead of service requester and service provider. The architectures proposed in [1, 3, 5] also adopt Web services. The current data model and API functions definition of SCORM are easy to be integrated with web service architecture. Figure 2 shows a revised SCORM RTE architecture for supporting various learning devices. Traditional invocation of SCORM APIs can also be supported with the help of Web Service Gateway (WSG). The WSG is shown in Figure 3. With the help of WSG and the LMS RTE, other LMS servers which do not support web service can also use WSG to wrap the original information into a SOAP message and send out the request to SCORM web service.

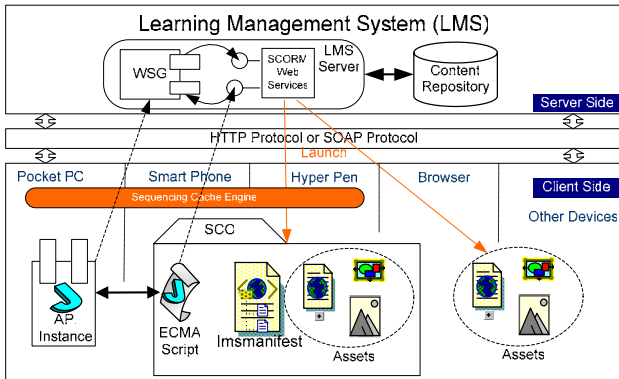


Figure 2: Revised SCORM RTE for Multiple Devices

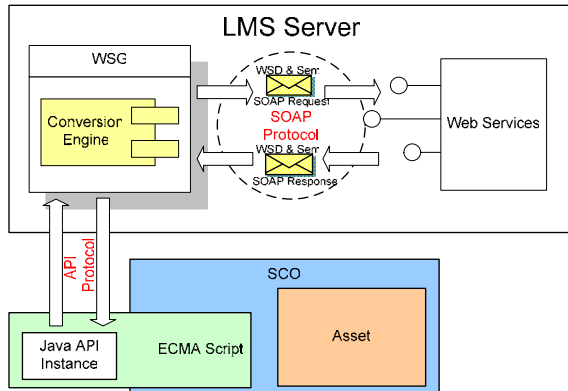


Figure 3: The Web Service Gateway

The Hard SCORM LMS supports different learning devices including PC, PDA, cellular phone, and Hyper Pen. A few important functions are implemented on the PDAs or Smart Phones. Object reflow will resize the content on PDA and Smart Phone to fit the window sizes [2]. As a result, the reader can only use the vertical scroll bar to read the content. In addition, personal notes can be added to the content and uploaded to the central database. According to the definition of SCORM specification, a cache mechanism is used. The cache mechanism is very important

for devices with small memory capacity. In addition, we use SOAP for message transmission [4]. Figure 4 illustrates the user interfaces on PDA and Smart Phone.



Figure 4: SCORM LMS on Smart Phone and PDA

4. SUMMARY

It is the first time that Hyper Pen device is used in a SCORM-based Learning Management System. We designed and implemented such a LMS, which is based on web service architecture. A few systems on mobile devices are also developed to be used in conjunction with the Hyper Pen. Individual learner profiles are maintained in a central server. The contribution of this paper is to bridge the gap between reading in a traditional manner and learning by using electronic devices. We believe that, with high-tech devices, ubiquitous distance learning will be an important issue in our education, especially for the young generation who use mobile devices constantly.

5. REFERENCES

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