2000

Streaming and Other Web-Based Multimedia in IS Education

Louise L. Soe
California State Polytechnic University - Pomona, llsoe@csupomona.edu

Streaming and Other Web-Based Multimedia in IS Education

Louise L. Soe, Computer Information Systems, California State Polytechnic University, Pomona, llsoe@csupomona.edu

Abstract

This paper discusses issues in teaching streaming and other multimedia applications in a Information Systems or Computer Information Systems program. It addresses the value of such learning to students and graduates and the technological and pedagogical issues involved in establishing and maintaining courses in this area. The discussion suggests how to organize a course that will help students learn to develop streaming and nonstreaming multimedia content suitable for the web and suggests the resources that are necessary to support course content and delivery.

Introduction

Streaming and other nonstreaming multimedia have become increasingly popular because they provide an extra measure of excitement to the delivery of information. In fact, one can argue that the entertainment value of multimedia has been critical to the development and diffusion of the Internet. University students are especially interested in viewing, listening to, and downloading all types of multimedia files, streaming and otherwise. The recent upsurge in MP3 streaming audio has even made dormitory living attractive, since dormitories provide high-speed Internet access that allows students to download and share their favorite music files (Miller, 2000). The leap from using streaming and other multimedia content to learning how to produce it is a predictable progression for technically charged students in a Computer Information Systems (CIS) or Information Systems (IS) program.

This paper discusses issues in teaching streaming and other multimedia applications in a CIS program. What is the value to students and graduates? What are the technological and pedagogical issues involved in establishing and maintaining courses in this area? The discussion of these issues suggests how to organize a course that will help students learn to develop streaming and multimedia content suitable for the web as well as the resources that are necessary to support course content and delivery. The paper briefly touches on the likely future value to students who learn this type of technology, and then provides references, including a list of resources to support development of such a program.

Discussion of these issues is based on experience with teaching streaming and other multimedia content development to undergraduate CIS majors in a large California public university in both classroom and virtual environments. This course is part of a specialization called "Interactive Web Development" which features the development of business applications for the Internet. This discussion should inform a department and faculty who are thinking about such a course.

Value to Students and Graduates

The first question anyone should ask is "Why bother?" When IS/CIS programs are so bombarded with students and faculty resources are so stretched, one has to realistically examine the value to students in teaching the preparation and publication of streaming and other multimedia content. Campus digital art programs may teach some of the same applications—in fact, many students take these courses to add breadth and depth to their knowledge.

The main reason to offer such a course in a CIS/IS program is to help students understand the value of streaming and other multimedia products in business applications, especially since the Internet has become such a prominent platform for information exchange, marketing, and selling. Streaming and nonstreaming multimedia content can be expected to grow rather than lessen as bandwidth grows.

Pedagogical and Technological Issues

The pedagogical and technological issues in implementing streaming and other multimedia content are not trivial, particularly when they are to be published and served over the Internet.

Pedagogical Model

The pedagogical model that we have developed in our approach to teaching multimedia applications for the Internet is much closer to the model of "active learning" than "talking heads". Four out of twenty sessions involve interactive lectures on the conceptualization, design, and usability of multimedia web sites. One of the remaining sessions provides a group exercise in critiquing websites, based on the theoretical ideas in the lectures and readings. This exercise provides preparation for their individual written critiques of other students' websites. The

individual critiques, which are posted on a discussion database, provide an opportunity for critical thinking and application of the course's conceptual material. Students also help one another improve their work. The final session is made up of short presentations of student website projects. There is one exam during finals week.

The remaining thirteen sessions involve hands-on collaborative workshops, in which students are walked through a series of exercises to learn the features and functions of streaming and multimedia applications. The course is taught in a multimedia lab equipped with the technology necessary to teach the course. Students sit at workgroup tables, each of which has a workstation with the necessary software. Typically two-to-three students work together. Students who bring laptops frequently share them with other students because they enjoy the group interaction during the exercises. This arrangement facilitates learning as more advanced students help less advanced ones, and students exchange ideas and learn from one another. Workshop instructions are published on the class website so that students can print them out, follow along step-by-step during class, and take detailed notes to repeat the workshop on their own time. Each workshop features several group exercises in which students build or develop streaming or multimedia products.

Each student spends the quarter designing and building a website with multimedia and streaming media content. Students use the "killer website" model set forth by Siegel (1997), the human-centered design ideas of Norman (1990), and web usability concepts of Nielsen (2000) to conceptualize, design, and develop their web site projects. Students first prepare and post a written document on a discussion database detailing the conceptual model for their site, which includes information about the site purpose, intended audience, GUI design, content, etc. Students who spend more time planning and designing their sites early in the quarter usually develop stronger projects as the term progresses. The issue of compression and bandwidth for files published on the Internet is emphasized in each of the applications they learn. Students are shown ways to reduce file size and are required to experiment, analyze, and report on the tradeoffs between quality and file size. Student critiques of one another's web sites in the latter part of the quarter point out areas that students need to improve.

The students, who already know how to build a web site and understand basic HTML, build their learning around three widely used, powerful multimedia applications: Adobe Photoshop, Adobe Premiere, and Macromedia Flash. They also learn related processes: scanning, video capture, and compression for streaming and nonstreaming video and audio. Photoshop, which is widely used in industry, familiarizes them with many functions and concepts that are used in the other multimedia applications. For their first project, students develop a conceptual and visual layout for their web site, and use Photoshop to alter and combine digitized images, create titles and buttons, and experiment with image development, compression, and the creation of high-quality, small sized images and transparent gifs.

For their second project, students learn to build a short video in Premiere, using sources such as video clips, still photos and other images, sound files, and animated titles. They publish various versions of their video, as they experiment with different levels of compression as well as with both streaming and nonstreaming RealProducer compression. Students are responsible for analyzing the effects of the various compression techniques on their video quality and file size, as well as differences between streaming and nonstreaming media. While streaming video should be optimal because the viewer can begin to view it as it downloads, many students find out that the streaming video portion stalls as the streaming server becomes clogged and elects to stream the audio portion instead. Nielsen's book on web usability (2000) has a number of suggestions to counteract this limitation when delivering video on the web.

For their second project, students also learn some simple ways to create animation, either with a tool or an HTML editor (such as Macromedia Dreamweaver) that generates Java or JavaScript animation, or by writing JavaScript. As students build their web sites, they need to integrate all of the streaming and multimedia content to make it all work together to accomplish their purpose and suit their intended audience.

The last application students learn is Macromedia Flash, which can be used to generate animated movies with MP3 sound. Flash movies on the web are often exciting, fast-paced, and appealing to young people. Flash uses vector-based animation of symbols that only need to be downloaded one time, which means that "shocked" (i.e., compressed) Flash movies often have remarkably small file size. Each version of Flash includes new functions that increase its value for ecommerce (e.g., text boxes for input and increased support for variables in Flash 4.0) and broaden its usefulness. Students are very excited about learning Flash, but find it fairly difficult because its user interface is not intuitive. Until very recently the primary sources for learning Flash were Flash documentation and some tutorials on the Internet (some of which did not work), but recent books on more advanced features of Flash are much more informative (Emberton and Hamlin, 2000; Franklin and Patton, 2000; Milburn and Croteau, 2000; Mohler, 2000; Reinhardt and Lentz, 2000).

Students work with different types of sound files throughout the quarter. Premiere and Flash do not yet support the use of streaming sound files, but Flash exports MP3. Students seem very familiar with using CD-rippers,

which convert sound files from one format to another. These applications are easy to use (see also Fries, 1999). To help in this area, one class developed a knowledgebase that provides information about sound file conversion and free software that can be downloaded from the Internet.

Faculty Training Issues

This point brings the discussion to another very important pedagogical issue: how does the faculty member teaching such a course learn the concepts and the technical multimedia applications? Most CIS/IS faculty members probably have related knowledge (e.g., human factors, GUI design concepts) that makes it less difficult to acquire and articulate the conceptual knowledge to teach this course (see Lynch and Horton, 1999; Nielsen, 2000; Norman, 1990; Weinman and Heavin, 1997). The multimedia applications are not trivial to learn, however. This issue is not easy to resolve unless the faculty member has access to faculty development programs or multimedia classes from others within or outside the university. Our program is fortunate in that two of our faculty members originally earned Bachelor of Fine Arts degrees before moving into the computer industry. This preparation helped us with the conceptual knowledge and understanding of important issues such as design, layout, color relationships, and video and animation timing.

The multimedia applications have been much more onerous to learn. Photoshop, Premiere, and Flash are all industrial-strength applications with many features and powerful functionality. They also are subject to frequent upgrades, sometimes with major changes to their functionality and even to the names of areas of the application interface. Fortunately there are many valuable books on Photoshop (Adobe Creative Team, 1999a; Blatner and Fraser, 1999; Bouton, 2000; Smith, 1999; Willmore, 1999), a much smaller selection on Premiere (Adobe Creative Team, 1999b; Bolante 1999), and some excellent new books on Flash (Emberton and Hamlin, 2000; Franklin and Patton, 2000; Mohler, 2000; Reinhardt and Lentz, 2000). Other less costly and powerful applications are available, but they are not widely used in industry and do not provide the same degree of control over the outcome of the product.

Faculty members in our program have adopted a bootstrap approach to learning this new multimedia technology. We learn how to do things either on our own, often through tutorials developed by software companies such as Adobe and Macromedia, or rarely by attending external workshops. We then build on this learning based on books and other types of materials. We share teaching materials with one another on the web and offer instruction to one another. We contract with senior project teams to explore new streaming and multimedia technologies for us. These teams typically have taken our multimedia course and develop user and reference documentation as well as a model project for us. We also bring in alumni and others who are working with these technologies in industry and have them demonstrate new techniques and tell us about their current business uses.

Teaching Lab Issues

Teaching streaming and other multimedia content requires the acquisition (and frequent upgrading) of technology, some of which is free, but much of which is relatively expensive to acquire and maintain. The hardware issues have to be resolved first, since the development and serving of streaming and multimedia products requires high-end computers and relatively powerful servers and a stable network. Students learning these applications need access to a computer lab both during and outside class time. They frequently do not have powerful enough computers or adequate disk space, and they find the software so expensive that they cannot afford to purchase all of the applications. In addition, our program has found that students learn these applications faster when the teacher works through the software application with the students in a lab setting. We therefore teach multimedia applications in a lab in which 2 or 3 students share a workstation. Students enjoy learning in this environment as they brainstorm in the production of their group exercises. They seem to feel freer to explore different approaches and ideas in the company of other students.

In order to be capable of developing multimedia in any sort of efficient timeframe, individual workstations require higher levels of random access and disk storage, and faster CPUs. Graphics and video programs take CPU power and RAM to render the multimedia files and store notoriously large temporary files. Attempting to teach these applications on low-end computers is frustrating for both students and teacher. While streaming and multimedia content on the Internet require close attention to file memory size, the development of quality content that can be compressed for the Internet is usually done within software packages that have high storage and CPU requirements. In order to reduce the need for duplicate work, one typically stores uncompressed copies of files in case something has to be redone later. These files usually are large. In addition, peripherals--at least one reliable scanner for still photos and a decent video capture card with an input device such as a VCR for digitizing videos--are necessary. Our program began by using existing university multimedia labs and equipment, but eventually found this arrangement inadequate because of limited access to the labs for teaching, and technologies that were not kept up-to-date.

Software issues are also nontrivial, since multimedia software licenses are relatively expensive, even with an educational discount. Multimedia companies do not

readily give away software licenses to universities, which means the department or school and the students will probably have to purchase the software. Some companies give volume discounts (e.g., Macromedia), which means it pays to consolidate orders across the university, usually through some central buying unit (on our campus, the university computer store inside the bookstore).

Servers and a fairly powerful network are also necessary for publishing streaming and multimedia software projects to the Internet. Nonstreaming multimedia products probably can be housed on regular university servers that are available for student projects, although students who are using their university web sites for multiple classes may run out of directory space. Our program provides multimedia students with accounts on a separate departmental multimedia server, thanks to a Hewlett Packard University Grant (which also provided additional servers as well as the workstations in the multimedia lab).

Serving up streaming media requires special server software, which the university servers may not support. Our program uses a powerful, dedicated HP server with dual processors to serve streaming video from a RealSystem G2 server on an NT server. Realmedia provides a free version of this server software that supports up to 25 simultaneous video streams as well as a version of the RealProducer G2 compressor that students can download free. Microsoft issued similar streaming software (Windows Media) last fall, with free video and audio compression software and free server software that runs on Windows NT. This software is comparable to Realmedia, although less integrated (Garrigus, 1999). Our program did not switch, because the RealSystem G2 software has been adequate, and the switching costs are higher than any advantages in the Microsoft product. Web sites such as Web Developer.com (www.webdeveloper.com/) and Streaming Media World (www.streamingmediaworld.com/) have numerous articles about the use of various types of streaming multimedia.)

Some students have successfully experimented with MPEG video compression with a limited trial version of the MPEG compression software they download. We have not switched to MPEG compression because the compression software is not as readily or freely distributed as RealProducer or Windows Media, and because the Realplayer browser plugin is more widely diffused among web users.

Future Value to IS

The hype about ecommerce and the Internet as the development platform of the future can only enhance the need for streaming and multimedia content in future IS development. The tradeoffs between quality and file size, the attention to web usability and GUI design, the requirement to focus development on a single purpose and audience, and the need to let loose creative urges are qualities that are transferable to other types of IS development. It is important for students to experiment with these applications now, as Internet applications will be taking on new formats for different players with a wide range of bandwidth connections. For example, web pages are already being served up to digital telephones, PDAs, and interactive Web TVs. What will happen when streaming and multimedia files need to be served up to our refrigerators and microwaves to help us order and prepare our food? As more and more business applications are transferred to the Internet, the need for multimedia content (both streaming and nonstreaming) will only increase.

References

Adobe Creative Team. *Adobe Photoshop 5.5 Classroom in a Book*, Adobe Press, Indianapolis, IN, 1999a.

Adobe Creative Team. *Adobe Premiere 5.0: Classroom in a Book*, Adobe Press, Indianapolis, IN, 1999b.

Blatner, D. and Fraser, B. *Real World Photoshop 5: Industrial Strength Production Techniques*. Peachpit Press, Berkeley, CA, 1999.

Bolante, A. *Visual Quickstart Guide: Premiere 5.1 for Macintosh and Windows*, Peachpit Press, Berkeley:, CA, 1999.

Bouton, G.D. Adobe *Photoshop 5.5 Fundamentals with ImageReady 2*, New Riders, Indianapolis, IN, 2000.

Emberton, D.J. and Hamlin, J.S. (eds.). *Flash 4 Magic*, New Riders, Indianapolis**,** IN, 2000.

Franklin, D. and Patton, B. *Flash 4! Creative Web Animation*, Peachpit Press, Berkeley, CA, 2000.

Fries, B. *The Mp3 and Internet Audio Handbook*, TeamCom, Burtonsville, MD, 1999.

Garrigus, S.R. "Is Windows Media the Streaming Solution for You?" Part 2, webreview.com/pub/1999/09/10/feature/index2a.html, Sept. 10, 1999, (Current May 2, 2000).

Lynch, P.J. and Horton, S. *Web Style Guide*. Yale University Press, New Haven, CT, 1999.

Milburn, K. and Croteau, J. *Flash 4 Web Animation f/x & Design.* Coriolis Group, Scottsdale, AZ, 2000.

Miller, G. "Ethernet Is Changing Dorm Life," *Los Angeles Times*, Part A: January 14, 2000.

Mohler, J.L. *Graphics, Animation & Interactivity with Flash 4.0,* Delmar Publishers, Albany, NY, 2000.

Nielsen, J. *Designing Web Usability*, New Riders, Indianapolis, IN, 2000.

Norman, D.A. *The Design of Everyday Things*, Bantam, New York, NY, 1990.

Reinhardt, R. and Lentz, J.W. *Flash 4 Bible*, IDG Books Worldwide, Foster City, CA, 2000.

Siegel, D. *Creating Killer Web Sites*, (2nd ed.), Hayden Books, Indianapolis, IN, 1997.

Smith, G. *Photoshop 5 3D Textures f/x and Design*, Coriolis Group, Scottsdale, AZ, 1999.

Streaming Media World, www.streamingmediaworld.com/, (Current May 2, 2000).

Weinman, L. and Heavin, B. *Coloring Web Graphics*, (2nd ed.), New Riders, Indianapolis, IN, 1997.

WebDeveloper.com, www.webdeveloper.com/ , (Current May 2, 2000).

Willmore, B. *Official Adobe Photoshop 5.0 Studio Techniques*. Adobe Press, Indianapolis, IN, 1999.