Application of real-time streaming audio to Web-based courses

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Abstract

A year of experience with the application of real-time streaming audio (RealAudio) to Web-based courses has yielded a wealth of experience in synchronous delivery of live instructional content and asynchronous delivery of archived content. Outcomes include:

1. Live broadcast of lectures
2. Archived lectures with the soundtrack synchronized with the Web pages displayed during the live lecture (Synchronized Multimedia)
3. Voice annotations of Web page links including:
   a. Explanation of examination questions and answers
   b. Motivational messages to explain Web pages
   c. Oral instructions for assignments

Products of this experimentation include:

1. User interfaces for:
   a. live broadcast
   b. archived lectures
2. Productivity tools for:
   a. constructing Synchronized Multimedia content
   b. creating voice annotations

The course can be found at: http://www.engr.iupui.edu/cpt/courses/cpt299.f97/

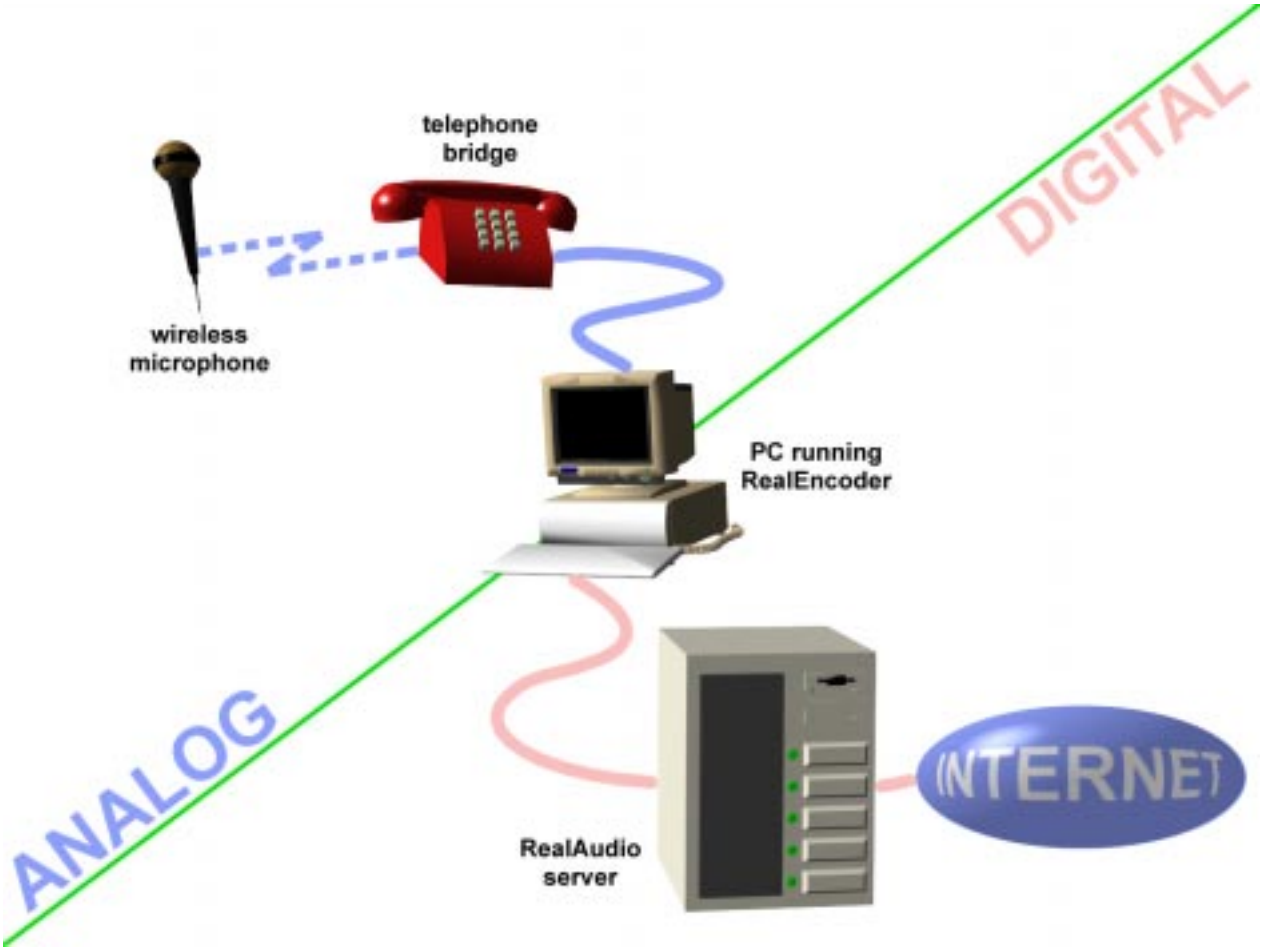
What is RealAudio?

The RealAudio Server, RealAudio Encoder, and RealAudio Player comprise the RealAudio System created by RealNetworks (1997). The RealAudio Server streams files created with the RealAudio Encoder to *free* RealAudio Players on sound card-equipped personal computers, which continuously decompress the audio and play it in real time without download delays, even over 14.4 Kbps modems.

RealAudio has been widely deployed on the World Wide Web especially to distribute news and music at the Timecast (1997) site guide. Educational applications are not yet as common but examples include:

- Shakespeare at the University of Illinois at Urbana-Champaign (1997)
- Writing at ACT Laboratory Ltd. (1997)
- Computer programming at the University of Washington (1996)

Figure 1. Originating a live broadcast via RealAudio



Experiments with RealAudio

Beginning in September 1996, Introduction to Data Processing (CPT 115) broadcast lectures *live* from Indiana University Purdue University Indianapolis (1996) via RealAudio. Figure 1 is a diagram describing how the live broadcast is done. In addition, the lectures were archived on the Web site. As a result of this audio content being available, the Web site was significantly

enhanced by the addition of voice annotations and oral instructions for assignments. Voice annotations were used to provide motivational messages to explain Web pages such as the ones at:
http://www.engr.iupui.edu/cpt/courses/cpt299/it/itaids.html and an example of oral instructions for an assignment can be found at:
http://www.engr.iupui.edu/cpt/courses/cpt115f96/115as05.html

During the Spring and Fall 1997 semesters, Internet Skills (CPT 299) at Indiana University Purdue University Indianapolis (1997) continued the experiment by using Synchronized Multimedia to synchronize the lectures with visual aids on Web pages. Most of the lectures on: http://www.engr.iupui.edu/cpt/courses/cpt299.f97/tcs.html have been synchronized. An example of Synchronized Multimedia by Thomas I. M. Ho (1997) explains this experiment in greater detail. To *experience* it, one will need:

- A personal computer with sound card
- An Internet connection with a 14.4 Kbps speed or better
- RealPlayer 5.0 (free to download from the RealNetworks Web site at www.real.com)

In addition, voice annotations were used to explain examination questions and answers on:
http://www.engr.iupui.edu/cpt/courses/cpt299.f97/tcs.html

Results of experiments

Products

The major products of this experiment include:

- User interfaces
- Productivity tools

The primary user interface has been developed for playing back archived lectures synchronized to the Web pages displayed during the live lecture. An example at:
http://weblab.iupui.edu/ho/cpt299_f97/lecture_frame.html?101797
demonstrates the controls for the soundtrack with a frame for displaying the synchronized Web pages.

JavaScript is used to create the voice annotations so that a single click displays the annotated Web page and plays the voice annotation. A template for the JavaScript looks like:

```
<script language="JavaScript">

<!--
function presentwindow()
{
window.open("put URL for Web page here",
"","toolbar=yes,resizable=yes,menubar=yes,status=yes,scrollbars=yes")
}
```

```
// -->

</script> <a
        href="put URL for voice annotation here"
        onclick="presentwindow()"><font size="3">put text for link here
        </font> </a><font size="3"> <img
        src="images/raworld.gif" alt="RealAudio"
        width="46" height="25"> <br></font>
```

where images/raworld.gif contains an image of the RealAudio logo.

Experiences

This experiment has demonstrated that significant instructional content can be delivered via real-time streaming audio that can be received by a modest computing platform with no more than a 14.4 Kbps dial-up connection to the Internet.

References

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Biographical Information

THOMAS I. M. HO is Chairman and Professor of Computer Technology at Indiana University Purdue University Indianapolis (IUPUI). Previously, he was a Senior Fellow in Information Systems and Computer Science at the National University of Singapore from 1993-1994. From 1990-1992, he was Director of the Information Networking Institute at Carnegie Mellon University.

BRIAN HO is a multimedia designer in the WebLab at Indiana University Purdue University Indianapolis. He is a graduate in telecommunications from Ball State University. He has also worked on CHEM 101 at: http://weblab.iupui.edu/c101demo