Music Library of the Future: A Pilot Project

Bruce Pennycook
Faculty of Music, McGill University
brp@music.mcgill.ca

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Abstract

The Music Library of the Future (MLF) is a pilot project investigating the implementation of a virtual music library publicly accessible over the internet. The project is based on technologies which have been developed for the World Wide Web (3W) - a loose collection of computer servers and clients scattered all over the globe. The MLF project is based on three primary objectives: i) installation of a 3W server at the Faculty of Music, McGill University specifically for music and audio information ii) development of new browsing and retrieval tools for music and audio iii) implementation of a prototype collection of musical scores, digital audio excerpts, biographical and analytical data, and general information about Canadian music.

1.0 Background

The Music Library of the Future (MLF) is a pilot project investigating the implementation of a virtual music library publicly accessible over the internet. The project is based on technologies which have been developed for the World Wide Web (3W) - a loose collection of computer servers and clients scattered all over the globe. The project received funding from the Canadian Network for the Advancement of Research, Industry and Education (CANARIE) in April, 1994 and has evolved into a long-term development effort within the Faculty of Music, McGill University and the Marvin Duchow Music Library.

2.0 Objectives

The MLF project is based on three primary objectives: i) installation of a 3W server at the Faculty of Music, McGill University specifically for music and audio information ii) development of new browsing and retrieval tools for music and audio iii) implementation of a prototype collection of musical scores, digital audio excerpts, biographical and analytical data, and general information about Canadian music.

3.0 The WWW Site

The WWW site can be found at: http://www.music.mcgill.ca. There are many entries ranging from general information about the degree programs in the Faculty of Music to private "home pages" of the graduate students. The site also serves as a repository for the Canadian Electroacoustic Community and for the McGill Chapter of the Audio Engineering Society. In the spring of 1995, a new project, funded by the Center for Information Technology Innovation (CITI) has resulted in the development of two Web-MOO systems - the Visual Film Festival and a music-based collaborative game. In collaboration with Prof. Cynthia Leive, Head Librarian of the
Marvin Duchow Music Library, the MLF project included the implementation of a generalized database system for entering, editing and browsing a large discography catalog of recordings of Handel (The David Edelberg Collection).

4.0 Software Development

The MLF site runs on an SGI Indy R4400SC which sits on the Faculty of Music network sub-domain, music.mcgill.ca. System installation, development and maintenance has been the responsibility graduate students, Kyle Dawkins and Paul Kennedy. While much of the Web server codes are public-domain, the specifics of this site required several additions to the standard web server. Numerous programs were developed in C and PERL to manipulate the hundreds of megabytes of data and to provide new facilities to deliver audio and MIDI to our browser helpers described below.

4.1 Segment Editor

An audio and MIDI editor for Macintosh computers was developed by Dale Stammen. This software forms an essential component of the project. Unlike most commercial or popular music, classical music tends to have very long sections of continuous materials. Hyperlinks in html only access by file name. In order to permit selective playback of pertinent musical sub-sections (a kind of "drop the needle") audio and MIDI data must be pre-edited into a collection of individual music sub-sections. The simple but tedious solution is to hand edit all of the files into a collection of small files. A more complete solution is to deposit markers into a single file which can be stored at the server or the client and used to locate the desired section. The Segment Editor is a graphic tool which achieves this in a unique way - either audio or Standard MIDI Files can be segmented in one program. A set of markers can be placed at arbitrary points in the file which are then stored either as an external segment file for audio or embedded in meta-events for MIDI.

4.2 MIDI Player

The MIDI player recognizes segment markers stored as meta-events in an SMF. As MIDI files tend to be small in comparison with audio data, a request from the html browser causes the modified SMF to be transmitted to the client. The Player is a helper application which automatically plays from the selected segment start point. As the entire SMF has been transferred, the end-user can also re-play any segment locally by selecting segment names from a pull-down list.

4.3 Audio Player

The Audio Player is more complex. The segment file from the Segment Editor is passed to an ORACLE table. PERL scripts interpret the html request (by logical name). The segment data is retrieved from the ORACLE database and passed to a companion program which first retrieves the requested audio data from the file (in-point/out-point), second, prepares a MIME compatible file type and third, ships the data to the client. Any audio player which recognizes .aif or .au files and has been designated as the "audio helper" will play the segment. However, new players developed by D. Stammen (Mac) and K. Dawkins (PC) provide more flexible tools for this purpose. The ORACLE component was written by Norma Welch and the extensions to the server were developed and written by Paul Kennedy.

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5. Database Systems

The MLF project included the acquisition of ORACLE 7, the most widely used database software for UNIX. Two existing databases were converted from other formats into ORACLE tables. A collection of interface tools were written in PERL and ORA-PERL, a version of PERL which supports SQL type calls to ORACLE based data tables. PERL is an compact, interpreted scripting language, (not unlike UNIX C-Shell scripting language) which greatly simplifies the development of interface software. Some of the client interfaces were implemented using standard HTML forms while others are generated dynamically by PERL scripts. The entire database system was installed, designed and implemented by graduate students in the Computer Applications in Music Program - Jude Collins and Norza Welch.

5.1. The David Edelberg Collection of Handel Recordings

In collaboration with Prof. Cynthia Leive, Head Librarian of the Marvin Duchow Music Library, the MLF project included the implementation of a generalized database system for entering, editing and browsing a large discography of recordings of Handel (The David Edelberg Collection). This part of the project included the implementation of ORACLE 7 interface tools for Web browsing through "forms" and a scheme to manage and view materials in MARC format.

5.2. The Canadian Electroacoustic Community (CEC)

Using ORACLE, PERL and HTML, the CEC database of composers, institutions, venues, events, etc. was transferred from File Maker Pro into a web site. In collaboration with Nathalie Berger of the CEC in Montreal, Jude Collins prepared a set of query tools to permit public access to the CEC materials. These tools differ somewhat from the Handel database in that the records are not typical catalog entries but a diverse collection of people, places and events. This section of the www site also includes newsletters and other information of general interest the Canadian compositional community implemented as standard HTML documents.

6.0 Canadian Composers Portraits

The central component of the MLF project is the Canadian Composer Portraits. Designed and implemented by Shireen Maluf, this portion of the site explores many ideas regarding presentation of contemporary music using hypermedia techniques. We address both the novice and knowledgeable user through a scheme which starts with simple biographical materials and media leading to more detailed information about the composer, complete lists of works, information about individual works and finally, a detailed presentation including graphic analyses of one or more works.

Each entry includes numerous hypermedia elements - scanned scores, audio clips, voice interviews, graphic materials and even analyses which can be navigated using the "maps" function of HTML. For example, the structural analysis of Claude Vivier's string orchestra work, Ziyang (1980) is a map which permits the user to click on a section heading such as, Variation 1. This presents the associated score and audio segments to the client machine through standard HTML links.

It is our intention to continue development of this part of the site. As the Segment Editor and Player software were completed after the first ten composers were
entered, this feature of the project is not utilized by the Composer Portraits materials at this time. All of the segments were made by hand (edited into countless tiny files). Furthermore, all of the historical, biographical, musical and analytical data on the site have been written by Maluf and other graduate students in the Faculty.

7. McGill Records

The Faculty of Music label, McGill Records, includes an eclectic collection of recordings made by McGill staff. This part of the Web site is a showcase for these records which includes colorful jacket covers and backs, liner notes and several audio clips (20'-30") per CD. The audio was encoded directly from CD thru converted to 22050 srate, mono, 16-bit sample data. This format is one-fourth full-bandwidth and serves to reduce transfer times while maintaining good audio quality.

8. McGill University Master Samples (MUMS)

MUMS samples are used world-wide, especially in the film music business. Sean Terriah has implemented a WWW demo page for MUMS which includes background information, audio demonstration files (22050, mono, 16-bit) and a novel MIDI player. Using QuickTime 2.0 General MIDI utilities, MUMS samples can be loaded into the extensions of the local client. The user can then play a Standard MIDI File of their choice with MUMS sample data.

A pop-up piano keyboard also permits the user to play selectively any tone in the data set. The drawback here is that QT-GM is designed as 8-bit data. However, as an educational tool in conjunction with the other aspects of the site this will be a powerful addition to the web tool-set. For example, while browsing a contemporary score a novice may wish to learn more about the harp. By clicking on "hear the harp", the MUMS samples, a typical SMF and the graphic-piano will all be shipped to the client. Note that with QuickTime 2.0, no external MIDI interface and synthesizer is required. Note also that for now, these programs work on Macintosh computers.

9. Other Activities

There are many elements to the site such as the Graffitti Wall - a public forum for comments on the site, the Snap Shots which permit instantaneous photos of three labs in our building, and a section called Current Research which includes hypermedia projects and term papers by graduate students in the program. We are also investigating new technologies for use in the presentation of music information such as real-time audio transmission, VRML (Virtual Reality Markup Language) for navigable 3-D graphic score presentation, and MOO-based systems for collaborative instruction.

8.0 Acknowledgments

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