

# Beyond VARIATIONS: Creating a Digital Music Library

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## Abstract

This presentation will focus primarily on work being done at Indiana University in the area of digital music libraries, with some discussion of related efforts.

Indiana University's VARIATIONS system serves as both an early example of a working digital library supporting music content and an early application of World Wide Web technologies to music. Since April 1996, the system has provided online access within the William and Gayle Cook Music Library to sound recordings from the library's collections. Unlike many early university-based digital library projects whose primary goals were to provide broader access to unique and/or archival collections, VARIATIONS has built its digital collection from standard musical repertoire identified as central to the teaching mission of the Indiana University School of Music.

At present, the collection available in VARIATIONS encompasses over 6800 sound recording titles, representing a broad range of musical material reflecting the curriculum of the IU School of Music, including operas, songs, instrumental music, jazz, rock, and world music. Recordings are digitized at CD-quality by library staff and stored as both WAV-format "archival" copies and MPEG service copies for delivery to users. Users are able to locate sound recordings either by browsing reserve lists (organized by course number, instructor, composer, and title) or by searching IU's online library catalog system, IUCAT. Sound files are streamed to users via an IBM VideoCharger server and a customized player application.

VARIATIONS has become an integral part of music library services and the instructional process within the School of Music at IU, but despite its success, VARIATIONS lacks many elements that one might expect to find in a "digital music library." One such element is access to formats other than audio. In fact, the very name VARIATIONS was intended in part to convey the idea that musical information by its nature comes in many different formats (including sound, notation, time-based information, text, video) and that access to all of these formats in an integrated fashion is a desirable goal for a digital music library system.

Indiana University has recently embarked on a four-year project to dramatically expand upon the current VARIATIONS system to create a Digital Music Library with funding from the National Science Foundation and National Endowment for the Humanities as part of the federal Digital Library Initiatives – Phase 2 (DLI2) program. Lead Principal Investigator for the project is Dr. Michael A. McRobbie, Vice President for Information Technology and Professor of Philosophy and Computer Science at IU. This project, involving faculty from music, law, and library and information science, and librarians and staff from both the library system and information technology services department, centers around three main tasks: First, the project will create a Digital Music Library (DML) testbed system. Secondly, applications will be developed for music education and research based upon the collections and functionality provided by the DML testbed. Finally, the DML will be used as a foundation for research in the areas of instruction, usability, and intellectual property rights.

**Testbed system:** The testbed system created in the DML project will support not only audio but images of musical scores, score notation files, time-based representations of music (such as MIDI), and possibly video. The system will provide navigation, search, and retrieval functions including bibliographic search; retrieval and synchronized playback of sound recordings, MIDI files, and music notation files; access control and authentication services; and rights management services. Synchronization and linking of multiple representations of the same musical work will be enabled through development of structural metadata formats for music. In addition to IU, seven institutions in the US, UK, and Japan have agreed to participate as “satellite sites” to explore issues involved in remote access to the system and its collections and provide additional feedback on the system’s design and development. Testing and evaluation of access across national and international networks, including both the commodity Internet and experimental high-performance networks, will be carried out in the project.

**Music instruction:** The promise of a successful digital music library in education can be realized only when users are able to integrate access to digital library content—including digital audio, score notation, structural representations, and annotations—easily with other interface elements in the creation of class presentations, learning activities, and publications. The DML project will develop an object-oriented component-based software framework to allow creation of such applications, including support for synchronization between media and visualization of musical forms. In addition, the project will evaluate the instructional impact created through use of the digital library in both major and non-major courses, including distance education courses.

**Usability:** There are many different categories of users who might make use of a digital music library system, including students, researchers, instructors, librarians, and the general public, and design of the system must take this into account. Questions to be addressed include: How do we offer users control of multiple information formats in a single interface? How do we represent the DML information space to support accurate navigation and retrieval? How do we make creation and modification of instructional tools as easy as possible? What constitutes an appropriate set of measures to assess the usability of this technology? To help answer these questions, both formative and summative testing will be pursued throughout the design process. Participation groups will be formed to allow users to be engaged directly in the design of the system through input into the requirements process and participation in usability tests.

**Intellectual property:** The creation of almost any digital library raises complex issues associated with copyright and other legal forms of intellectual property, and music poses particular copyright complexities given the multiple rights holders involved (for both the underlying musical work and the sound recording of that work). Research in this area will include determinations as to when fair use and other exceptions provided by copyright law may be invoked and what the most practical options are for securing permissions and licenses when these exceptions do not apply. Various management alternatives, both organizational and technical (authentication, access control, rights management metadata, etc.) will be explored.

**Content-based IR:** While content-based music searching is not a primary focus of this project, it is certainly a very important part of a digital music library, and we are very interested in working with others to integrate content-based IR capabilities into the system to complement the metadata-based capabilities that we are developing.

## Suggested Readings

Burroughs, Michael, and Fenske, David. 1990. Variations: A Hypermedia Project Providing Integrated Access to Music Information. In *International Computer Music Conference Glasgow 1990: Proceedings*.

Dunn, Jon W., and Mayer, Constance A. 1999. VARIATIONS: A Digital Library System at Indiana University. In *DL '99: Proceedings of the Fourth ACM Conference on Digital Libraries*, 12-19.

Digital Music Library project web site. <<http://dml.indiana.edu/>>

Multimedia Music Theory Teaching Project web site. <<http://theory.music.indiana.edu/mmtt/>>

VARIATIONS project web site. <<http://www.dlib.indiana.edu/variations/>>