The AudiAnnotate Project: Four Case Studies in Publishing Annotations for Audio and Video

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Abstract

Access to audio collections is often restricted by institutions for copyright, privacy, and preservation reasons, but it is the lack of descriptive metadata and annotations that stands in the way of all levels of access and use. Libraries, archives, and museums (LAMs) often hold physical audio artifacts that are unmarked and lacking important identifiable information such as title, date, location, subject, participants, or context. Annotating is only one of a list of scholarly primitives including discovering, comparing, referring, sampling, illustrating, and representing [Unsworth 2000]. IIIF (International Image Interoperability Framework) is one standardized solution that LAMs have adopted for giving users the ability to perform these primitives with images held in cultural heritage institutions. The AudiAnnotate project builds on the new IIIF standards for AV to address the gaps in engaging with audio by developing a solution to bring together free audio annotation tools and the Web as a standardized collaboration and presentation platform. The AudiAnnotate use case presented here includes a presentation by Tanya Clement titled "Zora Neale Hurston's WPA field recordings in Jacksonville, FL (1939)" which provides context to three recordings of Hurston created during the Works Project Administration Federal Writers Project from 1937-1942 and made available online at the Library of Congress as part of the Florida Folklife Collections Florida Memory (FM) project.

Introduction

In recent years, increased concern over media degradation and obsolescence combined with the decreasing cost of digital storage has led libraries, archives, and museums (LAMs) to digitize audiovisual (AV) materials for improved access and long-term preservation. Yet, improving preservation and access must go far beyond digitization. The fact that digital AV collections are not well-represented in our national and international digital platforms, such as Europeana and the Digital Public Library of America (DPLA), demonstrates complicated factors surrounding how LAM institutions manage and facilitate access to digital surrogates. As of July 2020, Europeana comprised 55% images and 42% text objects, but only 1% sound objects and .5% video objects [Europeana]. DPLA included 67% images and 32% text, with less than 1% sound objects, and moving image objects [Digital Public Library of America]. AV collections often include lectures, panels, and speeches; performances such as story-telling, oral histories, and poetry or dance performances; and other documentary AV historical artifacts. Yet, even while they are sometimes the only record of an event or an aural, visual, or performance tradition, AV digital artifacts remain underused and understudied. The goal of the AudiAnnotate Extensible Workflow (AWE) project is to accelerate access to, promote scholarship and teaching with, and extend understanding of significant digital AV collections in the humanities.

The State of Recorded Sound Preservation in the United States: A National Legacy at Risk in the Digital Age (2010) by the Council on Library and Information Resources and the Library of Congress reports that if AV collections go unused, libraries and archives that hold AV collections from a diverse range of time periods, cultures, and contexts will not prioritize their preservation [CLIR 2010]. One successful response to the 2010 report has been the Radio Preservation Task Force (RPTF) of the Library of Congress. Created 2014, the RPTF's primary goal has been "to support

collaboration between faculty researchers and archivists toward the preservation of radio history" by developing an online inventory of extant American radio archival collections and pedagogical guides for utilizing radio and sound archives [Radio Preservation Task Force]. While significant work, this kind of inventory only provides surface-level access to limited information about some artifacts. A persistent lack of descriptive metadata about the content of AV materials continues to stand in the way of further levels of access and use.

While increasingly more AV objects might be digitized, under-resourced LAMs must still spend valuable human labor listening to or watching AV media in real time to generate the basic metadata required to make these items indexable, searchable, and accessible online. LAMs often hold physical media artifacts that are unmarked and lacking important identifiable information such as title, date, location, subject, participants, or context. Beyond creating access and discovery points for researchers, this basic information can help LAM professionals organize these materials as well as decide whether there are cultural sensitivity, privacy, or copyright concerns at play in creating access to them. Generating the needed metadata is prohibitively time-consuming, and automatic, machine-generated metadata is an expensive process still very much in research and development and certainly not accessible to all.[1]

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Even with simple metadata, AV materials may not include enough information to pique researcher and student engagement. Annotations are what John Unsworth has called *a scholarly primitive* — an essential humanities method for adding context and meaning to cultural objects of study for use in research, teaching, and publication [Unsworth 2000]. Researchers annotate books when they are taking notes; students annotate print-outs of poems when they are discussing them in class; friends annotate faces on images on social media when they are trying to direct attention to a person on their post. With AV materials, users may want to annotate particular events such as when a speaker is speaking and who they are; the presence of chickens, gunshots, helicopters, or feedback from the crowd for a better sense of context; or when a speaker laughs, sings, yodels, plays an instrument, or switches languages in order to understand the genre of or audience for a performance. Annotations have been the basis for engaging audiences with cultural objects from the era of monks creating commentary on medieval manuscripts to current online scholarly pages, editions, and exhibits [Clement and Fischer 2021]. Sometimes, if an AV object is not available online, annotations can provide context, like being able to read liner notes for a missing album. Further possibilities for access include the ability for scholars, students, or the public involved in larger projects across institutions to systematically, collaboratively annotate or the ability for LAMs to showcase user annotations by including them back into their digital asset management (DAM) systems. Presently, however, even when AV materials are made accessible by LAM institutions, these digital objects remain inaccessible for annotation and therefore inaccessible for learning, public comment, scholarship, and general use.

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Annotating is only one of a list of scholarly primitives including discovering, comparing, referring, sampling, illustrating, and representing [Unsworth 2000].[2] IIIF (International Image Interoperability Framework) is one standardized solution that LAMs have adopted to give users the ability to perform these primitives with images held in cultural heritage institutions. Comprising 56 global members including major research universities, national libraries, and world-renowned museums, archives, software companies, and other organizations, the IIIF Consortium has worked together since Fall 2011 to create, test, refine, implement, and promote the IIIF specifications for interoperable functionality and collaboration across repositories. IIIF uses linked data and W3C web standards to facilitate sharing digital image data, migrating across technology systems, and using third-party software to enhance access to images, allowing for viewing, zooming, comparing, manipulating, and working with annotated images on the Web. With IIIF, users can reference images linked from LAMs into software that allows them to manipulate the images in new ways without impacting the institution's presentation of the item. Universal Viewer, for example, which has been under development by Digirati since 2012, is a community-developed open source project that allows users to zoom into an image using the IIIF image application programming interface (API), create annotations, and generate links to the zoomed, annotated regions. As a result, a user can focus on one part of Vincent Van Gogh's painting *Irises* at the J. Paul Getty Museum and annotate a particular brush-stroke. She can save this view, compare it against another part of the painting or another painting, and share this view with others. Storiiies is another project that demonstrates how third-party software can help users engage images at holding institutions to generate digital stories. In both cases, the institutions' use of IIIF allows researchers to implement a broad range of online tools to discover, compare, refer, sample, illustrate, and represent

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their interpretations of these cultural heritage objects, which in turn encourages their broader use.

As of June 2020, the IIIF-AV Technical Specification Group has extended the existing IIIF Presentation API (version 3) to accommodate rendering AV in a web browser. The AV group is actively welcoming contributions to their collection of AV user stories, mockups, and prototypes in order to make sure IIIF-AV is used by a broad audience. While IIIF has shared use cases for different kinds of AV manifests, including for album covers, oral histories, multi-track recordings, and AV with sign language, tools for exposing and playing these manifests are still under development.[3] Freely available, Universal Viewer displays annotations as captions on AV materials, but the annotations cannot be used to navigate the object or be shown separately from the AV object, a necessity for oft-restricted AV materials. The AWE project builds on these IIIF accomplishments, addressing the gaps in engaging with AV by developing a solution to bring together free AV annotation tools and the Web as a standardized collaboration and presentation platform.

In response to the need for a workflow that supports IIIF manifest creation, collaborative editing, flexible modes of presentation, and permissions control, the AudiAnnotate Extensible Workflow (AWE) connects open source tools for annotation (such as Audacity), public code and document repositories (GitHub), and the AudiAnnotate web application for creating and sharing IIIF manifests and annotations. Usually limited by proprietary software and LAM systems with restricted access to AV, researchers can use AWE as a complete sequence of tools and transformations for accessing, identifying, annotating, and sharing annotations. LAMs will benefit from AWE as it facilitates metadata generation, is built on W3C web standards in IIIF for sharing online scholarship, and generates static web pages that are lightweight and easy to preserve and harvest. AWE represents a new kind of AV ecosystem where the exchange is opened between institutional repositories, annotation software, online repositories and publication platforms, and researchers.

Technical Development

AWE owes much of its architectural direction to two projects that are built on the tenets of minimal computing: Readux (produced by the Emory Center for Digital Scholarship) and Ed. (developed by Alex Gil, in collaboration with Susanna Allés Torrent, Terry Catapano, and Johann Gillium). Readux is a tool for visually annotating digitized books and publishing the annotated texts as free-standing editions. Although the Readux application is a traditional web application (based on Django running against a Postgres database), when researchers export their editions, the images, text, and commentary are converted into static websites built using Jekyll and published to GitHub Pages. Ed. accomplishes a similar goal — producing static sites hosting digital editions — but uses an even simpler, Jekyll-based architecture to convert TEI-XML source or Markdown to web pages. Using Jekyll-based static sites and free hosting on GitHub pages is a sustainable model for hosting digital scholarship.[4] The combination of a full web application for scholarly annotation and data processing with an export to a static site for preservation and presentation is the basis of the AWE approach.

Architecture

The AudiAnnotate web application architecture is lightweight. Researchers create their own time-stamped annotations, provide a URL to the AV item, and upload the annotations to the AudiAnnotate application, which creates a static site that includes a playable edition or exhibit where the artifact, the annotations, and any introductory or other explanatory material can be viewed together. As a Ruby-on-Rails application that does not store data locally, the AudiAnnotate application eliminates the need to run a database or datastore. The application can be installed on a small, cloud instance, a 1GB Linode shared instance costing $5 USD per month. A further advantage to a databaseless architecture is that if the AudiAnnotate web application goes offline, the artifacts it produces will still be available on GitHub. Users with a basic understanding of Jekyll or Markdown can edit AudiAnnotate-created sites without the web application running at all. Furthermore, any other installation of the AudiAnnotate web application will have access to the same data created by previous installations, allowing projects to be transported from one institution to another without data migration.

The AudiAnnotate workflow (AWE) is built on what coders call *glue code* — code that sticks a bunch of things together to make something useful. Annotation tools such as Audacity give users robust AV analysis and labelling tools from

which a simple text file can be exported and used in AudiAnnotate. The AudiAnnotate application wraps references to online AV files and annotations in IIIF manifests to make them presentable in the Universal Viewer and publishes the sites using Jekyll to generate static pages. Even the app itself takes advantage of the Ruby on Rails web framework, Open Source libraries for authentication and displaying tables, and GitHub to store everything it produces.

Implementation

Researchers log into the AudiAnnotate web application using their GitHub account (enabled via GitHub's OpenAuth implementation), which in turn enables the application to read from and write to that user's repositories on GitHub. In order to prevent AudiAnnotate from modifying other projects under a researcher's GitHub account, the application restricts its access to repositories tagged with the topic "audiannotate."[5] Once logged into the application, a researcher can start a new project, which creates a new repository under their account and populates it with a Jekyll template built to read AWE projects. It is important to note that the AudiAnnotate software does not store AV files or provide a means to generate annotations.[6] A researcher adds an item to their project through the AudiAnnotate web form by providing a URL to an online AV object, a file that contains time-stamped annotations to that AV object, and minimal metadata about the AV source. When a user adds an item, the web application converts their form input into a IIIF v3.0 manifest JSON file, and saves it to the _data directory of the Jekyll site along with a stub page for the item. The resulting static site serves both the IIIF manifest as JSON and presents the AV file and its metadata on a static page embedding the Universal Viewer for playing the AV. When a researcher uploads the time-stamped annotation file they have already created, the AudiAnnotate application builds WebAnnotation JSON files, which are rendered into a static site by Jekyll and linked to the embedded viewer, allowing users to play related segments of AV by clicking on an annotation. Further interactivity — like sorting or filtering annotations — is provided through the JavaScript library DataTables.

Disadvantages

Dependency on GitHub is the biggest limitation on the process of producing AudiAnnotate sites. Since AudiAnnotate relies not only on Git but on the GitHub API, producing new AudiAnnotate sites would be impossible without GitHub. In addition, legal sanctions prevent scholars in Iran, Cuba, and other countries from using GitHub [GitHub and Trade Controls]. However, once the AudiAnnotate application creates a static site that is published to GitHub, that site does not have to stay on GitHub. A *git clone* command or a zip download copies the site to a local computer, after which it can be run locally, served from any web server, or stored in a digital preservation system.

While the system works well when only a few people are building AudiAnnotate sites, its reliance on GitHub can be a bottleneck when larger groups like a workshop or classroom all attempt to build sites at the same time. AudiAnnotate's first workshop ran into a "Too many requests" error from GitHub because participants were pinging the GitHub API to simply list their existing AudiAnnotate projects. This was a limitation of the "no database" architecture — the AudiAnnotate app had no data to show without a connection to GitHub. Consequently, the application's GitHub API connection was updated to use the authenticated user everywhere possible, which reduced the number of requests via the unauthenticated API connection. While the issue was resolved for the second workshop, delays still occurred in responses to API requests and when building sites. Because GitHub did not return a web page immediately when a request was kicked off, some users experienced errors. Ultimately, using the freely available services of a corporate-funded system like GitHub can be useful, especially for projects and teams with less funding, but it is one that comes with limitations.

AudiAnnotate Use Case Examples

The use case examples presented here include four kinds of projects that demonstrate how AWE provides new kinds of access to audio and video artifacts. The first example is an audio scholarly edition by Tanya Clement titled "Zora Neale Hurston's WPA field recordings in Jacksonville, FL (1939)," which includes three recordings created during the Works Project Administration (WPA) Federal Writers Project from 1937-1942 and made available online at the Library of Congress as part of the Florida Folklife Collections' Florida Memory project. Zora Neale Hurston was an African American ethnographer, novelist, and dramatist, a collector, speaker, performer, and writer of other people's stories and

her own. In the 1930s alone, Hurston wrote numerous short stories, journal articles, books, and musicals based on her ethnographic field work in Alabama, the Bahamas, Florida, Georgia, Haiti, Jamaica, and New Orleans.[7] These specific recordings of Hurston performing songs she had collected were created on June 18, 1939 in the WPA offices in Jacksonville, Florida under the direction of Herbert Halpert with Carita Doggett Corse and Stetson Kennedy. In order to make Hurston's performances more accessible, the Florida Memory project extracted 21 moments when Hurston sings and talks from the longer recordings.[8] In contrast to the Florida Memory abridged "playlist," Clement's scholarly edition is based on the full recordings and, consequently, facilitates listening to Hurston sing and talk within the context of the other songs, stories, and people recorded that day. Including stories shared by Beatrice Lange, which were told to her by the descendent of a rice plantation owner from South Georgia as well as Art Pages, the pianist for a Cuban band, and Rev. H. W. Stuckey of South Carolina, Buford County, the edition shows that listening to Hurston's performances in context is important. As an African American woman and ethnographer from Florida, educated at Columbia University as well as in turpentine camps and juke joints in the Jim Crow South, Hurston played multiple roles in the WPA office as both collector and performer, as subject and object of inquiry, and as an authorized and unauthorized agent of the narrativization of African American folklore. The presentation of Hurston's songs in the context of the other performances allows Clement to highlight conversations with Herbert Halpert, the white male lead and authorized "collector" as well as Carita Doggett Corse, Hurston's white, female benefactor, and the songs and stories of the other performers, both white and Black, male and female, who provide a complex picture of the racialized and gendered endeavor that was folklore collecting in Florida in 1939.

The second example, "Example Sensitive Audio Lesson: John Beecher, McComb 'Criminal Syndicalism' Case," is a lesson plan on using sensitive archival materials in the classroom developed by Bethany Radcliff and Kylie Warkentin. Radcliff and Warkentin base the lesson plan around a 1964 recording of a Civil Rights activism event from the John and Barbara Beecher Collection at the Harry Ransom Center (HRC) at the University of Texas in Austin. On the HRC website, the recording had been made accessible without any trigger or other warnings. While this recording highlights the voices of community activists, it also includes racist slurs, descriptions of imprisonment of Black high schoolers, and testimonies from concerned parents. In an attempt to practice trauma-informed pedagogy and avoid replicating oppression, the authors use the apparatus that AWE provides to present this audio within a context that guides students and instructors in their approaches to the conversation. A "Lesson Introduction and Overview" for the instructor gives resources on trauma-informed pedagogy, an overview of how to create a GitHub account and AWE project, and a full lesson plan for engaging students in audio annotation and working with sensitive materials. The next sections, "1. Considering 'Criminal Syndicalism' Audio," "2. Analysis and Potential Annotation Routes," and "3. Further Analysis and Annotation in Groups," comprise different activities for students including providing an annotated, time-stamped version of a clip from the audio, marked with trigger warnings for sensitive sections, and activities to lead students through a collaborative process of critical analysis with audio using annotation. The final sections "4. Presentation" and "Extension Activity Using Hypothesis" focus on using AudiAnnotate to present findings and introduce how to integrate Hypothes.is, a third-party web browser plug-in annotation tool that can be used with AWE projects to promote further discussion through collaborative annotation.

15

The third and fourth use case examples are graduate student essays that demonstrate how the AWE workflow works with video artifacts and how the process of annotation can shape scholarship. "The Kindergarten Teacher" by Zoe Bursztajn-Illingworth is an investigation of poetic voice and address on screen in Sarah Colangelo's film *The Kindergarten Teacher* (2018). The project shows that annotating scenes from the film shaped the author's dissertation chapter, "Right Voice, Wrong Body: *The Kindergarten Teacher*, Poetic Address, and Voice as Possession." Through the process of annotation, the author observed how the film's form reveals poetic voice as dialogic and public as opposed to a monologic, private utterance as lyric theory often proposes. In this multimedia essay, sections include scenes from the film with timestamped annotations alongside prose sections where the scenes are discussed further in the larger context of film and poetic theory.

16

The final use case example, "Camile 1921" by Janet Reinschmidt, includes annotations for the film *Camille* (1921) that the author used as part of a master's thesis on reception studies and queer interest in early Hollywood film. Again, this author provides access to *Camille*[9] with annotations that mark key scenes of interest as well as a discussion of the

17

influence that annotation had on their scholarship. During the annotation process, the author's perception of silent and early sound film shifted as they re-watched scenes dozens of times for minute details easily overlooked by audiences. The author discusses how this process helped them reconsider the editing techniques and industrial shifts in film editing of a hundred years ago. This project also deploys Hypothes.is as a means to invite public comment. The author starts the public conversation through Hypothes.is by creating her own Hypothes.is annotations as examples, including notes on background information on lesbian cinema history and on the role of production collaborators for the filming of *Camille*. For this author, the ability to facilitate and invite larger discussion around *Camille* means their project "is as much about the preservation of these endangered silent films as it is about my thesis research" [Reinschmidt].

These four projects (a scholarly edition, a lesson-plan, and two essays) show that increasing the use of AV in research and teaching — and therefore its preservation — is about more than just creating access. *The State of Recorded Sound Preservation in the United States: A National Legacy at Risk in the Digital Age* includes a survey of scholars whose work is primarily with audio and concluded that scholars wanted unfettered access and better discovery tools for *deep listening* or "listening for content, in note, performance, mood, texture, and technology" [CLIR 2010, 41] [CLIR 2010, 157]. The report also suggests that training for archivists and librarians in sound preservation must include *critical listening* skills [CLIR 2010, 147] because librarians and archivists need to know what scholars and students want to do with sound artifacts in order to make these collections more accessible. AWE facilitates such rich projects because it enables collaborative AV annotation and presentation through a minimalist computing workflow that depends on preexisting, free annotation software and on standardized web protocols the use of which is shared by free, community-rich platforms and tools such as GitHub and Hypothes.is. AWE is a sustainable and easy-to-use method that enhances how researchers and students are able to deploy scholarly primitives that, as the use cases show, go beyond annotation to include discovering, comparing, referring, sampling, illustrating, and representing. Increasing the use of AV materials and their preservation requires facilitating the production of new knowledge in sustainable ways.

Notes

[1] The massive Media Digitization & Preservation Initiative at Indiana University, for example, has had to pursue a subsequent project — the Mellon-funded AMP (Audiovisual Metadata Platform) — to develop a platform with automated mechanisms such as machine learning to generate and manage basic library and archive metadata at scale.

[2] Clement and Fischer address how annotation practices go back to the Medieval ages [Clement and Fischer 2021].

[3] See the "IIIF Cookbook" and the example for a video viewer with aligned transcripts as part of the Open Hypervideo Project and as part of the Universal Viewer.

[4] Later in this discussion we address how GitHub creates other kinds of sustainability limitations and how to address those limitations.

[5] This approach, and the use of the *GitHub* search API was suggested by similar functionality in CWRC-Writer and conversations with the CWRC-Writer team.

[6] Some researchers have used the Internet Archive or Audacity as storage and annotating platforms.

[7] *Jonah's Gourd Vine* (1934), *Mules and Men* (1935), *Their Eyes Were Watching God* (1937), *Tell My Horse* (1938), as well as her plays, *From Sun to Sun*, *The Great Day*, and *Singing Steel*. Posthumous publications that were also written during this time period include *The Sanctified Church* (1981), *Go Gator and Muddy the Water* (1999), *Every Tongue Got to Confess: Negro Folk-tales from the Gulf States* (2001), and *Barracoon* (2018).

[8] The Florida Memory project titled their playlist *Dust Tracks*, after the title of Hurston's autobiography *Dust Tracks on a Road* (1942).

[9] Using a version uploaded to Archive.org by "Silent Hall of Fame" at https://archive.org/details/Camille1921.

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