White Paper Report

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White Paper
NEH Award HD-51246-11
"Re-Framing the Online Video Archive : A Prototype Interface for America's Test Films"
Project Director Kevin Hamilton, with Co-PI Ned O'Gorman
University of Illinois, Urbana-Champaign
June 2013

We first envisioned and proposed a prototype video annotation, navigation and visualization project in 2011. The two years since have seen an explosion of new specialized and consumer-grade tools for annotation, as well as a variety of new approaches to navigating video annotations. Our contributions to this pressing area of research (facilitated through NEH Digital Humanities Start-up grant HD-5124611) lie in three areas - *video-segmentation* and *database structure*; *navigation* of multimodal annotations within a video playback interface; and *data visualization* in the context of video annotation.

BACKGROUND

We first saw a need for a new mode of video annotation and navigation in 2011 while attending an NEH Summer Workshop at University of Southern California. There, while authoring an interactive paper using the experimental platform *Scalar*, we began to see the potential benefits of annotating digital video files with text, images, other videos, and even URLs. We saw in this activity not only a rich opportunity for readers, but also for researchers looking to study a film closely as a text. As in the oldest academic and ecclesial traditions of textual exegesis and hermeneutics through parallel writing, we saw great potential for learning our subjects of study through "writing" our way through them.

Our case is somewhat unique in that many of our subjects of study - government produced films from the Cold War era - were produced in such quantity, and in heavily serialized form, that we needed something more database-oriented, and less argument-oriented, than Scalar to serve our needs. Our larger project examines a group of 1000+ films produced over about 20 years by the 1352nd Photographic Squadron of the U.S. Air Force (also known as Lookout Mountain Laboratory or LML.) These films, utilized largely for internal government communication, training, and scientific visualization, grew out of a highly regimented "factory" for the rapid production of films on-demand.As argued by multiple scholars within the study of "nontheatrical" or industrial films, the study of such a large corpus as ours requires special attention to the films in series or set. Comparison of films across different applications or commissions is necessary to discerning a particular visual/aural/narrative formula, or deviations from the same.

In addition, the films at hand in our case represent a significant, if diffuse and somewhat isolated, source of national memory about this nation's rise to nuclear legitimacy and power. The core group of films produced by LML related to the large-scale atomic and nuclear tests conducted in the American Southwest desert and the South Pacific ocean. These tests were singular in scale, employing tens of thousands of military and civilian workers, and generating mountains of data still used to this day by scientists and weapons-experts. Though pivotal in political and technological histories at a national and global scale, these tests are not easy to learn about. Their sheer size as bureaucratic, logistical and scientific enterprises presents a

challenge to comprehension, as evidenced by the thousands of pages of reports produced by each test.

Film documents of the tests, though designed to be limited or specialized, in this case serve as one of the only "human-scale" interfaces for learning about this history. We saw an opportunity in annotating these films for bringing the larger landscape of stories and data around these tests - official and unofficial, secret and public - into view. An annotated nuclear test film in which specific documents, photographs, websites appear as linked to particular parts of the film might make of the video "playhead" an entry point into vast other spaces and archives. To watch a film might be to wander a collection.

To this end, we annotated eight films from early in our corpus, then designed and constructed an interactive interface for navigating the films and their annotations. The films selected for our working prototype include:

1. Project Crossroads 41:30 1946, Black & White
2. Operation Sandstone 20:00 1948, Color
3. EGG in Operation Sandstone 15:40 1948, Color
4. USAF Participation in Operation Sandstone 30:00 1948, Black & White
5. U.S. Army Engineers on Operation Sandstone 20:00 1948, Black & White
6. Blast Measurement Group in Operation Sandstone 18:35 1948, Color
7. Navy’s Part in Operation Sandstone 41:30 1948, Black & White
8. The Story of Operation Sandstone 1:13:15 1948, Black and White

VIDEO SEGMENTATION & DATABASE STRUCTURE

A primary problem in video annotation lies in determining the boundaries of a temporal segment for tagging or identification. Some approach this as primarily a computational problem, solvable through computer vision algorithms or analysis of compressed data from digital video files. Others rely strictly on human-powered approaches, as in the NEH-granted Cinemetrics project, wherein film viewers create their own markers for annotation as they watch. Most approaches today likely lie in a mix of these approaches, where researchers are looking for ways of presenting human workers (if even in a crowdsourced "turk" labor scenario) with a few computationally-created prompts or choices designed either to streamline a time-intensive process or "teach" software to interpolate structure.

A primary challenge to all of this work lies in determining the bounds of a discreet video sub-unit. Unlike texts, which are composed of words, sentences, and paragraphs, a video arguably has no inherent internal structure. Determining the bounds of a film's various sub-units is somewhat akin to determining the discreet objects within a static picture. Some obvious directions to go in this effort lie in dividing a film into individual film shots, essentially reconstructing an editing process. But even this process is complicated by the degree of "editing" that takes place in-camera through shifts of point-of-view, panning or zooming. In addition, film studies teaches us that there exist multiple ways of dividing up a film to understand its structure, and that these don't always coincide with physical events, audible or visible edits. Film, and especially sound film, lends itself as a medium to sensorial simultaneity, thus bringing multiple structural layers at the same time.

In terms of data structure, one could then approach descriptive annotation in at least two different ways that we know of. One could construct an ontology based on location in time, in which each minute, second or frame contains all possible fields for data entry or description. Alternately, one could create annotations based on a perceived "chunk" that represents an event of a specified duration. We opted for the latter approach, accepting the inherent challenge therein of reconciling overlapping entries for the same point in time. (We believe a structure more like the first approach could still be inferred from our data, but will leave that for later work.)

Our resulting data structure, as represented in the XML Schema included in this document's appendix, is fairly "flat," composed primarily of a series of individual "timepoints" created without computational assistance. The most important feature of one timepoint in the XML file is the temporal in-point and out-point of the segment. After that, our structure applies no hard typology to differentiate one timepoint's information or content from another.

Each timepoint contains the same possible fields, and these fields span both basic elements of cinematic style or dialogue transcription and more "advanced" annotation about the content of a particular scene, or its parallels to specific pages of government documents.

This data structure allows our final interface to simply retrieve timepoints based on whether particular fields are populated or not, rather than based on a hard-fast typology. Given the way in which we divided the labor of annotation amongst undergraduate, graduate, and faculty workers, and recorded author IDs for each timepoint, an interface might also retrieve timepoints based on a particular task given an annotator.

Where, as mentioned above, this approach results in some duplication and overlap of timepoints when multiple authors or even the same author on multiple occasions created an entry for the same point in a film, we use visualizations to aid in navigation.

Our labor structure broke down in the following manner:

1. An undergraduate film student transcribed dialogue and described shots in terms of cinematic style
2. One graduate student read a selection of reports on the tests at hand, and described in greater context the personnel, processes and technologies in play, with links to relevant pages of PDFs
3. Another graduate student created annotated links of films to still photographs
4. Faculty researchers created another layer of timepoints that analyzed the films themselves.

We believe this approach worked well from critical, methodological, and even pedagogical standpoints. Each author, tasked differently in her pass-through of a film, worked from an identifiable level of expertise that interfaced with her own educational and research goals. Authors with a wider scope of possible subjects, can observe not only the film but the annotations of other workers in support of their own work. Readers can later understand the data accessed based on the location of an annotation's author within a knowledge labor project.

We also see easy room for growth within this structure, through either the inclusion of computationally-determined timepoints, or computationally-derived connections between timepoints.

NAVIGATION

Presentation of text annotations alongside video has been a subject of exploration among designers for some time now. Mozilla's Popcorn javascript library (which we also utilize) has rendered this task relatively easy. The New York Times was an early adopter of such strategies, as in the analysis of President Obama's State of the Union Address in 2012 and 2013.

The primary revolution in these projects is the way in which they render the film and the accompanying text equal in priority from a navigational perspective. In the NYT example (which is representative), one can either navigate the film by scrolling the text, or the text by scrolling the film.

Our interface complicates and expands this possibility by adding paginated PDF files, and multimedia annotations that can be viewed as sub-collections. As a result, one can view a film in our interface and view all available media objects associated with each portion of the video file, or select one particular form of media (such as images), or a single pdf file, and navigate the film using only that subset as reference. This we accomplished using a "drill-down" tiered approach.

The most promising innovation here has been the navigation of a film using a PDF. As our PDFs are linked to the film through particular timepoints, a reader can essentially change orientation in mid-stream. She might start by viewing a film, until a particular pdf emerges, and then decide to start reading the PDF, allowing the film to playback according to where she is in the digital document.

VISUALIZATION

A chief challenge of navigating such complexity in modes and amount of annotation lies in orienting the reader to her location within a film. The playhead of course is the chief waypoint, but given that the timepoints within our data vary greatly in length and scope, our reader might also need to know the duration of the film attached to a particular annotation.

We also faced the challenge of presenting the more easily "metricated" data of cinematic style notation for the film. In our annotation for example, we exercised a fairly granular approach to describing cinematic structure, resulting in a large amount of data.

Our solution to both of these issues has been the construction of a radial representation of timepoints, which the reader may toggle into view, and between datasets. This visualization, round in order to fit within the whole screen and provide a sort of "fingerprint" for the film in question, rotates like a vinyl LP to indicate the current location of the interface, and also serves as a navigation device.

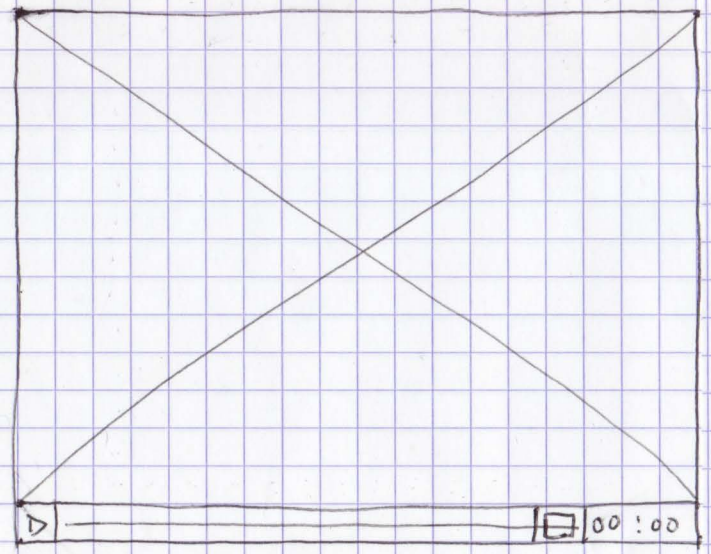
CONCLUSIONS

Our completed project will launch online in Fall of 2013. We anticipate working further on the piece, and building on our discoveries in the above areas to expand the archive and include more computationally intensive tasks. Though the size of our corpus (1000+ films) will necessitate working at a faster pace with the aid of computers, we feel that the groundwork laid in this prototyping process has been essential to ensuring a thoughtful engagement with larger-scale crowdsourced or automated approaches to annotation.

As new tools emerge and new related archives emerge from private and public sectors (including other NEH grant recipients) we look forward to contributing from our experience to a larger conversation about the future of video archives as a means to navigating our larger, multimodal heritage collections.

APPENDICES

1-5:	interface design from prototype to final version
6:	visualization design
7:	diagram of division of labor
8-10:	screenshots of input interface for annotation (Filemaker Pro)
11,12:	XML schema for annotation



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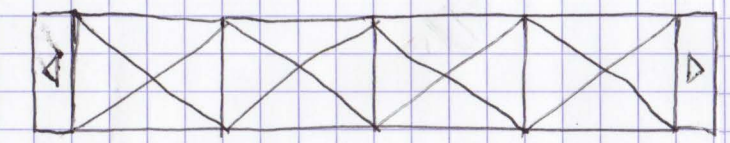
YEAR:
PRODUCER:
FORMAT:



COLLECTION | FORMATIONS | RE-FORMATIONS

DESCRIPTIONS

DOCUMENTS

ANALYSES

CHRONOLOGIES

MAPS

ANNOTATIONS

TITLE : Operation Ivy
YEAR : 1952
PRODUCER : Lookout Mountain Labs / USAF
FORMAT : Color, Sound, 16mm
SOURCE : Internet Archive

COLLECTION | FORMATIONS | RE-FORMATIONS

Descriptions (3)
Documents (36)
Analyses (2)

Timeline
- [x] international
- [ ] economic
- [ ] political
- [ ] cultural

Map
- [ ] transport
- [x] manufacturing
- [ ] ecology
- [ ] resources

Annotations (38)

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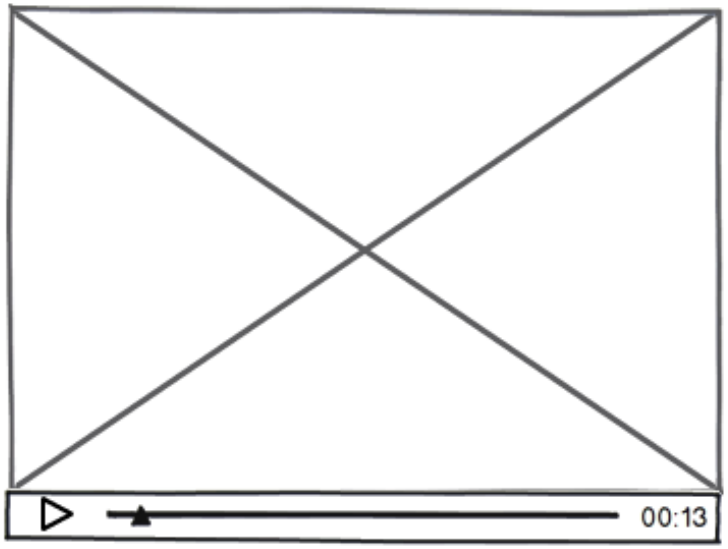


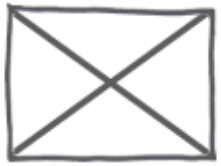
OPERATION CROSSROADS

1948, Color, 1:05:14

Collections | Histories | Exhibits

- [x] Documents
- [ ] Photographs
- [ ] References
- [ ] All

Histories > Documents



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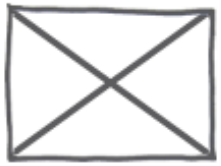

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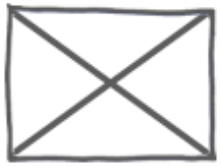

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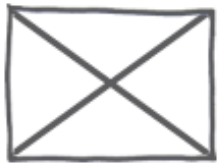

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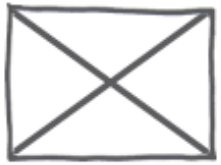

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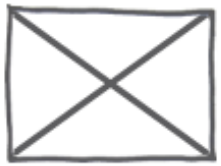

00:19:28 - 00:20:14 assets: 3

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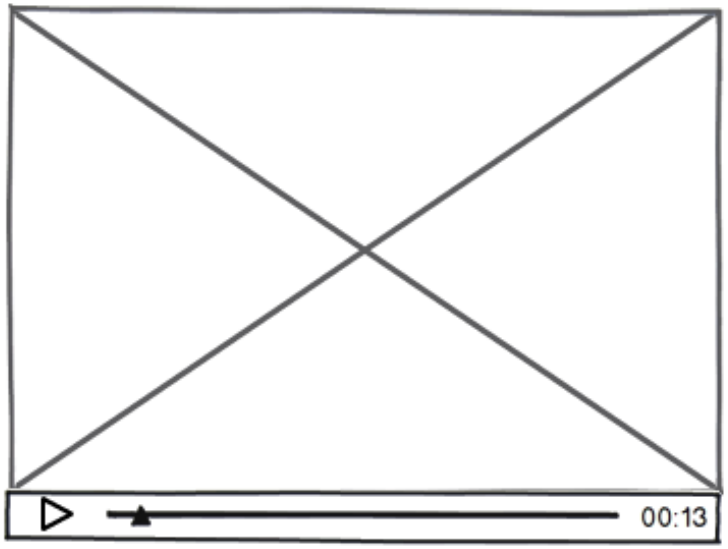

OPERATION CROSSROADS

1948, Color, 1:05:14

Collections | Histories | Exhibits

- ☑ Documents
- ☑ Photographs
- ☑ References

Histories > All Entries > 00:00:00 - 00:01:10 > Photograph NH345.89

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00:00:00 - 00:01:10

Photograph NH345.89

National Archives. USAF collection

asset 2 of 3

next entry

Operation Crossroads

1946, Naval Photographic Center, b/w, 16mm, sound 26:36

00:02:55

Overview Context Analysis

Documents the activities of Joint Task Force One,charged with detonating the fourth and fifth nuclear weapons at Bikini Atoll in the Pacific Ocean.

Digital versions : archive.org, doe.gov, youtube, amazon

Physical versions : NARA, LOC, Truman Library

00 : 02 : 50 - 00 : 03 : 05

The battleship USS Nevada, bomb aiming point, has been anchored at the exact center of the target array. Here to witness the completion of preparations is the President's Evaluation Commission. They will report the tests to the Commander in Chief.

00 : 03 : 05 - 00 : 03 : 25

Lashed to the decks of ships are samples of military supplies and equipment. Airplanes, jeeps, trucks, and tanks, themselves targets on target ships. Animals were placed aboard some of the ships to substitute for military personnel. A study of their future life history will provide invaluable information.

00 : 03 : 25 - 00 : 03 : 39

Steel towers seventy-five feet high have been erected on Bikini Atoll. Within these structures will be housed the remotely controlled cameras and specially designed scientific instruments that will record the data resulting from the blast.

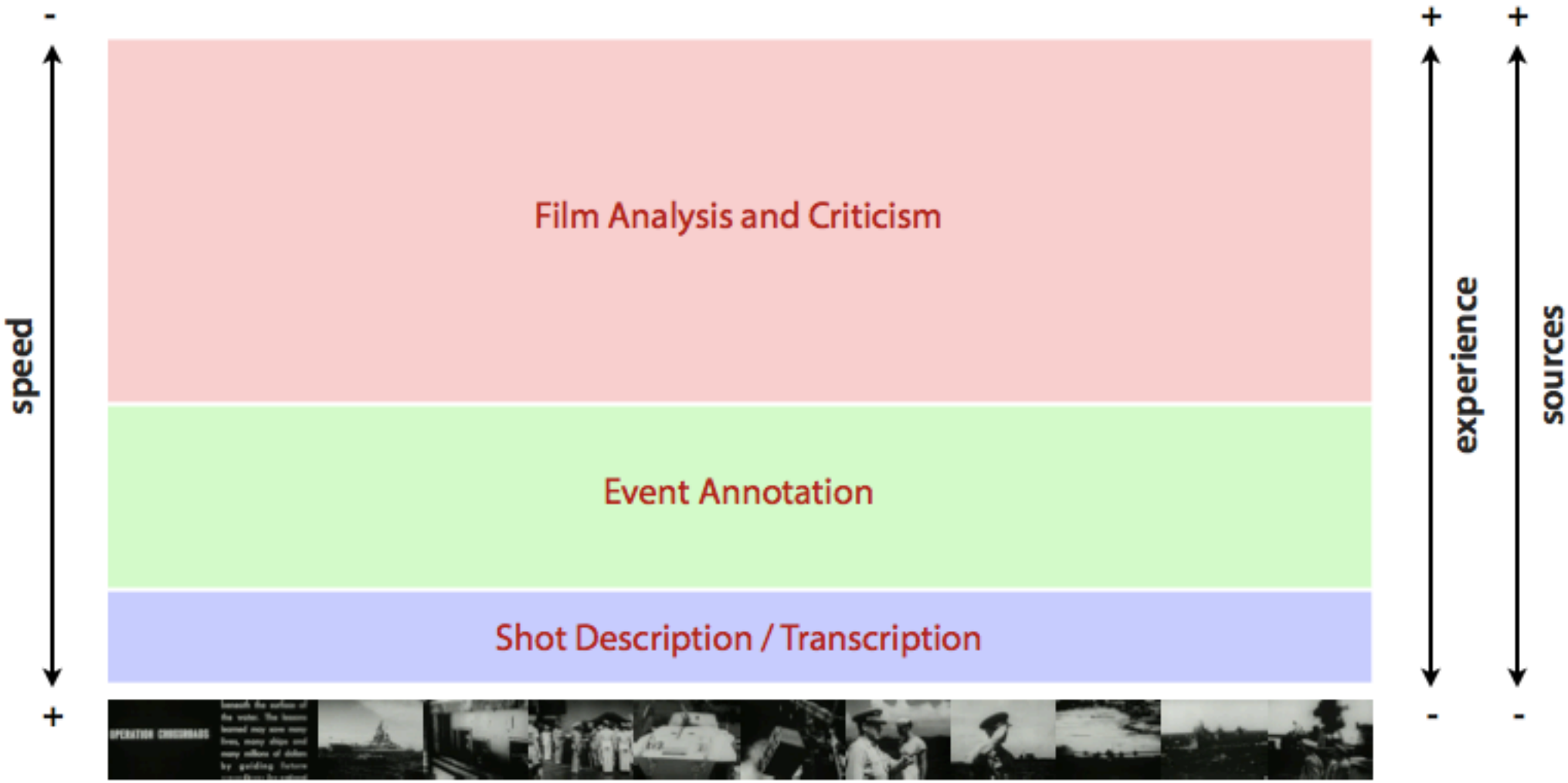
00 : 03 : 40 - 00 : 04 : 00

Many types of special motion picture and still cameras were encased in huge lead vaults. These unusual enclosures, built of rein forced concrete to withstand the primary blast action, were lined with thick sheets of lead to protect film from the effects of radioac tivity which would otherwise fog the sensitive material.

00 : 04 : 02 - 00 : 04 : 18

To further protect film from the effects of radiation, sliding lead panels built over the camera ports and designed to close automatically will seal the vaults, making radioactive penetration impossible.

EXTERIOR / INTERIOR
EXTREME LONG SHOT
LONG SHOT
MEDIUM LONG SHOT
MEDIUM CLOSE-UP
CLOSE-UP
EXTREME CLOSE-UP
DIEGETIC SOUND
MUSIC / NARRATION
TITLES & GRAPHICS
ALTERED FRAME RATE
07:28


speed
-
+
Film Analysis and Criticism
Event Annotation
Shot Description / Transcription
experience
+
-
sources
+
-

FILM: Operation Crossroads

file:/Kyoto/Users/hbirg/Documents/prototype.fp7

RECORD #: 451

Ian Hill 10/20/2011 4:01:47

duration 0:00:15

qt seconds	1483	1498
hh:mm:ss	0:24:43	0:24:58
	in-point	**out-point**
	set in	**set out**

Play from in point

PLAY / PAUSE

Play from out point

thumbnail

capture current frame as thumbnail

Transcription | Annotation | Shot Description

DIALOGUE

actor or narrator?

name of speaker

Transcription:

FILM: Operation Crossroads

file:/Kyoto/Users/hbirg/Documents/prototype.fp7

RECORD #: 451

Ian Hill 10/20/2011 4:01:47

duration 0:00:15

	in-point	out-point
qt seconds	1483	1498
hh:mm:ss	0:24:43	0:24:58

set in | set out

Play from in point

PLAY / PAUSE

Play from out point

thumbnail

capture current frame as thumbnail

Transcription | Annotation | Shot Description

EVENT SYNOPSIS

Joint Task Force commanders observe damage to the target fleet after the Baker Test. Rear Admiral W. S. Parsons directed technical and scientific work for Operation Crossroads with the title Deputy Task Force Commander for Technical Direction. His duties included preparing the target ships, instruments, test animals, the atomic bombs, and compiling the results of the tests. For two years prior to the operation he had been in charge of the Ordnance Division at Los Alamos. In that capacity, he assembled the Fat Man bomb that destroyed Hiroshima and flew in the Enola Gay on the bombing run. After Operation Crossroads, Parsons became chairman of the Joint Crossroads Committee.

LINK TO FILE

choose existing document

add new document

choose file

open file in Acrobat

page start set go

page end set go

paste image snips here

Save File Reference

FILM: Operation Crossroads

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RECORD #: 451

Ian Hill 10/20/2011 4:01:47

duration 0:00:15

	in-point	out-point
qt seconds	1483	1498
hh:mm:ss	0:24:43	0:24:58

set in

set out

Play from in point

PLAY / PAUSE

Play from out point

thumbnail

capture current frame as thumbnail

Transcription | Annotation | Shot Description

SOURCE

SOURCE MATERIAL

☐ Still Photo ☐ Motion Photo ☐ Text / Titles ☐ Static Illustration ☐ Animation

QUALITY

☐ Color

SPEED

☐ Slow-motion ☐ Fast-motion

FILMING LOCATION

☐ Exterior ☐ Interior

comments

CAMERA

SCALE OF SHOT ☐ Zoom

☐ Extreme LS ☐ Long Shot ☐ Medium LS ☐ Med CloseUp ☐ CloseUp ☐ Extr CloseUp

FOCUS

☐ deep ☐ shallow

MOVEMENT

☐ Crane shot ☐ Pan ☐ Tilt ☐ Tracking ☐ Handheld

comments

EDITING

TRANSITION *(from previous clip)*

☐ Crosscut ☐ Cut-in/away ☐ Establishing ☐ Shot/Reverse

☐ Dissolve ☐ Superimpose ☐ Wipe

EDIT STYLE

☐ Continuity ☐ Montage ☐ Elliptical

comments

Final Report
NEH Award HD-51246-11
“Re-Framing the Online Video Archive : A Prototype Interface for America’s Test Films”
Project Director Kevin Hamilton
University of Illinois, Urbana-Champaign
June 2013

XML SCHEMA

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