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Digital Video: From Digital Libraries to Social Interaction

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Outline

- o Thesis: Digital Video blurs traditional information and communication boundaries
- o Three ongoing DV projects
 - Open Video DL
 - Accessible, reusable files
 - Surrogation as key R&D challenge
 - User studies on surrogate effects
 - The question of channel synchronicity
 - VidArch and preserving context
 - YouTube and 2008 Election case
 - UNC YouTube Channel: issues and policies
- o From retrieval to (public) expression and conversation

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Digital Video Status

- o Digital video a burgeoning DL challenge: YouTube phenomenon (fall 2007: 65K new videos/day; 20TB/mo; 100M views/day)
- o Substantial research activity on storage, retrieval from engineering perspective (see IEEE, ACM MM)
- o Many large-scale DLs and services
 - InforMedia, Fischlar, ECHO, Internet Archive, Open Video, public.tv, researchchannel
- o Most attention on system/collection building rather than services
- o Commercial attention on system and management
 - IBM, MERL, Microsoft, Artesia, Virage, WFMY locally
- o NIST TREC Video Track for retrieval evaluation
- o Advances on capture, critical need for reuse tools
- o Portability advances (e.g., wifi, iPhone)
- o On the cusp of 'natural'

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Theoretical View

- o Digital video is crafted expression
 - Multiple channels (analog and digital)
 - Visceral as well as intellectual effects (analog and digital)
 - A descendant of film but with potential dynamics/behavior (digital)—changes over time, every time
- o Digital Libraries are journeys (learning environments) rather than destinations for patrons and librarians
 - Beyond libraries as repositories to sharium
- o Open Video deals with reusable (open) video objects
 - A journey toward new forms of expression and reflections on history
 - What do you do with 24/7 feeds of video from every street corner in Manhattan?

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Open Video Vision/Contributions

<http://open-video.org>

- o An open repository of video files that can be re-used in a variety of ways by the education and research communities
 - Encourages contributions
 - A testbed for interactive interfaces
- o An easy to use DL based upon the agile views interface design framework
 - Multiple, cascading, easy to control views (pre, over, re, shared, peripheral)
 - Views based upon empirically validated surrogates
 - An environment for building theory of human information interaction
- o A set of methods and metrics that reveal how people understand digital video through surrogates

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Background & Status

- o Begun 1995 with colleagues at UMD & BCPS; current instance at UNC initiated in 1999
- o Funding: NSF# IIS-0099538 1999-2004; NSF IIS 0455970 2006-07; Library of Congress NDIIPP (2007-08); IBM (2007); Google (2007)
- o Collaborators/Contributors: I2-DSI, ibiblio, CMU, UMD, Prelinger Archive, Internet Archive, NASA, ACM
- o ~4000+ video segments
- o ~40000 unique visitors per month
- o ~1.8M hits/month
- o MPEG-1, MPEG-2, MPEG-4, QT
- o OAI provider
- o Ongoing user studies of surrogation

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What is (was) a Surrogate?

- Condensed representation for human consumption constructed to stand for an information object
- Information compressions
- Surrogates
 - Enable decision-making by presenting search results in a uniform way
 - Support sense making and incidental learning
 - Save human time (compaction)
 - Save network capacity and system resources
- Examples
 - Abstract, gloss, summary
 - Title, bibliographic record
 - Preview, snippet
 - Profile
 - Logo
 - Your avatar

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The Blur

- The (relatively) Neat Past and the Very Scruffy Present
 - Blurring the 'levels of representation' model of information (primary-secondary-tertiary-n-ary)
- The metadata—surrogate continuum within the levels of representation continua
 - Metadata region mainly for retrieval
 - Metadata region mainly for and by machines (semantic web)
 - Automatic metadata generation advances
 - Implicit links and mining of interactions as metadata
 - Surrogate region mainly for sense making
 - Surrogate region mainly for and by people
 - Professional abstracting
 - Social tagging and annotations/links as surrogates

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Representation and the Digital Blur

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Digital Video Surrogates

- Classes
 - Textual
 - Visual
 - Audio
- Cost benefit analysis: maximize 'meaning' per unit time
 - Transmission time
 - Compaction rate
 - Cognitive processing time
- Performance vs. Preference

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Research Framework

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Surrogates Examined

- Storyboard with text keywords (20-36 per board @ 500 ms)
- Storyboard with audio keywords
- Slide show with text keywords (250ms repeated once)
- Slide show with audio keywords
- Fast forwards 32X, 64X, 128X, 256X
- Poster frames (1-3)
- Real time clips/excerpts (7 sec)
- Text (title, keywords, etc.)
- Visual features (e.g., in/out, people, etc.)
- Spoken descriptions
- Spoken keywords
- Combined visual (storyboard, fast forward) and spoken (descriptions, keywords)

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Tasks

	Text	Still Image	Moving Image	Audio
Recognition/ Selection	Object selection (text) Keyword selection Description selection Title selection	Object selection (graphical) Keyframe selection	Excerpt selection	Select Spoken Description Select Spoken Keyword
Generative Inference	Gist writing (free text)	Visual gist determination		

Metrics

- Accuracy
- Confidence
- Time to complete
- Usefulness, usability, engagement, enjoyment, preferences

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User Studies

- Qualitative Comparison of Surrogates (Spring 02, ECDL 02)
- Fast Forwards (Fall 02, JCCL 03)
- Text or Pictures (Spring 03, CIVR 03)
- Narrativity (CHI 02, ASIST 03)
- Shared views and History Views (Geisler dissertation)
- TREC evaluation (Spring/summer 03; 05)
- ViSOR (Gruss Master's paper)
- Look vs Read (Hughes Master's paper)
- Video relevance (CHI 05; ASIST04; Yang dissertation)
- Cognitive load (Mu dissertation)
- Teachers using video (Brown dissertation)
- Spoken Audio and Storyboards (CHI 07)
- Spoken Audio and Fast Forwards (current)

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Audio Surrogates

- Spoken descriptions, summaries, keywords
- Visual displays of audio signals
- Audio skims (excerpts)
- Compressed speech
- Parallel streams (cocktail party effect)

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Recent Study (CHI 07)

- 36 participants, within subjects design used audio-only (spoken descriptions), visual-only (storyboards), and combined surrogates to do 5 kinds of recognition and gist tasks.
- Accuracy, time to view, time to complete task, suite of affective measures
- Statistically reliable differences on 3 of 5 accuracy tasks, time to view, and most affective measures. Combined generally better and preferred, audio almost as good as combined, visual alone faster to consume but no time penalties for audio and combined on task completion.
- Implications
 - Add audio surrogates
 - Use audio in small form-factor devices
 - Audio and visual quality important
 - Synchronizing different channels in surrogates may not be necessary
 - User controlled tradeoffs: time, satisfaction, performance

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Synchronicity

- Coordinated media channels lead to better understanding, retention, and satisfaction
- What about multi-channel surrogates?
 - Assume surrogate channels should also be coordinated?
 - Perhaps more sense making possible if sampling across different channels and integrating in the head at consumption time rather than pre-coordination at indexing time?
- We have initiated a series of studies

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Tradeoffs

Visual channels
Audio channels

OR?

= most salient samples

Pre-processed integration yields less cognitive load. Less sense making and retention?

User-centered integration (constructivist). More cognitive load. Better sense making and retention due to active participation and ?better? Information samples

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Video Preservation (VidArch) Project

- o <http://ils.unc.edu/vidarch>
- o What kind and how much context to preserve?
- o National Digital Information Infrastructure Preservation Program (NDIIPP) funding via NSF and LoC.
- o Focus on specific topics
 - 2008 Presidential campaign (15K May 07-present)
 - Energy, truth commissions, health, pandemics
- o Harvest video, metadata, and activity from YouTube; use API to query rather than crawl
- o Create Curator's tools and services
- o **Fundamental DL issue of content/metadata/context boundaries in WWW objects**

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Extend Documentation Strategies to Web

- o Power of the masses to produce documentation of a subject or issue (folksonomy).
- o Web-based materials can have a strong impact on society, including phenomena such as voting behavior.
- o Democratizes collecting strategies; more than network news or campaign materials being collected.
- o Materials never before created or collected.

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Challenges of Extending Documentation Strategies to Web Videos

- o Potentially too many for hand-crafted, artisan approach.
- o Ephemerality— here today; gone tomorrow.
- o Variable quality and relevance.
- o General lack of metadata.
- o Unclear provenance and authenticity.
- o Lack of contextualizing information.

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Video Harvesting from YouTube

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Election 2008 Collecting Scenario

- o Curator of Hillary Clinton's campaign.
- o Direct feed of materials from Clinton's staff and Democratic Party.
 - Press releases, video, interviews, Face Book, etc.
- o Wide variety of traditional media – newspapers, TV, radio.
- o Now wide variety of bottom-up materials, including YouTube videos
 - "Official" CNN debate videos, reactions, etc.

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Video Harvesting from YouTube for Election 2008

- 56 queries (6 general and 50 names)
- Use YouTube APIs, screen scraping and other tools to collect videos and context
- Crawl everyday (almost) since May 07
- Get top 100 results for each query
- Collect more than 20 attributes (including all the comments)
- Download flash videos
- Compare to blog postings

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Overview of the collection (as of 04/17/2008)

- Crawls = 273
- Unique videos = 17,862
- Total videos = 19,570
- Video files = 181 GB
- Total views = 496,581,313
- Total comments = 3,017,625
- Total ratings = 2,847,427
- Total honors = 547

Capra, R., et al., (in press). Selection and Context Scoping for Digital Video Collections: An Investigation of YouTube and Blogs. ACM/IEEE Joint Conference on Digital Libraries (June 2008). Also see <http://ils.unc.edu/vidarch/>

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Implications to Date

- YouTube is as much a conversation as an information source
 - Comments and responses
 - Textual
 - Video
- Layers of video representation that are strongly culture dependent
 - Video allusions (e.g., McCain's Obama girls, mama, etc.; Vote different)
- The Internet is not quite mainstream
 - Ron Paul in blogosphere and YouTube

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UNC YouTube Channel

- <http://youtube.com/uncchapelhill>
- Content
 - Information in Life Series
 - Lectures (SILS, ibiblio, Public Health)
 - Interviews with UNC Faculty/staff
 - Carolina Week playlist
 - Global Health playlist
 - News and Publicity

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Policy Issues

- Collection Development
 - Campus gatekeeping
 - Instructor ownership
- Intellectual Property and Reuse
 - CC
 - Incidentals
- Management
 - Content development
 - Channel freshness
 - Blowback

Marchionini, G. (in press). Digital Video Policy and Practice in Higher Education: From Gatekeeping to Viral Lectures. Educational Technology <http://youtube.com/uncchapelhill>

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Implications

- The Medium get attention, attention brings new requirements for response
 - Sturm's viral lecture on storytelling
 - Carson memorial comments
- New opportunities and challenges for teaching and learning

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Summary Implications:

- The beginning of an information and communication paradigm shift
 - Lots of content to reuse
 - Professional to web/security cam
 - Capture everything mentality
 - Public/private blur
 - Non-textual tags and annotations
 - Primary/n-ary blur
 - Conversation interjections
 - Create/find/share blur

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Q&A

Thanks for your attention

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