

Social Video: A Platform for Collaborative Discoverability and Annotation of Disconnected Media

David Killeffer

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Harvard University Extension School



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Extension School

Department of Information Technology

Proposal

**Social Video: A Platform for Collaborative
Discoverability and Annotation of Disconnected
Media**

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Abstract

There are very few good tools available that allow people to digitally categorize recorded videos. This is a problem because with the rise of digitization of recordings previously created on magnetic media and other media as well as the proliferation of smartphones, there is an ever-growing volume of videos being made available to people, but a severe lack of ways to organize and search those videos. The absence of good tooling often means that many people amass large collections of self-recorded videos (both digital as well as older, analogue format recordings such as VHS, Mini-DV, etc.) which are largely inaccessible and make it extremely difficult to locate past recordings due to the absence of meaningful metadata. With the rise of cheap, large online storage resources and very powerful handheld recording devices, but few and inadequate tools to catalog them, there is a looming problem that many videos will go unwatched and uncared for, and the importance of their content go forgotten. By utilizing an easy to use web interface, this project attempts to bring the power of crowds to aid in adding metadata and meaningful annotations to online video for the benefit of other viewers.

Even if an individuals video recordings were somehow properly "tagged" with perfectly accurate metadata describing all the pertinent aspects of the video, without a rich, well-designed and easy to use search interface, the effort expended on such annotations would be wasted and the future utility of the recordings still in question. This project attempts to prototype a fully-featured, easy-to-use, faceted search interface which will help make locating and sharing recordings of precious memories easy and enjoyable. Additionally, once videos are properly tagged and annotated, users can explore further avenues to enrich sets of recordings by making "playlists" of segments of videos; for example, creating a "highlight reel" which is a playlist of all the recordings in a set that are tagged with the word "funny".

Acknowledgements

I would like to acknowledge the excellent help, guidance, and wisdom of both Susan Buck and Dr. Jeff Parker. They provided much needed tips and feedback over the course of the development of this thesis proposal which helped make it successful.

I want to also acknowledge and thank my wife Sarah and kids; thank you for being patient with me, putting up with my moods as I struggled through this process, and for all the tea.

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Motivation and Problem Statement

“ You can’t do better design with a computer, but you can speed up your work enormously.

— Wim Crouwel

(Graphic designer and typographer)

1.1 Motivation - Overview

Today people are recording more videos than at any other time in history. Most people have very well equipped video recording devices that they carry in their pockets (smartphones) which have capabilities that dwarf even the most advanced handheld camcorders of just a few years ago. YouTube reports that they receive 300 hours of recorded video submissions PER MINUTE (see: <https://www.youtube.com/yt/press/statistics.html>, accessed 2015-05-22, <http://www.tubefilter.com/2014/12/01/youtube-300-hours-video-per-minute/>, accessed 2016-02-25, and <http://expandedramblings.com/index.php/youtube-statistics/>, accessed 2015-02-25). In addition to the stratospheric proliferation of newly recorded digital video, in recent years an entirely new industry of video preservation companies has sprung up which offer a variety of services to help both professional and consumer customers to digitize their recordings made on film, magnetic, or optical formats; these services will accept all manner of defunct formats and digitize the recordings captured on them in as high resolution as possible and create digital copies of the originals. With the future viability of nearly all physical media formats in doubt at best and all but assuredly over at worst, it seems the writing is on the wall for the future primacy of digital video as the format of the future. However, with the massive increase in the amount of recorded video content created, how should content be organized for sharing and annotated for posterity?

One popular method people used to use for creating "playlists", "favorite" recordings, and generally sharing of media in the past was to create so-called "mix-tapes" of favorite music and videos. People would typically use two "decks" to create the compilations; one would be used to play back the song or video they wanted to record, and the other deck would be used to create the new recording. Today this

practice is an all-but forgotten media artifact of the 1980s and 1990s (rarely ever seen since the early 2000s). At the same time as people are no longer creating and sharing "mix-tapes" of either songs or videos for friends and family, the world is seeing the largest exponential growth of recorded media in its history; clearly the manual labor and time investment required in the now lost art of creating "mix-tapes" does not scale, and better solutions are needed for organizing, categorizing, and sharing important digital video works. Without the benefit of carefully crafted and curated metadata to catalog the output of this new explosion of recordings, the future usefulness and viability of new recordings is in serious question. As video recording has shifted away from being created on physical media formats to digital formats, new digital recordings do not have the advantage of their physical media forebears which could be easily and simply labeled with a pen or marker to describe their contents.

At the same time as society has seen explosive growth in the proliferation of recordings due to technological advances, we have also seen the rise of the "social" web. People are sharing all aspects of their lives with friends, family, even perfect strangers online. Participants in the "social web" allow others to add metadata, comments, and add to their own digitally shared pictures, music, videos, etc. This has proven to be a very effective way to apply meaningful metadata to digital artifacts, and adds to the future longevity and viability of such digital artifacts (presuming that the metadata applied to individual files can be guaranteed to survive alongside the digital files themselves well into the future).

1.2 Motivation - Personal Story

Several years ago my siblings and I lost our two remaining grandparents; my maternal grandmother, and my paternal grandfather, both within a couple years of each other. These were difficult losses to take, and I was left thinking of them often and the times we had together. At the same time, I was recently married and had started a family of my own, and enjoying all the highs, lows, and excitement of being a part of a young family with children. With sentimentality creeping into my mind more and more, we would often videotape our young son, and then his younger brother, and making memories with our children and saving them to video for posterity. Several years later I found myself with a very large collection of both VHS and Mini-DV tapes (well over a hundred tapes, at least), and I realized that my wife, kids, and I had not viewed most of these recordings, not even since they were originally taped. At an extended family dinner I inquired about all the old VHS tapes my parents had recorded of us kids growing up, including several important family milestones and a few select events that my grandparents would have been a part of; I was told that I was free to take any videotapes I could find. I did the same thing with my in-laws and gathered

up all their old videotapes as well; soon I found myself in the possession of a virtual mountain of videotapes, some up to 25 years old. I knew that over time videotapes degrade and are subject to a process of "vinegarization" (see http://www.clir.org/pubs/reports/pub54/2what_wrong.html and <http://www.emeraldartservices.com/visual-media-deterioration/>), and I knew that if I wanted to preserve all the precious memories that were captured on those tapes that I would need to digitize this collection.

Thus began a process of over a year's worth of work whereby I slowly digitized nearly 200 analogue tapes of various formats; VHS, Mini-DV, VHS-C, etc. Initially I was tempted to edit and cleanup the recordings as I imported them, but soon I found out just how much time and effort is involved in doing high-quality video editing and cleanup, and I realized I would never finish digitizing the tape collection if I stopped digitizing to edit each tape. Eventually I was able to successfully digitize about 99% of the videotape collection, and I was left with an enormous set of video files (one per tape). Some statistics of the collection:

- over 3000 different video files of various formats
- over 2.33 TB of disk space used
- TODO: total number of hours of recordings

While I certainly loved being able to go back and re-live many funny childhood moments that were now immortalized on an external hard drive, I quickly came to realize several things about my new massive video file collection:

1. I did not know who was in several of the videos, but I knew that my mom/my dad/my father-in-law/my uncle/etc. would know
2. I did not know when many of the recordings took place
3. I did not know where some of the recordings were made
4. It was extremely difficult and time-consuming to be able to properly share old historical family moments from the video collection with the family because the videos were only labeled by type (VHS, Mini-DV, etc.) and tape number

The last point is perhaps the most poignant. In my eagerness and excitement to share my newfound digital video treasure trove with my family, I fumbled at several family dinners and gatherings when I was requested to play the *"funny barbecue video from 1987 where Nate accidentally hit cousin Al in the head"*, and several other classic family gems; I simply couldn't find videos that I was looking for without

basically brute-forcing my way and playing each video, fast-forwarding through the video until either I found (or did not find) what I was looking for, and then wrote down what video and at what time "that moment" that I was looking for was found in. The problem was that despite having invested over a year's worth of time and effort into preserving all these old family videos, it wasn't worth much to everybody else (or me!) in their current form ***because nobody could find what they actually wanted to see without watching the entire collection***. And this revelation was the genesis of my thesis idea; to create a platform where I could leverage the knowledge and memories of my family to help me build up a set of rich metadata to annotate the family video collection, and then to reward them for their help in annotating the videos by building out a rich, faceted search interface to the video collection, as well as creating the ability to create "playlists" where users can make their own "highlight reels" of special moments, people, places, etc.

1.3 Problem Statement

The problems that my thesis thus attempts to address are:

- how to ***effectively annotate*** and add valuable metadata to a ***shared collection of video recordings*** via a loosely affiliated group of friends and family
- how to best ***organize and present valuable user-added metadata*** from video recordings in a ***faceted search interface*** that provides an easy way for people to find and play back videos they might otherwise not even know exist
- enabling users to ***explore libraries of richly annotated videos*** and ***make "playlists" of their favorite videos/segments*** based on the metadata that the videos have been tagged with

My thesis project will attempt to answer these questions by architecting a web application prototype where users can add videos, annotate who is in those videos, what the content of those videos is, where they take place, when they take place, and more. This metadata will be aggregated and used to power a faceted search, which will expose the video collection in a powerful new way to users and allow them to explore and reengage with the video collection in new and compelling ways.

Prior Work

“*A picture is worth a thousand words. An interface is worth a thousand pictures.*”


— **Ben Shneiderman**
(Professor for Computer Science)

The idea of annotating videos is not entirely new or novel, but such tools have not become commonplace in the same way that high quality image editing software and facial recognition algorithms have brought new dimensions to digital photography. YouTube has empowered people to share their recordings with the world in new ways and given rise to entirely new forms of entertainment. In the realm of education with the rise in online education and increasing pressure to make class lectures available to students both on-campus and remote, many classes are now recorded and distributed online, and there has been some scholarly research work done to enable students to annotate and share notes on classes.

Some prior scholarly works in the area of video annotation include:

1. **OpinionCity**, by Daniel P. Coffey: danielpcoffey@gmail.com

OpinionCity is a website that was created by Daniel P. Coffey for a Digital Media Capstone project at Harvard Extension School. It is a tool for real-time group feedback on videos that have been uploaded to YouTube and allows for collaborative, time-code based annotation of videos as well as whole-video annotations. Users may select a video to "upload" to OpinionCity where the video from YouTube will play in an embedded player, and then users can add comments to the video at specific timecodes or apply their remarks to the entire video. Users can also invite others to join in and comment on the video as well.

 OpinionCity

HomeVideosImport

Hello David Killeffer⚙️Logout




Welcome to OpinionCity!

A place on the web for real-time video collaboration

Welcome, David Killeffer!

Head to your [video list](#) or [import a video!](#)

Dan Coffey 2016 - All Rights Reserved. [Credits](#) - [Contact](#)

 OpinionCity

HomeVideosImport

Hello David Killeffer⚙️Logout

 **Import****Title**
Date

Import

Your Videos

Date	Title	Invite Collaborators	Remove
05/27/2016	2014 Audi R18 e-tron: Audi's Infamous Diesel-Hybrid Tested! - Ignition Ep. 125	<input type="text" value="email@gmail.com, otherperson@alta"/> <button>invite</button>	✕
05/27/2016	2016 Audi R18 LMP1 Spied Testing At Monza Circuit!!	<input type="text" value="email@gmail.com, otherperson@alta"/> <button>invite</button>	✕
05/27/2016	2015 Audi R18 E-Tron Quattro Le Mans Aero Kit - High Speed Fly Bys	<input type="text" value="email@gmail.com, otherperson@alta"/> <button>invite</button>	✕

Collaborations

Date	Title	Remove
You haven't yet been invited to collaborate!		



00:00:07


▶ ⏮ 1.00x ⏭

New Comment...


Global ☐


Add New

Timecode	Commenter	Comment	Vote	Complete	Date	Remove
<input type="text" value="filter comments..."/>						
00:00:03	David Killeffer	love that sound as it rounds the corner!	0	<input type="checkbox"/>	03:11 PM	✕
00:00:17	David Killeffer	where can I rent one??	0	<input type="checkbox"/>	03:11 PM	✕





OpinionCity

[Home](#)
[Videos](#)
[Import](#)

Hello David Killeffer

[Logout](#)





00:00:08



1.00x


New Comment...

Global ☐

Add New

Timecode	Commenter	Comment	Vote	Complete	Date	Remove
filter comments...						
00:00:03	David Killeffer	love that sound as it rounds the corner!	0	<input type="checkbox"/>	03:11 PM	
00:00:17	David Killeffer	where can I rent one??	0	<input type="checkbox"/>	03:11 PM	

2. Phil's thesis

2.1 Prior Work Section 1

2.2 Prior Work Section 2

2.3 Prior Work Section 3

2.4 Conclusion

Requirements

” *Innovation distinguishes between a leader and a follower.*

— **Steve Jobs**
(CEO Apple Inc.)

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

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3.1 Requirements Section 1

And after the second paragraph follows the third paragraph. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words

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Fig. 3.1: Figure example: (a) example part one, (c) example part two; (c) example part three

After this fourth paragraph, we start a new paragraph sequence. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

3.2 Requirements Section 2

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Fig. 3.2: Another Figure example: (a) example part one, (c) example part two; (c) example part three

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3.3 Requirements Section 3

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3.4 Conclusion

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System

“ *Innovation distinguishes between a leader and a follower.*

— **Steve Jobs**
(CEO Apple Inc.)

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4.1 System Section 1

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Fig. 4.1: Figure example: (a) example part one, (c) example part two; (c) example part three

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4.2 System Section 2

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Fig. 4.2: Another Figure example: (a) example part one, (c) example part two; (c) example part three

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4.4 Conclusion

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Design

” *Innovation distinguishes between a leader and a follower.*

— **Steve Jobs**
(CEO Apple Inc.)

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5.1 Design Section 1

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Fig. 5.1: Figure example: (a) example part one, (c) example part two; (c) example part three

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5.2 Design Section 2

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Fig. 5.2: Another Figure example: (a) example part one, (c) example part two; (c) example part three

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5.4 Conclusion

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Work Plan

“ *A picture is worth a thousand words. An interface is worth a thousand pictures.*

— **Ben Shneiderman**
(Professor for Computer Science)

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6.1 Work Plan Section 1

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6.2 Work Plan Section 2

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Risks and Alternatives

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Preliminary Schedule

“ *A picture is worth a thousand words. An interface is worth a thousand pictures.*

— **Ben Shneiderman**
(Professor for Computer Science)

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Glossary

Here are some of the terms used throughout this proposal.

DVD: Digital Video Disc

Mini-DV: a successor to the wildly popular VHS home recording system, Mini-DV is a cassette tape format for video recording. It captures video in a resolution close to that of DVD. (see <http://techterms.com/definition/minidv>)

VHS: VHS: acronym for "Video Home System", it is a widely-adopted videocassette recording (VCR) technology that was developed by Japan Victor Company (JVC) and put on the market in 1976. It uses magnetic tape 1/2 inch (1.27 cm) in width. It was extremely popular in the 1980s and 1990s, and declined in use during the early 2000s. (adapted from <http://whatis.techtarget.com/definition/VHS-Video-Home-System> and <https://en.wikipedia.org/wiki/VHS>)

Colophon

This thesis was typeset with \LaTeX 2_ε. It uses the *Clean Thesis* style developed by Ricardo Langner. The design of the *Clean Thesis* style is inspired by user guide documents from Apple Inc.

Download the *Clean Thesis* style at <http://cleanthesis.der-ric.de/>.

Declaration

You can put your declaration here, to declare that you have completed your work solely and only with the help of the references you mentioned.

Cambridge, Massachusetts, May 21, 2016

David Killeffer

