Moving Image User-Generated Description: A Matter of Time

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Abstract: This article explores temporal influences on compressive social tagging generation for archival moving image materials through a quasi-experimental study. Forty participants tagged the same video segmented into differing lengths. Analysis of the resulting data found the average number of user-generated tags is influenced by the length of the video within moving image collections. Specifically, the average tagging rate for a short video was higher than its lengthier counterpart.

"The younger public now thinks of moving image archives as a kaleidoscopic online collection where access is replaced by automatic ingest and metadata by user-generated tags" (Prelinger, 2007).

Over the past decade, archivists began experimenting with user-generated description through social tags and commenting. Social annotation became the trend de jure and it was promoted as a method for increasing access and democratizing the archive while many repositories used them to broaden description of photographic and textual records. While the popularity of tagging grew both inside and outside archives, early archival studies focused more on their use in textual and photographic collections than on moving image materials.

The following article reports the first in a series of studies that isolate specific variables unique to moving image materials. The results of these studies will develop a broad set of best practices for integration of social tags within moving image archival collections based on empirical data. Furthermore, each study highlights strengths and weaknesses of the participatory model. This first study explores the following research question and hypothesis:

RQ1: What effect does video length have on user-generated tags?
H_1: Users produce tags at a higher average rate for shorter videos than longer videos.

Literature Review

Although its origins include older analog models, participatory archives became popularized within the archival literature in parallel with the Web 2.0 and Archives 2.0 movements in the mid-2000s. According to Eveleigh (2017), "'Participatory archives' is one of a number of shorthand phrases used in the archival literature in reference to contemporary initiatives, which seek to engage non-archivists—generally through the medium of social Web technology—either to contribute to archives or to comment on archival practice." Early studies highlighted the participatory archives' broad potential for increasing access, pluralizing the archival voice, and engaging with the public in new and innovative methods.[1] Archivists began exploring these possibilities through early projects, such as the Polar Bear Expedition Finding Aid (Krause and Yakel, 2007; Yakel, 2006). Subsequently, new models of user-repository interaction were developed to further the participatory idea. Anderson and Allen (2009), for example, developed and promoted an archival commons framework, and Evans (2007) suggested leveraging participatory techniques to ease archives' growing fiscal concerns. Additionally, archivists further implemented participatory strategies for arrangement, description, transcription, outreach, and acquisition as individual case studies (Boyer, Cheetham and Johnson, 2011; Samouelian, 2009; and Theimer, 2011b). Finally, considering

1 For more detailed and broader reviews of participatory archives, see Eveleigh, 2017; Flinn, 2010; Oomen and Aroyo, 2011; Theimer, 2011a; and Theimer 2011b.

moving image materials, the participatory research focused on transcription and community outreach, in addition to tagging.

As part of the movement's universe, social tagging emerged as an early magnet testing the waters. Social tags are user-generated terms, keywords, or descriptions created for either the user's own organizational purposes or to share with others. As Guy and Tonkin (2006) note:

> In essence, a tag is simply a freely chosen set of textual keywords. However, because tags are not created by information specialists, they do not at present follow any ubiquitous formal guidelines. This means that items can be categorised with any word that defines a relationship between the online resource and a concept in the user's mind. Any number of words might be chosen, some of which are obvious representations, others making less sense outside the tag author's context.

The collection of tags within a particular system creates a folksonomy of non-formal object description. Although some minor differences exist between the terms social tagging, user-generated description, and crowdsourced description, the phrases are used interchangeably within this article.

These initial studies (and the majority to follow), however, focused on still images and textual archival records—with only a handful exploring tagging's use with moving image materials. The Library of Congress Flickr and the Steve.Museum projects represent the two most extensive studies to date, and each focused on still images (photographs and fine art) (Springer et al., 2008; Trant, 2006; Trant, 2009a; Trant, 2009b; Trant, 2009c; Bearman and Trant, 2005). Additional smaller studies explored the types of tags created on popular bookmarking sites, such as Del.ic.ous and discussed their use for personal and professional organization (Kipp and Campbell, 2006l Kipp, 2008; Hunter, 2009). More recently, Benoit investigated the potential using domain expert user-generated tags as a replacement for item-level metadata within a minimally processed digital archives for a collection of photographs and textual documents (Benoit, 2017; Benoit, 2018).

Although only a handful of studies explore the use of social tagging within moving image archives, their findings indicate significant potential (Mellenhorst, Grootveld, and Veenstra, 2008). The development of moving image specific studies follows a similar pattern to their still image counterparts. Kevin Andreano (2007) recognized the potential benefits of user-generated metadata early in the movement. He highlighted the existing commercial use of crowdsourced description moving image sites such as YouTube and the Internet Archive and argued for archivists to consider similar adaptations. Andreano did not merely proselytize the benefits of social tagging; he also recognized their potential flaws and limitations. In discussing the Internet Archive, he notes, "[the] inability to provide any metadata other than content description," the possibility for "flawed" or "misleading" information, and the lack of formalized controlled vocabulary (Andreano, 2007). Despite these concerns, Andreano encourages moving image archives to consider using user-generated description as a tool, noting "User-created metadata cannot provide the functionality of more standardized cataloging practices, but it does have some advantages of its own, such as catering to the natural language of users through folksonomy, and presenting the possibility of serendipitous discovery. It is also a relatively cheap and easy way for archives to provide content description" (Andreano, 2007).

Allied disciplinary studies, such as those in computer science and information science, initiated most of the early moving image studies with an emphasis on understanding the retrieval role of user-generated comments and tags within online video hosting services, such as YouTube (Madden, Ruthven, and McMenemy, 2013; Jeong, 2008; Jeong, 2009; Huang, Fu, and Chen, 2010; Gedikli and Jannach, 2013; Ames and Naaman, 2007; Bertini et al, 2013). These studies influenced the further development of tagging and description tools, including the *Wasida?* video labeling game (Gligorov et al., 2011; Gligorov, 2012; Hildebrand et al., 2013).

Gamification or games with a purpose (GWAP) were popularized during early citizen science crowdsourcing projects and create a competition style environment to increase both metadata creation and quality. Rather than describing entire videos, the *Wasida?* platform uses time coding to associate each tag with a specific frame in the video (Hildebrand et al., 2013). Initially developed by the Netherlands Institute for Sounds and Vision and the Vrije Universiteit Amsterdam, the *Wasida?* game has also been adapted for fiction movies and analysis of domain expert description (Estranda et al., 2015; Estranda, 2015).

Despite these studies (and others not noted), the application of social tagging approaches for moving image archival materials remains behind its photographic and textual counterparts. The limited number of studies exploring the use of tagging as a comprehensive description tool for moving image materials partially explains this gap. Additionally, moving image materials possess more complex characteristics and therefore more challenges. This study begins addressing the lack of social tagging empirical research focused primarily on moving image archival materials.

Methodology

To address both the research question and the need for empirical data, the research study employed a mixed-methods, quasi-experimental two-group design (Hank and Wildemuth, 2009). This approach limited the potential variables through random group assignment and a sterile interactive online space (Qualtrics). Recruited participants were randomly assigned to one of two groups. Each participant was informed that they would either watch a single 25-minute video or three videos of equal length for a total of 25 minutes. Upon starting to view the video(s), participants could easily tell which group they were placed into based on the video's time counter (displaying either 25 or 8 minutes). Additionally, participants were provided with the following description of tagging in their instructions:

Please create tags/keywords for the video. A tag, if you are unfamiliar with tagging, should provide some description of the video that would help yourself and/or others find it through searching or browsing online. Tags may include any word or combination of words (e.g., you can enter "funny" or "silly video" as individual tags).

Group A watched a 25-minute video and then created tags while Group B watch the same video broken into three segments, and generated tags after each segment. The tagging environment did not include other participant's tags, nor any description, title or metadata associated with the videos. Finally, the study required each participant to create at least one tag per video (or video segment) with no upper limit on the number of tags created. The generated data were analyzed using descriptive statistics, open coding, and cross-sample comparative analysis.

Sample Video(s)

The research study used, "Miss Lucy's Classic Cajun Christmas," a video from the Louisiana Digital Media Archive (LDMA), as its sample.[2] Miss Lucy hosted several specials on Louisiana Public Broadcasting (LPB), and the sample video was selected for the following three reasons: Louisiana themes, video length, and existing metadata. Louisiana themes: Although limiting variables, the research design aimed to emulate some real-world conditions. In this case, the recruitment of local participants would be most interested in a video with local themes. Video length: The broadcast structure of the video follows a segment style construction over 25 minutes. Therefore, the video could easily be sub-divided into three segments of relatively equal length (one 9 minutes, two 8 minute segments). Existing metadata: The research designed aimed to include multiple tag comparison including inter-group and with existing metadata. The LDMA includes rich metadata for its videos including genre, geographic locations, subject terms, contributors, and a narrative description (see Table 1 for the sample video's existing metadata).

Table 1 Sample Video Existing Metadata from LDMA

Field	Data
Collection	LPB
Genre	Holiday special
Place Covered	Lafayette, Lafayette Parish, Louisiana, Natchitoches, Natchitoches Parish, Louisiana, St. James Parish, Louisiana, Breaux Bridge, St. Martin Parish, Louisiana
Copyright Holder:	Louisiana Educational Television Authority
Date Issued	2001-12-01
Duration	00:24:51
Subjects	Zaunbrecher, Lucy Henry, 1938- | Holidays | Christmas | Vermilionville | Acadian Village (Lafayette, La.) | Lasyone's Meat Pie Restaurant | Natchitoches Meat Pie | Natchitoches Christmas Festival | Bonfires on the Levee | Hayes, Hunter, 1991- | PARADES | Christmas lights

2 The LDMA is a joint venture of Louisiana Public Broadcasting (LPB) and the Louisiana State Archives. More information can be found at http://www.ladigitalmedia.org/. http://ladigitalmedia.org/video_v2/asset-detail/LMLCC

Contributors	Zaunbrecher, Lucy Henry *Host* Allen, Gary *Producer* Yancey, Allegra Nevils *Producer* Bailey, Jarad *Photographer* Crews, Keith *Photographer* Mitchum, Steve *Photographer* Woods, Virnado *Photographer* McKenzie, Lucy Suzanne *Guest* Lasyone, Jim *Interviewee* Pellerin, Ray *Interviewee* Angelle, Jennifer *Interviewee*
Description	In this Christmas special from December 1, 2001, Ms. Lucy travels around Louisiana to explore Cajun Christmas traditions. In Lafayette, she visits with Papa Noel at Vermilionville and tours the Christmas lights at Acadian Village with her granddaughter, Lucy Suzanne McKenzie. While in Natchitoches, she eats a traditional Creole Christmas meal with Bobby DeBlieux at the Taunte Houpee' Inn, talks to Jim Lasyone about his Natchitoches meat pies, explores Linda Lou Ropp's collection of Santa figurines at the Laureate House, and attends the Natchitoches Christmas Festival of Lights. Ms. Lucy then visits the Bonfires on the Levees in St. James Parish and attends the Cajun Christmas Bayou Parade along Bayou Teche in Breaux Bridge, including a performance by Hunter Hayes. Lastly, Ms. Lucy reads the "Cajun Night Before Christmas" by Trosclair with illustrations by James Rice.

Participants

Study participants over 18 years old were recruited through social media and flyers around the greater Baton Rouge area. Interested persons accessed the study through a Qualtrics-based online survey, and upon agreeing to the informed consent, were randomly assigned to a study group. Each participant completed a pre-questionnaire with demographic information and was then presented instructions for their assigned group's task. The study remained open until 40 participants successfully completed their assigned task(s). Finally, upon completion, all participants could opt into a random drawing for one of four $50 payments. Most of the sample population were geographically located in Louisiana (65%). The sample was also primarily female (77.5%) and white (77%) with an average age of 30.9 (19-65 range).

Results

Overall, Group A (long video) generated 322 total tags while Group B generated 555 (aggregating all three short videos). This represents a statistically significant difference between the number tags generated for the long video ($M = 16.1$, $SD = 22.6$) and the short videos ($M = 27.75$, $SD = 12.1$); $t(38) = -3.11$, $p = 0.004$. The Group B participants only reused 59 tags between segments (a user reusing the same tag in multiple segments) and produced 281 total unique tags or 50.6% of their tags. Group A created a higher percentage of unique tags (54.3%), but a lower number overall at 175. Finally, a comparison of the unique tags from each group finds 31.7% of unique tags were created by participants in both groups.

In addition to generating a higher total number of tags (both unique and composite), Group B participants were more likely to exceed 20 created tags than Group A. Figure 1 highlights the number of tags created by each Group B participant with 14 exceeding 20 total tags (70%). In comparison, Figure 2 shows only two members of Group A did the same (10%).

As expected, the tagging rate for the short videos declined slightly from video 1 to video 3. Expressed as a percentage of all tags created, Group B participants created 39% for video 1, 34% for video 2, and 27% for video 3.

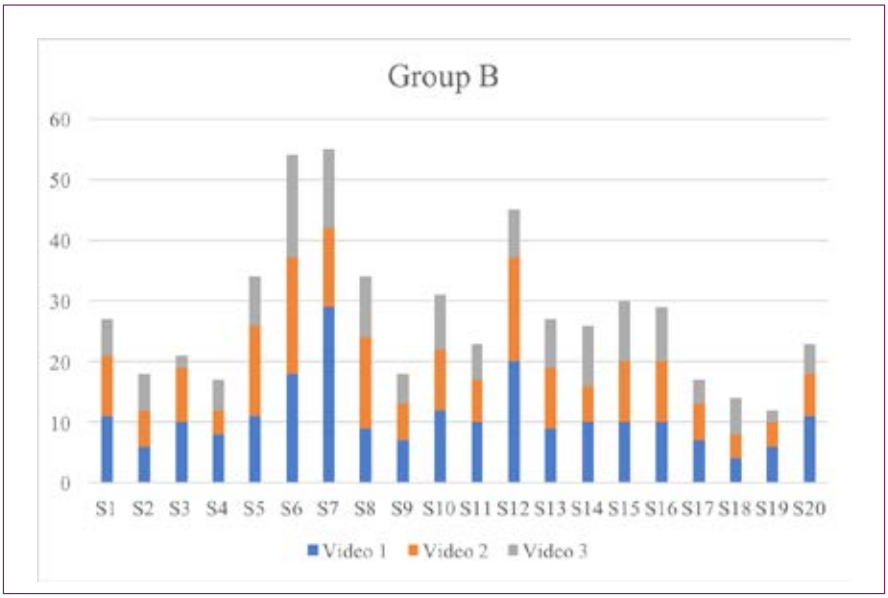

Figure 1 Group B Tagging Rate Per User

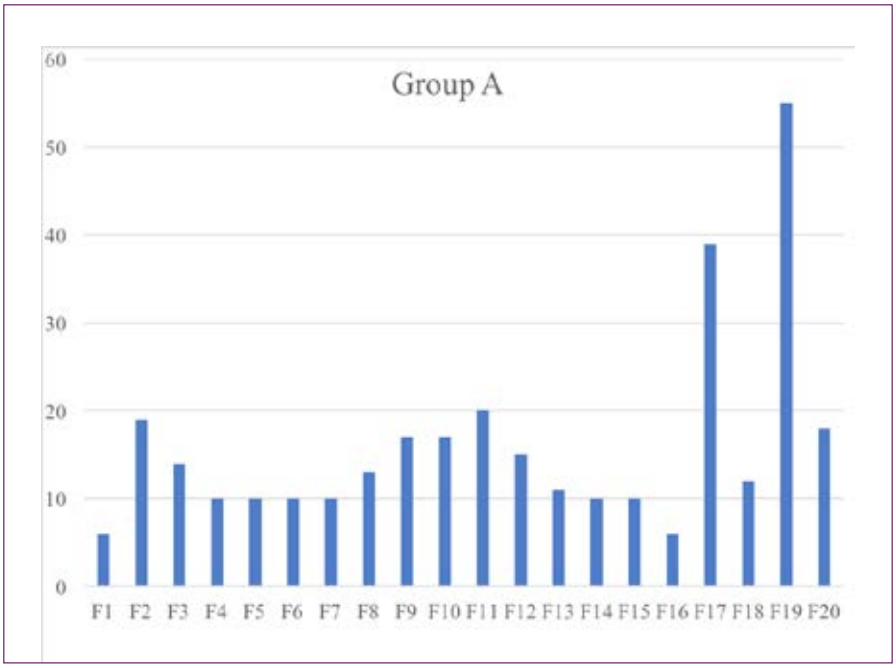

Figure 2 Group A Tagging Rate per User

Although the two groups generated tags at different rates, the types of tags created remained similar. Table 2 compares the most frequent tags for each group with its frequency. Unlike previous studies, the vast majority of tags fell into one of three main types: description, identification, and response. The description tags literarily describe the content of the videos, such as *bedtime stories*, *burning fire*, and *music on the bayou*. While the identification tags also indicate content, they highlight specific persons, places, music, etc.—proper nouns such as *Natchitoches*, *Ms. Lucy*, and *We Wish You a Merry Christmas*. The final main category of tags reflects emotional responses to the video(s) themselves, such as *funny*, *educational*, and *joyful*. As noted in Table 3, the proportion of tags within each category followed a similar pattern for both groups. Interestingly, the tags did not comment on the format itself—which is common among tagged photographs (Benoit, 2017).

Table 2 Most Frequently Used Tags per Group

Group A (Long Video)	**Group B (Short Videos)**
Christmas (14)	Cajun Christmas (19)
Papa Noel (13)	Louisiana (17)
Cajun (10)	Christmas (16)
Louisiana (9)	Papa Noel (16)
Cajun Night before Christmas (6)	Cajun (12)
Lafayette (6)	Bayou (11)
Natchitoches (6)	Bayou Parade (11)
Bayou (5)	Cajun Night before Christmas (10)
Cajun Christmas (5)	Food (9)

Additional analysis compared the generated tags with the video's existing metadata (which users did not see during the tagging process) to explore if tagging alone could replace item-level metadata. A compiled list of metadata from Table 1 was run through a stop list removal process. The resulting list of 89 metadata terms was compared with the unique generated tags from each group. Half of the metadata terms did not match the tags of either group while 39% match the overlapping tags created by both groups. Of the remaining matching terms, 9% of the metadata list matched tags created only by Group B and 2% match tags created only by Group A. The metadata terms that did not match included the date issued, duration, birth dates of subjects, and contributors (aside from Ms. Lucy).

Table 3 Tag Category Divisions per Group

Tag Category	Group A (Long Video)	Group B (Short Videos)
Description	52.2%	50.5%
Identification	42.1%	46.0%
Response	3.9%	2.8%
Other	1.7%	0.7%

Discussion

The statistically significant difference between the tagging rates of the two groups confirms the study's hypothesis that users will generate more tags per user after viewing short videos than viewing a single long video. Likewise, Group B (0.925) nearly doubled Group A's average number of tags per user per minute (0.537). Although the rates were different, both groups generated similar proportions of unique tags; indicating homogeny between the group participants—thereby further validating the study results.

Previous tagging studies often note the inclusion of so-called super-users or super-taggers (Benoit, 2017; Springer et al., 2008). While there is no clear delineation between a regular tagger and a super-tagger, the latter typically produce tags at least 150% of the average rate. As noted in Figures 1 and 2, the shorter videos slightly increased the likelihood for super-tagger occurrences with Group B including three compared to Group A's two. Similarly, the shorter videos had a significantly higher proportion of users exceeding 20 total tags than the longer videos. This result suggests users could not remember as many descriptive terms after watching for 30 minutes compared to 10 minutes. The study's platform, Qualtrics, did not allow for real-time tagging. If the study had users create tags in real time rather than after the video, there would likely be less difference between the groups.

While the study confirmed its hypothesis, the tagging rate decline between shorter videos for Group B was unanticipated (as shown in Figure 1). The displayed tagging fatigue suggests users' production follows a long tail style decline over time. A best practice approach would, therefore, increase the number of users creating tags while decreasing the number of short videos encountered in the tagging process. This would likely happen in a natural setting as most users would only engage with a low number of videos within a collection. If a repository utilized a gamification system, such as *Wasida?*, they should limit individual sessions to a small number of short videos (or video segments) to avoid tagging fatigue.

Another positive indication from the study was the lack of group difference regarding tag characteristics. Since the users were not divided based on domain expertise, the tags should be relatively similar in nature—as the data confirm. Previous studies recommended specific tag types such as cinematography, emotions, explanations, and facts in their instructions to users (Estrada et al., 2016). This study did not include recommendations, instead the instructions stated, "A tag, if you are unfamiliar with tagging, should provide some description of the video that would help yourself and/or others find it through search or browsing online." If a repository preferred specific types of tags, then more direct examples should be given to users.

Finally, the data suggest that tagging alone cannot replace item-level metadata for moving image materials since half of the metadata terms did not match generated tags. Over time, with additional users and tags, the long-tail principle suggests the proportion of metadata matching terms would likely increase slightly—but not significantly. Not surprisingly, the majority of matching tags relate to subject and title metadata fields. This replicates previous findings for photographic and textual documents, thereby indicating another consistent aspect of moving image tagging (Benoit, 2018).

Limitations

To focus on video length as a tagging variable, the study relied on a quasi-experimental design framework that requires limiting variables and uses a non-real-world interface (i.e., not an existing digital collection interface). Although this method produces concrete empirical data, its cannot explore every aspect of moving image social annotation within a single experiment. For example, the issue of tag quality, and the potential for misuse, remains a regular discussion avenue for social annotation projects (Matusiak, 2006; Benoit, 2017; Benoit, 2018). While this study found minimal issues, it did not specifically test for any inter-user quality assurance mechanisms like those found in gamification approaches (Estranda et al., 2015; Estranda, 2015).

The study used a professionally produced, holiday special from LPB for its sample video since it could be easily divided into three distinct segments of equal length. The video included voice-over narration, soundtrack music, and story-based editing. While these elements might influence the types (and number) of tags generated, the effects cannot be analyzed in this study. Likewise, the number of participants could be increased to verify the study's findings through replication in the future.

Conclusion and Future Directions

This article is the first in a series of moving image tagging studies exploring the unique aspects of moving image archival materials. The resulting empirical data will be used as the foundation for developing a guide to moving image tagging best practices. Focused on temporal effects, this study found that the average number of user-generated tags is influenced by the length of the video within moving image collections. Additionally, the findings suggest the following recommendations:

- When requesting comprehensive tagging (as opposed to time-coded), repositories should provide users with shorter videos than longer ones.
- If necessary, divide longer videos into shorter segments and aggregate the generated tags afterward.
- Using shorter videos within a tagging project will generate more super-taggers.
- To avoid tagging fatigue, increase the number of users tagging fewer videos rather than having users tag multiple videos in a single session.
- Do not rely on tagging alone instead of item-level metadata. Tags will most likely relate to subject and title metadata fields.
- If a repository is looking for specific types of tags (e.g., persons, emotions, etc.), they should include examples in their user instructions.

Future studies will continue exploring additional moving image tagging variables, including production type (professional vs. amateur videos); genre; participatory encouragement (gamification, rewards, recognition), and video length in time-based tagging.

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