

Human versus machine: Analyzing video game user reviews for plot and narrative

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Abstract

Video game users have shown strong interests in having subject metadata to find games. However, creating and maintaining subject metadata is costly and difficult. This study explores the utility of an automated approach for generating subject metadata for video games, focusing on plot and narrative. By comparing two methods to analyze the reviews—qualitative analysis conducted by a human researcher vs. automated text analysis using topic modeling—the researchers investigate if an automated method can generate subject terms that are comparable to the ones generated by qualitative analysis. Findings suggest that even with a smaller set of sample dataset, qualitative analysis could create a better set of terms than automated text analysis. However, terms generated from the automated text analysis indicate that its capability to retrieve *themes* of the video game may be useful in future libraries.

1 | INTRODUCTION

Video games, enjoyed across age and gender demographics (Gough, 2019; Perrin, 2018), are increasingly being added to many library collections (such as, Vernau, 2017). Providing access means more than adding media to the collection. To successfully recommend games, librarians should understand various types, genres, and plots. However, video games often demand expertise knowledge, and we cannot assume librarians have time to gain experience in a variety of games. Better metadata could help.

Many games have a strong narrative component which can be as complex as fiction in terms of description. User studies of video games (Lee, Clarke, & Perti, 2015) found that users want to use subject metadata (e.g., plot/narrative, mood) to search for video games, but current metadata in library catalog records focuses on objective information (e.g., Title, Production Company, Year Released) (Lee, Cho, Fox, & Perti, 2013).

Describing games is challenging: their plots are complex and vary based on players' choices. Visual styles, types of characters, and gameplay mechanics all influence user preferences.

This short paper explores the utility of an automated approach for generating subject metadata for video games, focusing on plot and narrative. We use a method that has been successfully applied to fiction in our previous study (Adkins, Bossaller, & Moulaison Sandy, 2019)—scraping user reviews for analysis. Expanding upon our prior work, we compare two methods to analyze the reviews: qualitative analysis vs. automated text analysis. By comparing the resulting lists of plot/narrative-related themes identified from these approaches, we answer the following research questions:

- **RQ1.** Can a text-mining approach produce topics/themes related terms comparable to the terms generated from a manually-coded qualitative analysis?

- **RQ2.** What are the benefits and disadvantages of different approaches in generating topics/themes related terms of video games?

The findings will provide insights regarding (a) the kinds of metadata that can either be manually or automatically extracted from user reviews, and (b) methodological understanding of whether an automatic approach can be used to produce comparable results. These insights will benefit information professionals, including information scientists and librarians interested in metadata generation approaches.

2 | LITERATURE REVIEW

Video games are a very popular media form, and libraries are increasingly adding video games to their collections. According to ALA's Games in Libraries Round Table (ALA GameRT, n.d.), games not only entertain, they also tell stories. Scholars have tried to create more satisfying recommendation and information searching experiences for users by identifying video game users' information needs (Cho, 2019; Lee, Clarke, Cho, & Windleharth, 2017) and creating metadata schema (Lee, Cho et al., 2013; Cho, Donovan, & Lee, 2018) to organize video games.

Improving access to games has proven to be challenging. McDonough et al. (2010) found existing organizational schemes did not work with video games because players' priorities such as mood and similarity to other games, are not included. Lee, Tennis, Clarke, and Carpenter (2013) created personas to establish and test 16 metadata core elements for video games and discuss challenges in obtaining metadata as the descriptions of games are often inconsistent and vague. Developers and marketers might create their own vocabularies, but the lack of standardization means they do not work well across platforms (Lee, Cho et al., 2013). In addition to these issues in obtaining accurate descriptive information, there is a question as to how to collect and use subject metadata.

Prior research suggests that having subject access (metadata) would be useful to organize, retrieve, and preserve video games in libraries (Lee et al., 2017; Lee, Cho et al., 2013; Cho, Donovan, & Lee, 2018). Likewise, Lee et al. (2015) tested the Video Game Metadata Schema¹ with users through surveys and interviews, finding that price, platform, mood, relatedness to other games, and visual characteristics of the game were most valued among players and that several of those elements are not available to catalogers. However, generating (and maintaining) this kind of subject metadata is costly and

difficult. Beyond individual cataloger's expertise and time, there is also the problem of finding appropriate resources to collect accurate subject information about video games (e.g., *how can a cataloger find themes of a video game released in 1987 that she has never played before?*).

Therefore, it is worthwhile to explore automatic approaches in generating such metadata. The approach we will adopt in our research is topic modeling which has been widely used to discover latent topics in document collections (Adkins et al., 2019). Further information about the approach is provided in the *Methods* section.

3 | METHODS

Among the list of best-selling video game franchises of all time that have sold at least 100 million copies, *Final Fantasy* (149 million),² was selected for its rich narrative component. Particularly, one of this franchise's recent releases, *Final Fantasy XV*,³ was selected as a case study for this paper. To collect user reviews of this game, we chose *Steam*,⁴ an online video game distribution service. Review data was collected as follows:

1. All 10,038 reviews were downloaded via the *Steam appreviews* API.⁵

4 | THE DATASET WAS USED FOR TEXT ANALYSIS, AND RANDOMLY SELECTED 1% OF THE DATA WAS USED FOR QUALITATIVE ANALYSIS. EACH METHOD IS DESCRIBED WITH MORE DETAILS BELOW

4.1 | Method I: Qualitative content analysis

Using a hybrid approach of inductive and deductive analysis (Fereday & Muir-Cochrane, 2006), randomly selected 1% of data (101 review posts) was analyzed using a qualitative analytical software, NVivo 12.⁶ First, one researcher initially reviewed the complete dataset. In this step, the researcher identified that 45 user reviews out of 101 collected reviews discussed plot and narrative related themes. Among these 45 reviews, the researcher further identified sub-themes and matched them with the terms from existing related literature (Cho, 2019; Cho, Schmalz, Keating, & Lee, 2018; Lee et al., 2017; Welhouse, Lee, &

Bancroft, 2015). After iterative processes of revising codes and codebook structure, the finalized codebook (Figure 1) was created.

4.2 | Method II: Text mining process by topic modeling

Two text analysis tools were used to determine content: Voyant Tools, a web-based, visual, digital humanities project, and the Quanteda package for RStudio. Voyant Tools is a web application that provides word count, frequencies, correlations, and contexts between words and phrases in textual documents. The entire corpus of reviews was uploaded to Voyant's interface. Top words and expressions were retrieved, as were common phrases. Voyant Tools also provides keywords in context, searching specific words and showing the words that surround those words. Several keywords were used in searching.

Quanteda enables topic modeling, or unsupervised document classification, as a way to discover and classify hidden themes. Latent Dirichlet Allocation (LDA) looks at each document as a “bag of words.” Based on the words that appear in the document, and appear across a collection of documents, LDA assigns words together as potentially representing a topic. Reviews were imported into Quanteda as a corpus. Text was pre-processed, including removing stopwords, stemming, and removing punctuation, and the corpus was converted to a data frequency matrix, before running the LDA process and evaluating the topics suggested.

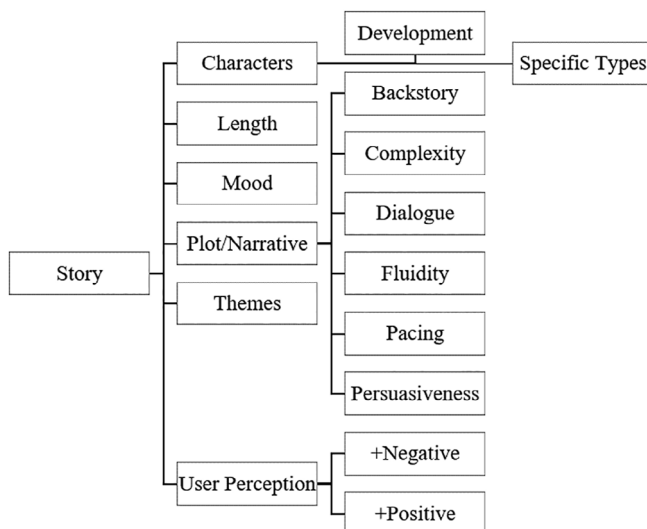


FIGURE 1 Final codebook from qualitative coding

5 | FINDINGS AND DISCUSSION

5.1 | Findings from method 1: Qualitative content analysis

Table 1 shows the 17 plot and narrative related elements (codes) identified with the frequency. We discuss the three most prominent codes in the following.

5.2 | Characters

Frequently-mentioned identified character-related terms were: friends; buddies; boyband (as a rather derogatory description of 4 main characters); NPC (Non-playable characters, often mentioned to discuss their dialogues); Noctis (name of the protagonist); Prince (the protagonist's occupation). For this game, the relationships among the protagonist, Noctis, and his friends seem to be an important and enjoyable part of the story for many users. Users often mentioned how much they enjoyed the personalities and interactions of the four characters (e.g., “the experience of having what felt like 3 real people with you helping you along your journey was unlike anything I have experienced in a game before.” [Reviewer 44,599,338]).

5.3 | Themes

Some of frequently mentioned theme-related words from user reviews were: road trip; journey; adventure; friends; friendship; traveling the world; Final Fantasy for first-timers; fantasy epic; monsters and demons; coming of age; love story. Friendship or brotherly relationships were especially prominent in many user reviews.

5.4 | User perception

The review data indicated that this game is often criticized for the lack of the fluidity in its plot. Many users mentioned that the plot has several “holes,” which were not explained well in the main story and affected the overall plot negatively (e.g., “However quite a few holes in the story. The story has a lot of potential but the execution is lacking. Just hope expansion 2.0 is not expensive.” [Reviewer 41,273,203]).

Despite there being many negative comments about the plot and overall story (17 users out of 45 users mentioned negative comments about the story), users did not necessarily dislike the game. On the *Steam* review page,⁷ 79–80% of the users gave positive reviews, most likely

TABLE 1 Definitions and frequency of code use

Code names	Descriptions	Files	Reference
Story	Top level code. Any comments relating to the story of the game.	45	241
Characters	General character related comments that contribute to the story of the game.	21	36
Characters_Development	How characters develop throughout the story.	5	6
Characters_Specific types	Characters with specific personalities, occupations, and relationships with the main character that a user plays. Specific characters mentioned by their own names belong here, as well.	11	12
Length	Length of the story.	4	4
Mood	Particular feelings and atmospheres evoked by the game or how users feel about the game.	6	6
Plot/narrative	How the main events are presented as an interrelated sequence, as a key component for the overall story.	27	56
Plot/Narrative_Backstory	Behind stories of the main plot that was not discussed in the original game. Additional hidden stories.	10	13
Plot/Narrative_Complexity	Depth or complexity of the plot.	4	5
Plot/Narrative_Dialogue	Conversations between characters or dialogues from a character.	6	8
Plot/Narrative_Fluidity	Whether the main events or plots are well-connected without interruptions throughout the gameplay.	14	18
Plot/Narrative_Pacing	How fast or slow the plot unfolds.	4	5
Plot/Narrative_Persuasiveness	Whether the plot is realistic/convincing to users.	4	7
Themes	Subjects/topics/themes of the overall story.	12	13
User perception	[auxiliary code] how users feel about the certain aspects of the story. This code is used with other code(s); it is not a stand-alone code.	38	68
+negative	Negative feedback	17	37
+positive	Positive feedback	26	31

due to the fact that video games are composed of various elements, including visual style, gameplay mechanics, music, and more beyond the narrative.

5.5 | Findings from method II: Text mining process by topic modeling

The top terms and number of appearances are: game (18,647), story (5,712), like (4,296), just (4,036), final (3,476), good (3,408). These terms offer little insight into players' thoughts about the plot or narrative of the game. Phrases offer more insight. For instance, we can see that many reviewers said "game is stunning" or "amazing

story." Most frequently appearing words are found in Figure 2.

More interesting is the context surrounding certain terms. Searching the keyword "plot" revealed 489 instances of its use. However, the surrounding words tended to be comments about the plot, rather than about plot content. "Quest" appears 567 times, and "story" 5,727 times. These also contained a considerable amount of commentary about the game-playing experience, with some coverage of plot elements (e.g., "bromance simulator", "prince on an epic quest", "fetch quests"). Changing our keyword retrieved more pertinent information. The term "friendship" (see Figure 3) and "brotherhood" (see Figure 4) revealed that the game includes a theme on bonding, friendship, and trust.

Topic modeling provides some useful data as to plot elements, but most of the information returned focused on gamer experience and satisfaction. Table 2 presents some of the top 20 topics generated by the text modeling process. Some elements of the plot are apparent (“quest, combat”), and words such as “world” and “charact*” suggest world-building and character engagement.

Text mining and topic modeling indeed allow one to “see through” the text, but it is of limited utility as an automated tool to aid in revealing plotlines and other information sought in this study. However, it is useful as a way of seeing the most common words, phrases,

collocated words, thus gauging opinion about the product if we spend time looking beyond the most common words.

5.6 | Comparison of two methods

Comparing methods revealed that human qualitative analysis was better able to capture more in-depth plot/narrative-related themes of the game based on reviews than machine-based topic modeling. Our team replicated what we assume to be standard conditions for game cataloging: none of the three researchers (*one conducted a qualitative analysis, and the other two conducted machine-based topic modeling analysis*) had played the game. The remaining researcher had played the game and had substantially knowledge of it.

However, engaging in qualitative analysis is not cost-effective for librarians to engage in. Topic modeling retrieved some limited information about themes, but



FIGURE 2 Word cloud generated by Voyant tools

TABLE 2 Selected topics produced by LDA

1	Quest love also run world get set slide even look
2	Stori feel time lot get much make charact main use
6	Stori world even combat charact great get end first go
12	Stori charact combat time side quest world use even look
19	Good quest feel great stori combat get well thing graphic

FIGURE 3 Lines of content surrounding the word “friendship”

minutes of the game, that	friendship	is the main topic in
how they force the whole	friendship	idea in this game all
is a game about bonding,	friendship	, building trust, and standing by
is a game about bonding,	friendship	, building trust, and standing by
FF9 but minor Great gamebest	friendship	simulator ever 10/10 would
garbage. It's the journey and	friendship	between these characters that's the
monologues about bravery, sa...	friendship	every 2 minutes (unlike in
game. You can have a	friendship	with your bros...till the
focus on the theme of	friendship	is really the highlight of
contains an excellent tale of	brotherhood	and friendship. Fun combat and
absolutely nailed its theme of	brotherhood	. It's just a shame that
me win in an older	brother	type way. His AI slowed
to be the strict older	brother	with an obligation, but this
JRPG. This isn't your Older	brother	/Father's Final Fantasy though, And
they are best friends or	brothers	. [h1]Cons:[/h1] Okay just
game doesn't include Kingsglaive (or	brotherhood	, the prequel anime) to watch
be traveling with, check out	brotherhood	on YouTube, a five-episode
screen time than her own	brother	[noparse] (ノ 〆)ノ 〆 [noparse], and the DLC
and the free Final	brotherhood	added as Youtube's 100th DLC

FIGURE 4 Lines of content surrounding the word “brother*”

less information was revealed than was contained in the plot description provided by the game manufacturer. Text mining, however, could contribute to game advisory in terms of review data and player mood, features which are not generally available in producer descriptions. For example, terms yielded from the text mining approach (e.g., “brotherhood”) can be good subject access for users searching for games based on themes/topics. We can easily imagine that games about history, civilization, and other diverse themes can be provided to users through text mining.

Video game reviews reflect the experience of playing and players' reactions to plot and themes, as well as their thoughts about gameplay, visual styles, and more. This limits the utility of machine learning for classifying video games by plot. Book reading requires fewer physical components than gaming, which might have allowed us to learn more about book plot and themes from book reviewers in the previous study (Adkins et al., 2019). This finding led us to wonder, if looking at games from a ludological perspective (video games are a unique form of medium, hence it should be studied as it is instead of being studied as part of narrative media) is more reasonable than a narratological perspective (video games can be looked at for their stories like other forms of narrative media), the debate which has been going on for several years (Murray, 2005).

Also, text miners need to have some background information about the game or familiarity with the game to find the plot/narrative-related themes efficiently. Often the tool generates noise terms such as “game” and “like,” and it also generates many terms related to games' system requirements or platform information rather than subject information. Knowing “what to eliminate” beforehand can yield more meaningful data. Similarly, we have learned that inputting a character's name in this tool, *Noctis*, created more plot/narrative-related results than using terms like “story” or “plot.” However, that also requires text miners to know about the game's story on some level.

6 | CONCLUSION AND FUTURE WORK

We have compared the results between qualitative analysis and text mining analysis to analyze video game reviews to generate plot/narrative-related themes. Although the qualitative analysis generated terms that provide better understanding of the plot and narrative of the game we chose, we could see that topic modeling approach can potentially provide a set of themes that can be utilized as subject access points for users.

Many topic models use dictionaries of existing terms to help define their content. A dictionary of video game themes and content could be used to train models to recognize standard video game themes such as “brotherhood” or “friendship.” This could be used to distinguish between one game and another and make conclusions about the contents of those games. Therefore, developing and improving controlled vocabulary for video games' themes (such as Welhouse et al., 2015), may be a reasonable next step for future studies. In this pilot study, we analyzed a small sample data set, looking at one particular game. By using a larger data set consisting of multiple games, we could have added the game itself as a metadata element to explore plot differences between games and created a more thorough list of terms relevant to themes. We plan to pursue this idea in our future work.

ENDNOTES

- ¹ <https://gamer.ischool.uw.edu/releases/>
- ² https://www.gamasutra.com/view/pressreleases/356047/SQUARE_ENIX_SPREADS_HOLIDAY_CHEER_WITH_MERRY_OFFERINGS_ON_FINAL_FANTASY_MOBILE_TITLES.php
- ³ <https://finalfantasyxv.square-enix-games.com/>
- ⁴ <https://store.steampowered.com/>
- ⁵ <https://partner.steamgames.com/doc/store/getreviews>
- ⁶ <https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home>
- ⁷ https://store.steampowered.com/app/637650/FINAL_FANTASY_XV_WINDOWS_EDITION/

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How to cite this article: Cho H, Bossaller JS, Adkins D, Lee JH. Human versus machine: Analyzing video game user reviews for plot and narrative. *Proc Assoc Inf Sci Technol*. 2020;57:e235. <https://doi.org/10.1002/pr2.235>