Proceedings of the 7th International Conference on Economic Management and Green Development
DOI: 10.54254/2754-1169/28/20231310

How to Find Valuable Stories for Vendors: Case of Murder Mystery Game

Long Fang[1,a,*]

[1]*Rensselaer Polytechnic Institute, Troy NY 12180, USA*
a. aaronlfang@gmail.com
**corresponding author*

Abstract: This paper wants to explore how to use game analysis and machine learning techniques to alleviate the information asymmetry for vendors in the murder mystery game industry. Sentiment analysis and game analysis are proposed to extract attributes and opinions from game introductions and reviews, then to propose strategies for selecting more valuable stories. Despite the abundance of genres and the complexity of gameplay, the data information of text and features can still be utilized to build a model for interactive story and form a standardized decision making process. This paper can provide a strategic basis for Software as a service (SaaS) companies that want to enter the related industry, using natural language processing (NLP) techniques to alleviate information asymmetry between upstream and downstream.

Keywords: story games, game analysis, natural language processing

1. Introduction

A story-based game is a game in which multiple players cooperate on telling a story by playing their respective avatars. A murder mystery game is a story-based live-action role-playing-game (RPG) that creates a virtual murder story, where the host plays out the plot and players communicate with each other and search for clues to deduce the murderer. In recent years, story-based games such as live-action role-playing games and tabletop role-playing games have emerged in China. According to Iimedia Research1, in 2022, the total market for murder mystery games in China is estimated to be 23.89 billion Chinese Yuan, increasing 45% year over year. After attracting capital market favor, the murder mystery game has formed a complete set of industry chain from publishers, vendors to consumers.

© 2023 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2754-1169/28/20231310

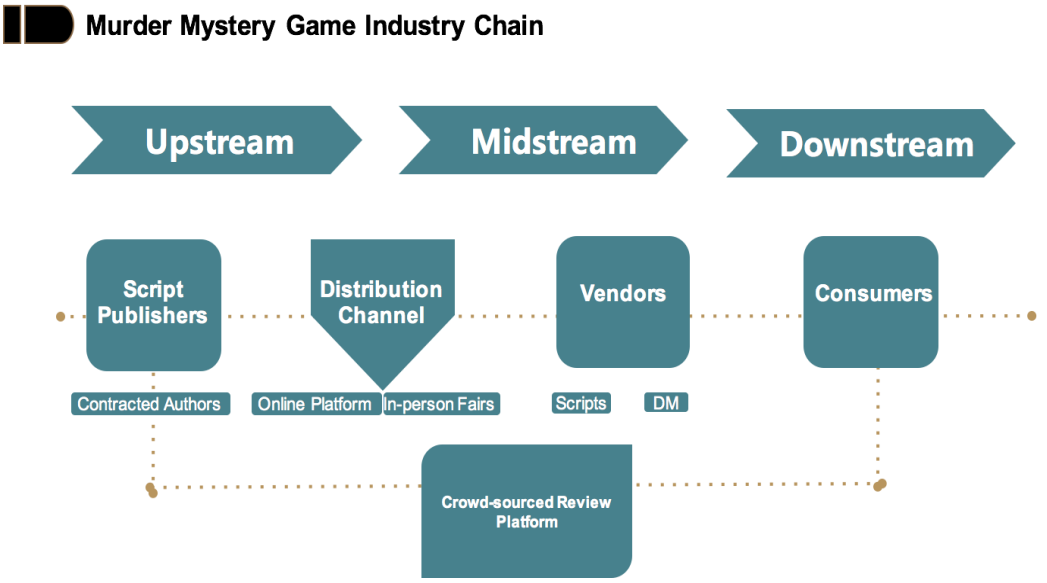

Figure 1: Industry chain.

In this chain, upstream and midstream connected through a distribution channel, publishers sell scripts to vendors through online platforms and in-person fairs. A risk then arises between the upstream and midstream of the industry. Due to the uniqueness of the storyline and clues, scripts are expendable. Therefore, few customers will experience the same script multiple times [1]. As a commodity with low reorder rate, the script has relatively high cost and risk. This risk is transferred from publishers to vendors: vendors can only see the introduction of the script on online platforms, such as story background, difficulty, expected game time and etc. Vendors also have the option to buy tickets to in-person fairs. Publishers will let some players play the new scripts. Vendors may use the opportunity to learn more information about new scripts. The more experienced vendors are more likely to pick more valuable scripts based on their past experience. This information asymmetry makes it difficult for new vendors to control the cost of buying new scripts.

Outside of this chain, crowd-sourced review platforms, such as MeiTuan, can help us make better decisions. Those who have played the game (including those in fairs) may leave their reviews on these platforms about their game experience and their opinions about the scripts. The content of these comments offers extra information to help vendors choose a more valuable script.

This study aims to reduce potential risks and expenses by investigating scripted content and sentiment analysis. Sentiment analysis, a common field in NLP, is utilized for analyzing customer reviews in industries such as consumer products and restaurants. However, there is a lack of use in game content analysis. In this paper, a model is proposed through text and game analytics and marketing functions. Despite the lack of data to validate the model, this paper provides a strategic guide to improve the efficiency of the industry.

2. Literature Review

By publishing The Murders in the Rue Morgue in 1841, Edgar Allan Poe paved the way for what would become one of the century's most popular literary subgenres [2]. Over the span of a century, writers like Agatha Christie, Arthur Conan Doyle, Dashiell Hammett, Raymond Chandler, and many more influenced the development of the mystery book. Most works of classical mystery and crime literature use the Aristotelian style of storytelling, which aims to maintain suspense until the very end. Depending on the author's voice, many additional story elements are also ubiquitous. In addition,

DOI: 10.54254/2754-1169/28/20231310

numerous reviewers have pointed out that, this kind of narrative more strongly matches puzzles and riddles than it does traditional literature [3].

Mystery games can be thought of as a type of information game, in that they provide the player with a world and mysterious events that the player must solve by interacting with that environment, its characters, and its clues, and making connections between that information to solve the mystery. A player's method of learning this knowledge, however, might change from game to game. It is possible that some players may employ a more time-efficient strategy than others, that some will complete the challenge in less time than expected, and that some will even win by sheer chance [4].

The role of sentiment analysis is to analyze the attitudes (positive, negative or neutral) expressed in the text. Depending on the intensity of the processed text, sentiment analysis can be divided into chapter/sentence-level sentiment analysis and attribute-level sentiment analysis [5]. Attribute-level sentiment analysis is more detailed than sentence-level sentiment analysis, requiring consideration of both the attributes as well as the corresponding sentiments. This task is known academically as Aspect Based Sentiment Analysis, and is specifically divided into Aspect Category Sentiment Analysis (ACSA) and Aspect Term Sentiment Analysis (ATSA). ACSA identifies the sentiment tendencies of the corresponding predefined attribute categories, while ATSA identifies the sentiment tendencies of the terms in the text.

ATSA is achieved by performing Aspect Sentiment Triplet Extraction. Aspect Sentiment Triplet Extraction includes aspect extraction, opinion extraction and aspect-opinion [6]. Aspect Sentiment Triplet Extraction does not only analyze the sentiment of a sentence, but also distinguishes one or more attributes of the sentence and analyzes their respective sentiment tendencies. Thus, Aspect Sentiment Triplet Extraction can be used to analyze the sentiment of varied attributes in the comments of the murder mystery games. Practitioners can build the taxonomy and the emotion dictionary. ATSA can help to distinguish the attributes from the taxonomy and, based on the emotion dictionary to grade the sentiment score.

3. Attributes in the Taxonomy

There has been an uninterrupted discussion in academia about ludology and narratology. These two schools of thought try to identify the essential features of games that help to express their meaning. Narratologists argue that games can be interpreted like literary texts because of their narrative structure. Emphasizing on the game experience, ludologists believe that there is no way to understand games without experiencing them firsthand [7].

The difference between murder mystery game and other RPGs and LRPGs is that, in murder mystery game, players need to spend a lot of time reading the script to understand the plot. Also, although ludologist Jesper Juul claims that players have control over what happens, for each player, the plot is incomplete [8]. The player needs to understand the script in pieces and eventually restore the whole story in the game. Thus, a player is likely to misunderstand the script. So, the role of the host (also called DM) in murder mystery game is to control the course of the game. In order for the game to run smoothly, the host must be able to keep track of the game's progress and, if necessary, use some means beyond the game's limits. This role design minimizes the possibility of players disrupting the game, but also reduces the players' control over the game. Since the influence of the host is not part of the discussion, this paper only discusses how to analyze the text and game mechanics, taking into account the factors that can be categorized in the murder mystery game and help us to establish a taxonomy.

DOI: 10.54254/2754-1169/28/20231310

3.1. Narrative Attributes

Influenced by the literature above and after talking with several practitioners, I select the following categories from the narrative perspective.

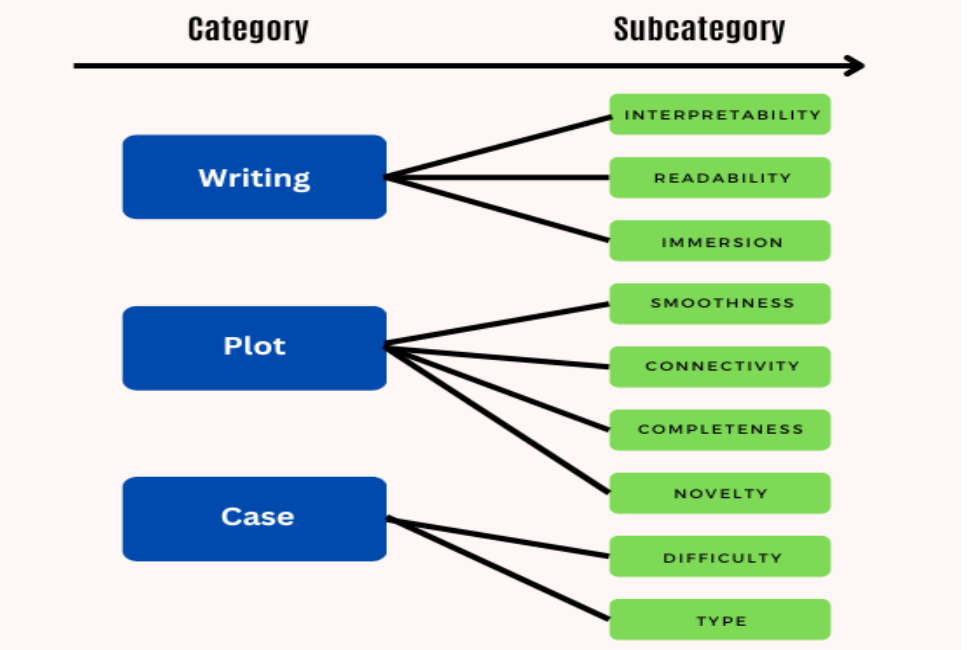

Figure 2: Narrative variables.

Writing

At the start of a murder mystery game, each player picks his own game character, and read their own scripts. Script gives each player a different first-person perspective. Point-of-view writing requires detailed writing and thoughtful character behavior. If the player does not recognize the character's personality and behavior as described by the author, then the player will not be able to communicate with other players from that character's point of view. Therefore, writing is classified as a category. Subcategory includes readability and immersion. At the same time, considering that many authors will design some restoration play to help players to immerse themselves in the characters in order to make up for the lack of writing, this study considers interpretation as a subcategory. More importantly, many DMs want the case to be well explained. At the end of the game, the DM will restore the whole story for the players. If the author doesn't explain the design of the case well, it will be difficult for the DM to answer the players' doubts about the case, leading the players' satisfaction to drop significantly. So, interpretability also needs to be a subcategory.

Plot

The story plot can also be used as a category. As in other RPGs, the characterization of the player in murder mystery game is based on the plot. In fact, it is difficult for the player to interact and control the character completely apart from the plot. Both "Grand Theft Auto", a game with a thin plot, and "The Witcher" which has an ingenious story, rely on their plot to drive the game forward.

Setting the scene for a murder mystery game is key to creating a compelling and believable mystery. It is important to create a plausible and interesting murder scenario, with enough suspects and clues to make it challenging but not too difficult to solve. The setting should also be appropriate to the theme and the characters, and should be described in enough detail to give the players the necessary context to start solving the mystery. Also, in murder mystery games, it is difficult to recreate the entire murder from the perspective of a single player. In terms of how scripted murders

DOI: 10.54254/2754-1169/28/20231310

are usually written, the characters are listed as suspects, get to know each other and share their perspectives. Therefore, the fluidity, connectivity and completeness of the plot has an important impact on the gameplay experience. In addition, once the player has experienced a certain number of scripts, they may begin to recognize common patterns across scripts. Not only is there a common formula to the narrative, but it is also the key to finding the criminals. Writers must continually find new ways to engage players, as the traditional methods of using logical deduction and narrative manipulation in murder mystery games are becoming exhausted. The need for innovative narratives, backstories and crime techniques in scripts becomes paramount as the genre enters the "repetition" stage. Therefore, plot novelty is also a key subcategory.

Case

Many murder mystery writers, influenced by British and Japanese mystery writers, divide the genres into HONGAKU (with mystery solving as the main direction), HENGAKU (with elements of ghosts, science fiction, etc. The mystery is usually surprising or whimsical in conception, a criminal investigation (relying on physical evidence), or a locked room mystery. Hence, the type of the case in the story can be considered as a subcategory. Furthermore, the publisher puts the case difficulty in the introduction of the game, in order to help customers to choose the challenge level. Case difficulty can also be determined from review comments, which may provide a more objective assessment of the case difficulty.

3.2. Game Attributes

In addition to the narrative attributes, game attributes can also be used as factors for evaluating scripts and they can be mined from the game introduction. The dimensions of the game can be divided into world, objects, agents, and events [7]. Based on the unique characteristics of the murder mystery, I list three important game attributes: theme (world), characters (agents) and time.

Theme (World)

The theme is the foundation of any murder mystery game. It sets the tone and determine the general feel of the game. A murder mystery game can take on any theme, from a classic old-fashioned murder mystery to a modern spy thriller, even science fiction or fairy. Players tend to gravitate towards the themes that interest them when choosing the scripts.

Characters (Agents)

Characters are the central driving force of any murder mystery game. Without characters, there’s no story, and no one to solve the mystery. Characters can range from suspects to investigators and can even include victims and bystanders. It’s important to choose characters that will fit the players' own characteristics, and that have their own goals and motivations that will shape the game’s plot.

Time

Different players have different motivations for playing muder mystery games. Some players enjoy the detective reasoning and are willing to play longer, while others are not. Mystery games today typically last 3 to 6 hours, with some exceeding 8 hours. In a 2021 survey1 of the mystery market in China, 48.4% of customers prefer 2-3 hours of play time, and only 1% are willing to play more than 5 hours in a single session. Playing time is therefore one of the factors that most gamers have to consider.

4. Model Development

Currently, NLP is being used in many applications, and customer experience analysis of story-based games is an area that could benefit from the use of NLP. With the growth of the Internet, millions of users access information and express their opinions and emotions on the Internet. Customer feedback data, although mostly unstructured data such as customer review text and call centre data, provides

DOI: 10.54254/2754-1169/28/20231310

richer information than immediately quantifiable information. For example, Yelp allows users to rate restaurants and leave their own comments. A customer might leave a five-star review for a restaurant, along with the following comment: "The food was good, but the service was below my expectations. In this review, the restaurant received a high score, but the service was rated negatively. To extract this more nuanced information, this paper considers to use finer-grained sentiment analysis at the attribute level, such as aspect category sentiment analysis. Some newer multitask learning solutions can be applied to perform aspect sentiment triplet extraction, which helps us to extract attributes, relations and sentiments of sentences [9]. Extracted triplets include aspect terms, their associated sentiment polarities and the opinion terms reflected by their sentiments [10]. Using the same example, food and service are aspects, with food's sentiment being positive and service being negative. Tasty and below my expectation are their respective opinions.

To construct an NLP model for predicting the popularity of murder mystery game scripts, data (reviews) should be gathered crowd-sourced platform. These reviews should then be annotated with information such as the aspect of the script discussed, the sentiment score, and the specific text span that expresses the sentiment. Utilizing our understanding of narrative attributes in murder mystery games, these reviews can be grouped into two levels: categories and their corresponding subcategories. For each review, the annotator must identify if these attributes are mentioned and determine their sentiment tendency (positive, actively positive, neutral, passively negative, negative, or not mentioned). Using advanced algorithms such as BERT or LSTM, the sentiment tendency of reviews for different scripts can be obtained. These tendencies are then converted to numerical values (-2, -1, 0, 1, 2) with a value of 0 assigned if no mention is made.

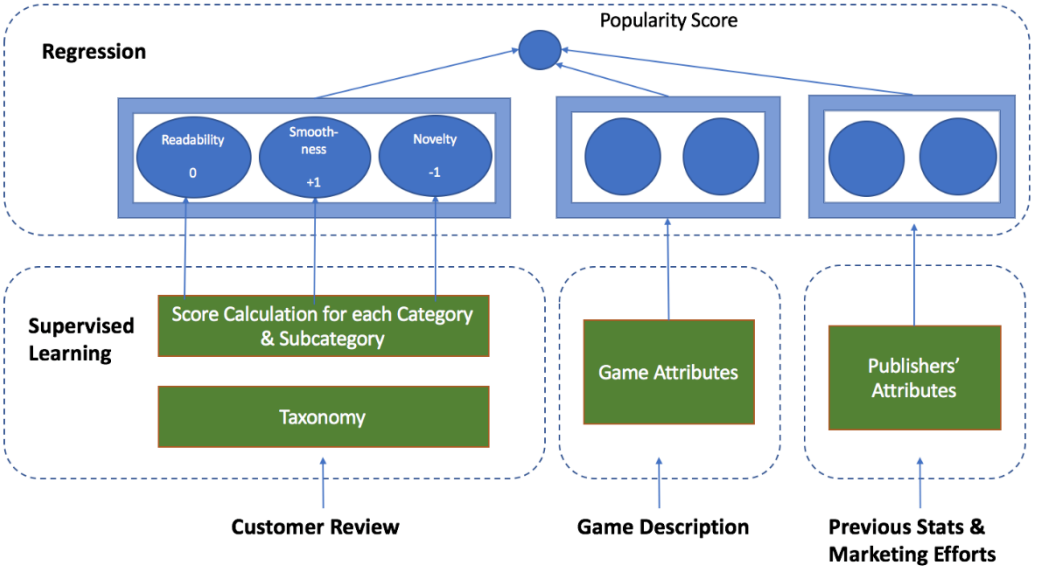

Figure 3: Modeling framework.

Besides considering factors like game time, theme, and characters, this study also take into account attributes of the publisher, such as the popularity of their previous scripts (as determined by summary statistics) and the level of pre-release marketing effort (measured by the volume of reviews before script release). By gathering this information, a predictive model is proposed to forecast the success of scripts. The regression equation is specified as follows:

$$Y = \beta_0 + X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + \varepsilon$$

DOI: 10.54254/2754-1169/28/20231310

Y is the popularity or hotness of the script. X_1 are the set of the features that are generated from the text and X_2 the game attributes. X_3 is the publisher attribute. Betas are their respective coefficients. ε refers to the residual error.

5. Conclusion & Discussion

This paper aims to assist vendors in the story-based gaming industry in addressing the issue of information asymmetry by utilizing game analysis and integrating attribute-level sentiment analysis with viewpoint triad analysis methods. By reducing the information gap, vendors can make better product decisions and decrease their costs.

Attribute-level sentiment analysis has been applied in various fields, but in cross-industry such as story-based games, it is necessary to manually define various attributes. These predefined attributes require an in-depth understanding of the industry, and as the industry evolves, so too will the categories and subcategories. The incorporation of NLP and automatic attribute mining techniques can aid in achieving a higher level of digitization and reducing costs within the industry.

References

[1] *Ye, Q.: Playwriting, dramatization and its emptiness: Screenplay Killing as a Cultural Phenomenon. China Acedemic Journal. (2021)*
[2] *Poe, E, A.: The Murders in the Rue Morgue. Graham's Magazine. (1841)*
[3] *Steele, T.: The structure of the detective story: Classical or modern? Modern Fiction Studies, 27(4):555–570, 1981. ISSN 00267724, 1080658X. URL http://www.jstor.org/ stable/26281062 (1981)*
[4] *Cook, M: Generative forensics: Procedural generation and information games. CoRR, abs/2004.01768. (2020)*
[5] *Zhang, L.: Deep learning for sentiment analysis: A survey. Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery. (2018)*
[6] *Peng, H. "Knowing what, how and why: A near complete solution for aspect-based sentiment analysis." In Proceedings of the AAAI Conference on Artificial Intelligence. Vol. 34. No. 05. 2020. (2020)*
[7] *Aarseth, E.: A Narrative Theory of Games. Center for Computer Games Research. (2012)*
[8] *Juul, J.: Half Real: Video Games between Real Rules and Fictional Worlds. Game Study Wiki.https://gamestudies.fandom.com/wiki/Half_Real:_Video_Games_between_Real_Rules_and_Fictional_Worlds (2005)*
[9] *Wu, Z.: "Grid Tagging Scheme for End-to-End Fine-grained Opinion Extraction." In Proceedings of the 2020 Conference on Empirical Methods in Natural Language Processing: Findings. (2020)*
[10] *Yu, S. B.: Aspect Sentiment Triplet Extraction Using Reinforcement Learning. CIKM '21: Proceedings of the 30th ACM International Conference on Information & Knowledge Management. (2021)*