How bullet screen empowers Bilibili to become one of the most popular online communities in China?

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Introduction

After a long day of hard working in school, high school student Eddie gets on the subway to return home. He will be staying on the subway for about 30 minutes, so he opens his phone, like he always does, and starts browsing recommended videos on the famous bullet screen website Bilibili. Since he enjoys playing video games, he clicks on one video featuring top moments from a recent *League of Legends* championship, viewing the video and the bullet screen comments on the video at the same time. Bullet screen, just as its name suggests, features bullet-like comments that fly through the screen from right to left as the audience watches the video. This special kind of comment is pseudo synchronic, meaning messages exclusively follow the moment of insertion in the video's timeline. For this particular video Eddie is watching, the bullet screen comments include commentary on the actions, expressions of exclamation, and some jokes about the content. Eddie says he has fun watching bullet screen videos, which make him feel like he is watching with so many other people interested in *LOL*. In fact, a large number of people are big fans of this bullet screen feature. It is widely believed that bullet screen is the exact reason why Bilibili has been able to gain lots of popularity in recent years and beat all other video websites.

Bullet screen is a concept created by the Japanese video-sharing site Nico Nico, and became popular in China in the past decade, with Bilibili being the most popular bullet-screen-enabled video-sharing website. Many see Bilibili as a Chinese counterpart to YouTube nowadays, but bullet screen, as the core feature of Bilibili, sets the two apart. Bullet screen provides the audience with new ways to interact and creates a unique co-viewing experience unlike that of any previous media.

This research will compare Bilibili and other video websites that have bullet screen systems— analysis will be done from the following three perspectives: bullet screen feature, bullet screen content, and how bullet screens empowers Bilibili to form a sense of community.

Since bullet screen is a relatively new concept, almost all the researches I found were produced in the past 3 years, therefore it is reasonable to infer that all the conclusions are still applicable to today's situation. The reference used by the papers also have many overlaps due to the comparative scarcity of research, and this shows how the papers gradually build on one another and form the growing body of literature we see today.

Prerequisites for the popularity of bullet screen

Bullet screen's popularity in China and Japan, and in China and Japan only, can be explained through multiple perspectives.

From a linguistic perspective, the Chinese language is characterized by gaving a high information entropy, or in other words, high information density (Wang, 2021). The efficiency of Chinese transmission of information is high. More information is contained in the same length of Chinese characters than in other languages, and that makes short and meaningful bullet screen comments possible in a Chinese context. Whereas in other languages, for example English, it may require a long sentence to express the same meaning, which would cause difficulty for the audience to read quickly without being distracted from the video content.

It is also noticed that it is not new for Chinese people to be consuming both the media content and some commentary at the same time (Wang, 2021). An analogue genre of bullet screen comments appeared for the first time in the celebrated Chinese literature Hong Lou Meng. One version of the book contains margin notes from several friends and relatives of the author Cao Xueqin. Those margin notes not only provide insightful analysis of the book, but also contain entertaining commentaries like the margin note "如闻", meaning "as I heard it", beside "放屁", meaning "bullshit", said by the heroine. The margin notes add both depth and entertainment effect to the original book, which is also the function of today's bullet screen on videos (Wang, 2021). Therefore, the appearance of margin comments in classical Chinese literature arguably explains the easy embracement of bullet screens from a cultural point of view.

The social factor is also crucial for accounting for the popularity of bullet screens in China. Chinese people "demonstrate a high level of polychronicity" and "incline towards multitasking", which are results of the typical collectivistic culture of China (Wang, 2021). Since multitasking is essential for bullet screen, which requires frequently switching between watching video and reading bullet screen comments, the acceptance of bullet screen in China makes sense. In an experiment exploring how users from U.S. and China interact with bullet-screen videos, participants were asked to watch several bullet screen videos and then record their feelings about it (Wan, Moscowitz, and Wu, 2020). The result shows the primary barrier to adopting bullet screen is the ability of multitasking. Also, they discovered cultural differences between American participants' individualism and Chinese participants' collectivism. Chinese participants' perceived pleasure and gratification in reading others' comments and participating in conversations with others using the bullet screen is a reflection of collectivism. On the other hand, individualism can potentially account for American participants' lack of general interest in commenting.

Comparison between bullet screen and other social media

In the field of media studies, critics have generally treated the bullet screen in one of the two ways: as a technology of reading and writing or as a subcultural practice (Cao, 2021).

As a tool of reading and writing, the bullet screen exhibits distinct features. Cao (2021) points out that bullet screen comments can be both discursive and non-discursive (sequential or casual logics do not necessarily exist between the texts), they target no specific addressees (although they might

hit unintended targets), and they do not call for responses (though they might be responded to and resonated with).

Similar findings are discovered by Zhang and Cassany (2020). In previous forms of social media like SMS and Twitter message, there has been more or less coherence within the texts and communications (Zhang and Cassany, 2020). There are medium-specific resources for coherence building, with the @ sign as a marker of "addressivity" (Nilsen and Mäkitalo, 2010; Werry, 1996) in tweets being an example (Honeycutt and Herring, 2009). Although the anonymous nature makes similar functions such as "reply" impossible for bullet screens, bullet screen users have developed their creative ways to substitute those functions. Users can use various non-verbal ways like striking color (yellow is commonly used, as it is noticeable copared to the white color of general bullet screen), central position, and arrow symbols to interact with other bullet screen comments, and use verbal methods like second-person pronouns and quotations to participate in discussion with others. Coherence is formed in these ways. Zhang and Cassany (2020) also noticed that with more people engaging in interaction, the bullet screen becomes more relevant and significant. Those comments not only represent a variety of different reactions to the video content but also facilitate understanding of adjacent bullet screen and guide future interpretation of the video content.

Another noteworthy characteristic of bullet screen is the idiolectic. Bullet text or bullet language is referred to as idiolect, a way for individuals to express their uniqueness and distinction (Jakobson, 1987). Oftentimes, bullet screen comments are written in subcultural dialects only decipherable by insiders. To communicate effectively with other like-minded viewers, diverse linguistic, and semiotic resources are mobilized by users, such as internet buzzwords and symbols (Wang, 2022). It is said that "寄生性" (the parasitic), "音韵性" (the metaphoric), and "相似性"(the iconic) play an major role in the deconstruction of conventional language and the invention of novel and creative bullet screen language (Shen and Wenjing, 2019). More on role of the bullet screen as a subcultural practice will be explored further in the social impact part of this paper.

Value of bullet screen

Sun, Wang, and He (2018) used bullet screen comments as a tool for generating better movie summarization. Their program the number of bullet screen comments on a segment to determine the excitement degree of the audience and uses the content of the comments to determine the concepts (e.g., the characters and the scenes) that interest the audience. They give scores to candidates and in the end, the candidates that achieve the highest score are selected to compose a summary. Till today, there is not a lot of research that makes use of the cultural value of bullet screen to generate useful information and solve real life problems, but Sun, Wang, and He definitely show us a possible research direction.

Social impact of bullet screen

As both bullet screen system and bullet screen culture become more and more sophisticated and complete, a new genre of media is being created—bullet screen video. Deng and Zhan (2022) treat bullet screen, online videos, and bullet screen videos (bullet screen + online videos) as different

textual entities, and explore how bullet screen, a sort of interactive mechanism, alters the way that online audiovisual texts are read and constructed in a carnivalesque environment.

Bullet screen can be treated as the paratext of online videos. It is subordinate to the online videos it overlays and contextualizes, and is a sort of unofficial or semiofficial paratext, shaped by a third party and accepted by the author. From another perspective, bullet screen can be thought of as an organic textual component of the bullet screen video, which is the integrated text created by the deconstruction and reconstruction, and the intersection of both bullet screen and video.

Apart from adding the co-viewing effect to video watching, bullet screens can also contribute to the deconstruction and reconstruction of online videos by inviting users to intervene in their presentations. They cannot change the images of bullet screen videos much by themselves, but they help viewers to open a new world of significance (Deng and Zhan, 2022). One example to further illustrate to idea: in the video Bilibili Gala of 2019, when Zhang Qiang, a significant pop singer in China, sang a song *Let's Disco*, many users use bullet screen to encourage other audiences change the video setting to "480*360 resolutions," "4:3 aspect ratios," and "mirror these images" to simulate the effect of an old television and obtain a nostalgic feeling. In this way, a new relationship forms between video producer and audience—audience becomes "co-producer" of bullet screen videos.

Another creation following the popularization of bullet screen is the appearance of an online virtual community.

Wang (2022) claims bullet screen creates a new way to build and maintain a sense of community through the more advanced, convenient, and immersive social co-viewing experience, and the stronger common space it provides. All the registered Bilibili users form a big virtual community, comprised of ephemeral subcommunities attached to individual videos and relatively long-term subcommunities of interest.

Bullet screen's playful tone, the special bullet screen language, used to emulate and reinforce in-group identity and create an invisible boundary to differentiate this virtual community from others, and the collapse of asynchronous behaviors into a seemingly simultaneous show of community can all reinforce a sense of unity in the user community. Users' ability to utilize this language signals their membership in this bullet screen community (Wang, 2022).

Teng and Chan (2022) explore the collective coloring phenomenon of bullet screen comments, showing they are either for enacting fan relations or expressing judgement and affect. Doing so can create cohesion in bullet screen comments by marshaling individual bullet screen comments into a collective comment coloring action. This is also a contextualization cue that requires the audience to have certain cultural knowledge to interpret the comments correctly.

The audience is encouraged to join the bullet screen community and post bullet screen comments through many ways. The interactive viewing of bullet screen de-alienates viewers by allowing individuals to create sociality through texting (Peng, 2015). The plethora of texts visually echoes the audience's thoughts and sentiments—this resonance with an imaginary crowd also motivates

audience to text (Chen et al., 2015). The experiment by Wan, Moscowitz, and Wu (2020) shows that a high level of user control and the feeling of belonging within the bullet screen community would increase the likelihood of commenting. Wang (2021) states that the popularity of bullet screen among young Chinese audiences can be attributed to a range of reasons: the experience of co-viewing, which alleviates loneliness and generates excitement using pseudo synchronicity the text and video (Perse & Courtright, 1993 and Chen et al., 2015); a sense of belonging, which might be correlated with peer pressure; and the desire for self-expression, which promotes a sense of personal efficacy. Bullet screen, along with the virtual community and special bullet screen culture it creates, can satisfy the needs of youngsters perfectly. This explains why the majority of Bilibili users are young.

In the discussion of bullet screen and the virtual community originated from bullet screen culture, although the majority of apps and websites that have a video-sharing function in China have bullet screen system now, people usually think of Bilibili first. Also, most scholarly discussions have been focusing on Bilibili and solely use it as example for analysis. It appears people have put an equal sign between bullet screen and Bilibili, though it apparently is not true. This lack of research on other video-sharing platform is thought provoking. The differences between different platforms, both difference in bullet screen features and difference in bullet screen contents, could possibly explain more to us about the success of Bilibili as being the synonym of bullet screen, and also reveal more information about the formation of virtual community from bullet screen. Therefore, I propose the following research questions:

RQ1: How do the features of the bullet screen system differ between Bilibili and other video websites?

RQ2: How does the content in bullet screen differ between Bilibili and other video websites?

RQ3: What characterizes the sense of community empowered by bullet screen comments in Bilibili?

Uses and gratifications theory

Majchrzak, Faraj, Kane, and Azad (2013) identify technology affordances as "the mutuality of actor intentions and technology capabilities that provide the potential for a particular action". According to Sundar and Limperos (2013), new media studies tend to be biased towards social and psychological factors rather than medium-related factors. Their suggestions were that researchers need to focus on the technologies themselves and the new uses and gratifications they create. Taking the uses and gratifications theory into account can help with framing and understanding the meanings and objectives of use of media, and introduce a series of variables that should be taken into consideration.

Previous literature has shown researchers using the uses and gratifications theory to explain the new medias. LaRose and Eastin (2002) offered insights into gratifications people expect from cyberspace: novel sensory incentives (gratifications from searches for information), social

gratification, activity and personal incentives (contained in the notion of boredom), with special mention of the idea of monetary gratification and status, not included in previous texts.

García-Jiménez, López-Ayala-López, and Gaona-Pisionero (2012)'s work draws conclusions about the existence of a wide variety of reasons for using Internet. To quote, "This broad choice would explain the popularity of the Internet among adolescents, who would in this way see some of their chief 'needs' at this stage in life, such as communication and relationships with their peer group, covered. All of this has fostered the development of a youth culture that is increasingly relegated to the bedroom, in a society in which parents value having their children at home as opposed to the perceived dangers of the 'outside world'."

The three research questions discussed will also be explicated with the uses and gratifications theory.

Method

To investigate the three research questions, two general methods are used: taking screenshots and performing data analysis with Python.

For RQ1, the video websites I chose to compare are Bilibili, Tencent Video, and Zhihu. Tencent Video is chosen to represent the Netflix-like video websites (mainly streaming movies, TV shows and documentaries) which integrated bullet screen comment system. Zhihu, a question-and-answer website, was chosen to represent other websites and apps, in which videos are not the main source of content for the audience to consume, but also feature simple a bullet screen function. Screenshots on the setting users can adjust to send and control bullet screen, and screenshots on how the bullet screen are displayed will be used to understand the difference between the functions of bullet screens between the websites.

For RQ2, since Bilibili is well-known for having a better bullet screen atmosphere than other platforms, only Bilibili and Tencent Videos will be studied to keep the data to a more reasonable amount, so more comparisons between the two can be done. The videos to be studied are *Harry Potter and the Sorcerer's Stone*, and *The Blue Planet* episode 1, as they are available on both platforms and represent videos of different categories—movie, and documentary—and covers audience with different purpose of video watching—entertainment and possible educational purposes. For the same videos, the time in which screenshots would be taken will also be unified, so there would be no other factors affecting the content of bullet screen. Also, for the movie *Harry Potter and the Sorcerer's Stone*, bullet screen comments of the video on two platforms would be extracted using Python, and then data analysis would be done to investigate the general pattern behind the bullet screens. The movie is more likely to trigger the audience's emotion and cause resonance, therefore has greater value for comprehensive analysis. Another type of video to be investigated is user-produced videos on Bilibili. No comparison with Tencent Videos is available for this type of video, since they are mostly uploaded to Bilibili only. The method for those videos would also be screenshots and would focus on interactions between content and video producer and audience using bullet screen that is not available in other media.

It is expected that with investigation and analysis above, information about RS3 will be gained and a certain degree of understanding will be achieved.

How do the features of the bullet screen system differ between Bilibili and other video websites?

Though the simplest concept of bullet screen has been implemented commonly among video websites in China, the various settings and additional functions have made the user experience and affordances of the bullet screen system distinct on different platforms.

Buller screens can come in various forms. The first and most common one, for all platforms, are white bullet screen that flies across the video from right to left like a bullet. This is the default setting when the audience wants to send a bullet screen comment.

While both Bilibili and Tencent Video provides users with a large variety of options for bullet screen, the only bullet screen setting for the question-and-answer platform Zhihu, is to enable or disable the bullet screen, and only the ordinary white bullet screen is available. Another note-worthy fact is that, unlike Bilibili and Tencent Video, where bullet screen is available and the same for all devices (mobile app, computer software, or webpage), bullet screen is only available on Zhihu mobile app. You can only see and send bullet screens on your mobile device, but not on your computer. This can seriously hinder the bullet screen usage on Zhihu. In fact, there are indeed little bullet screen comments for videos on Zhihu, but this does not bother Zhihu users much, since they mainly go to Zhihu to check text-based questions and answers, and video was just a tiny part of the information. Comments are enough for interaction on Zhihu, and the bullet screen is just an attempt to make an already sophisticated platform perfect, though it did not reach that purpose since users are not using it much.

Back to Bilibili and Tencent Video, for them, there are also colored bullet screens. Both platforms offer users a variety of common colors to choose from, but they also offer distinct features. Tencent Video provides VIP users with special colors like "酷金"(blaze gold) to make their bullet screen stand out from the normal ones, and VIPs of higher levels have access to more special colors.

Figure 1. From top to bottom: normal white bullet screen on Bilibili, colored (blue) bullet screen on Bilibili, and VIP-color bullet screen on Tencent Video

Another Tencent Videos-only feature is the bullet screen character. With this setting, VIP users can choose to show their VIP level in front of the bullet screen, or choose to use one of the Chinese celebrities available as an avatar to be shown in front of the bullet screen.
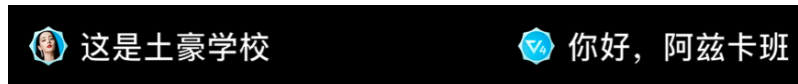
Figure 2. From left to right: bullet screen with a Chinese celebrity as an avatar on Tencent Video, bullet screen with VIP level shown on Tencent Video
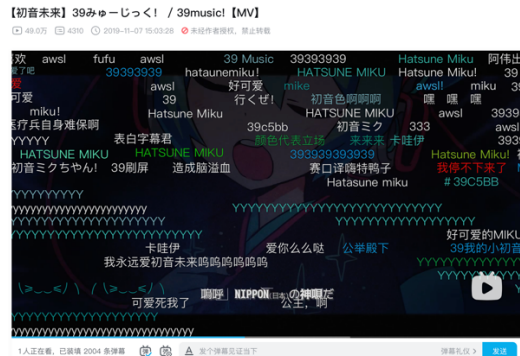

Figure 3. Bilibili users express love and support for Hatsune Miku using her iconic color #39c5bb

In contrast, instead of providing VIP-only features, Bilibili's additional feature allows users to use hex code to define their own colors. Compared with Tencent Videos, this is more practical and useful. This small function is useful for fans to create a specific color, not given by the system, to enact fan relations and express support for the video, as shown in **figure 3**, where users express love and support for Hatsune Miku using her iconic color #39c5bb.

Apart from color, one distinct feature of the bullet screen on Bilibili is the advanced bullet screen. Advanced bullet screen can break the rule of traditional bullet screen—that is one can only send bullet screen in one line—and allows users to create shapes and animations freely. This gives users, who can be perceived as the co-creator of bullet screen video, more control over the content, and a chance to unleash their creativity. In fact, there are even videos that only use advanced bullet screens to create scenes, like the one shown in figure 4. The original video only serves as a black background, while the real content audience sees is created by advanced bullet screens. For this video, users intentionally avoid sending bullet screens in case they disrupt the original scene (although you can still see one or two in the video). The most-liked comment for this video says that this video represents the essence of Bilibili bullet screen culture.

Figure 4. Screenshots of the music video *Gurenge* on Bilibili, all texts and images in this video are constituted by advanced bullet screen

Another slight difference comes in the "like" mechanism. While both Bilibili and Tencent Video allow users to "like" a specific bullet screen, you can see how many people "liked" a bullet screen on Bilibili, and the "most-liked" bullet screen will be marked so the audience can easily recognize it among the whole screen of bullet screens. The two features are not available on Tencent Videos. The mark on the "most-liked" bullet screen is a filter given by all audiences. It filters out the most valuable, or the most resonance-provoking bullet screen, so the audience can notice it easily and possibly be resonant as well.

Figure 5. The most-liked bullet screen in Bilibili

From **Figure 6** and **figure 7**, we can see the bullet screen displaying settings are both very comprehensive, allowing the audience to make various adjustments so they can enjoy the bullet screen without being disturbed by it. It is arguably true that the bullet screen sending setting provides similar functions, but it is also easy to see that the two platforms have different focuses.

Among the methods to make bullet screens more noticeable—using different colors, using exclusive colors (Tencent Video only), adding an avatar or VIP icon (Tencent Video only), and being selected by users as the "most-liked" or high-value bullet screen (Bilibili only)—many features applied by Tencent Video are not helpful for expressing meaning, but can only make it look better and showcase the VIP status. This exclusivity in function also seems to be a way for Tencent Video to attract users to subscribe to their VIP service. Tencent Video not only provides additional options for VIP users, but also puts those options in the front, allowing users to better notice them, and possibly be encouraged to use them. Bullet screen, in this case, has become more than a tool for co-viewing and communication, but also a place where VIP users can enjoy their superiority. In contrast, Bilibili settings do not have that exclusivity. Every user has access to all functions—every user and every bullet screen comment is equal. All functions in Bilibili serve the purpose of perfecting the practicality of the bullet screen system so it can contain more messages (e.g., the definition of new color, and advanced bullet screen) or provide more value for users (e.g., the mark on "most-liked" bullet screen), and they can all help audience to form cohesion even though the bullet screen media itself do not provide any method of maintaining connection.
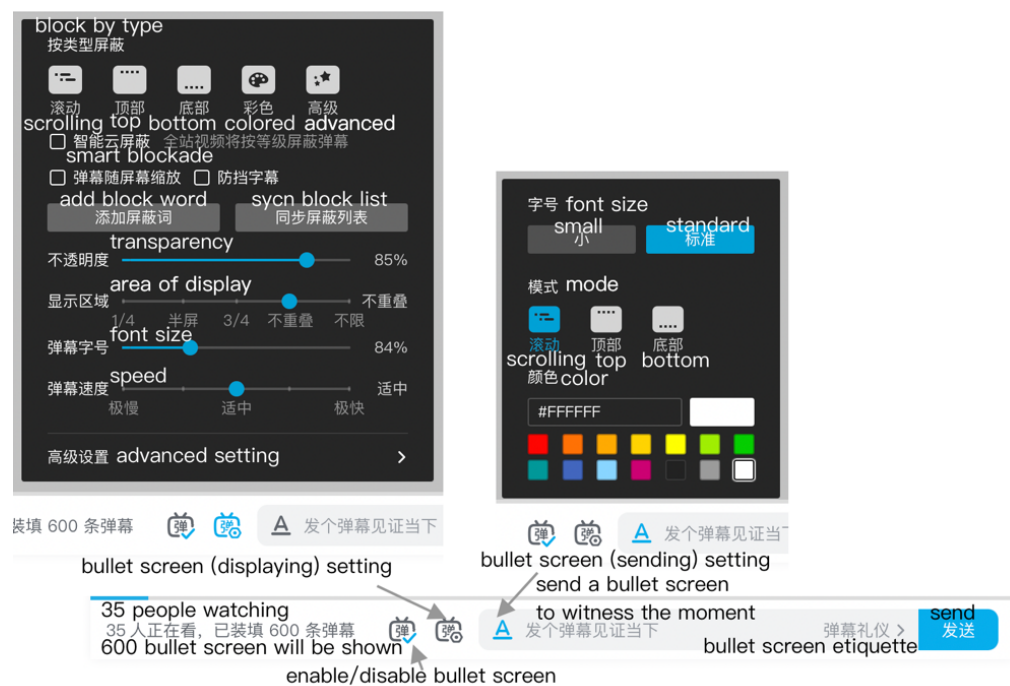
Figure 5. Screenshot of bullet screen settings on Bilibili

Figure 6. Screenshot of bullet screen settings on Tencent Videos, a lot of VIP-exclusive options can be seen

How does the content in bullet screen differ between Bilibili and other video websites?

Harry Potter Analysis

In the movie *Harry Potter and the Sorcerer's Stone*, when Professor McGonagall first introduces the four houses of Hogwarts to the first years, Bilibili bullet screens show a magnificent fan reaction—the audience starts to join the movie by posting the name of the house they favor or support. As shown in **figure 7**, the use of the color function helps the audience distinguish between the different houses the bullet screen support (each of the four colors represents a different house). This pool-like interaction was not guided by Bilibili officials but was completely audience-oriented. It is astonishing how a bullet screen pool of this size is formed by the audience spontaneously.
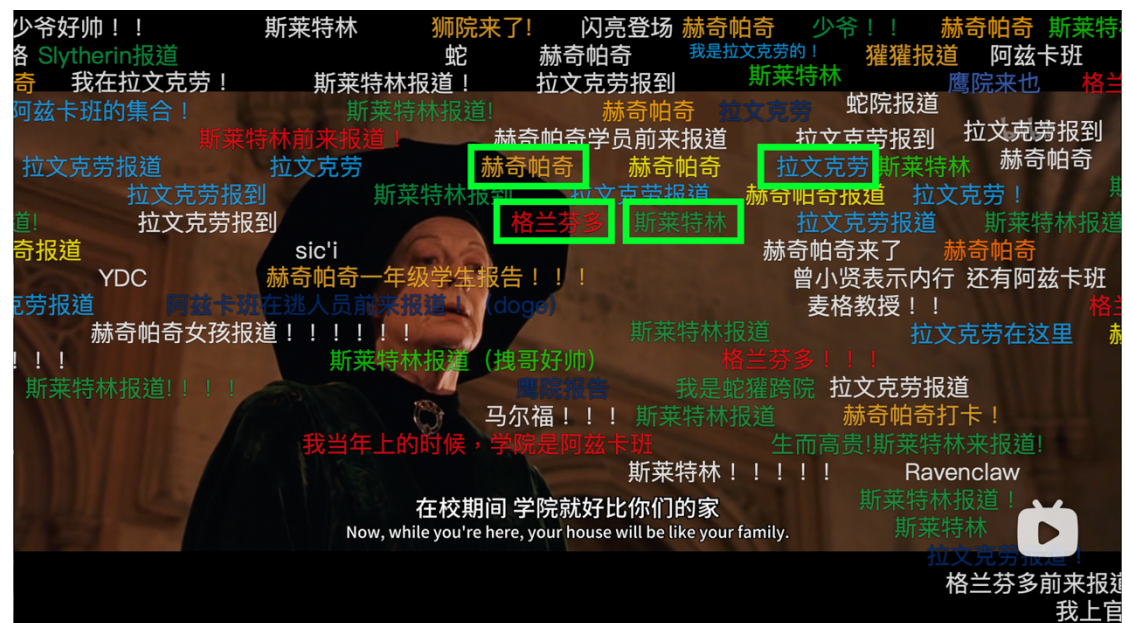

Figure 7. Screenshot of bullet screen from *Harry Potter and the Sorcerer's Stone* on Bilibili. The four colors of the bullet screen—red, green, blue, and yellow— represent support for the 4 fictional houses in the movie

In comparison, for the same scene on Tencent Videos, there is no bullet screen showing support to the houses. In this scene, the bullet screens are arguing about the appearances of the characters in the movie, as shown in **figure 8**. The topic of discussion or arguing is half-related to the movie, but still, this argument can make some audience feel unpleasant and annoyed. In actuality, this kind of bullet screen argument is pervasive throughout the entire movie.
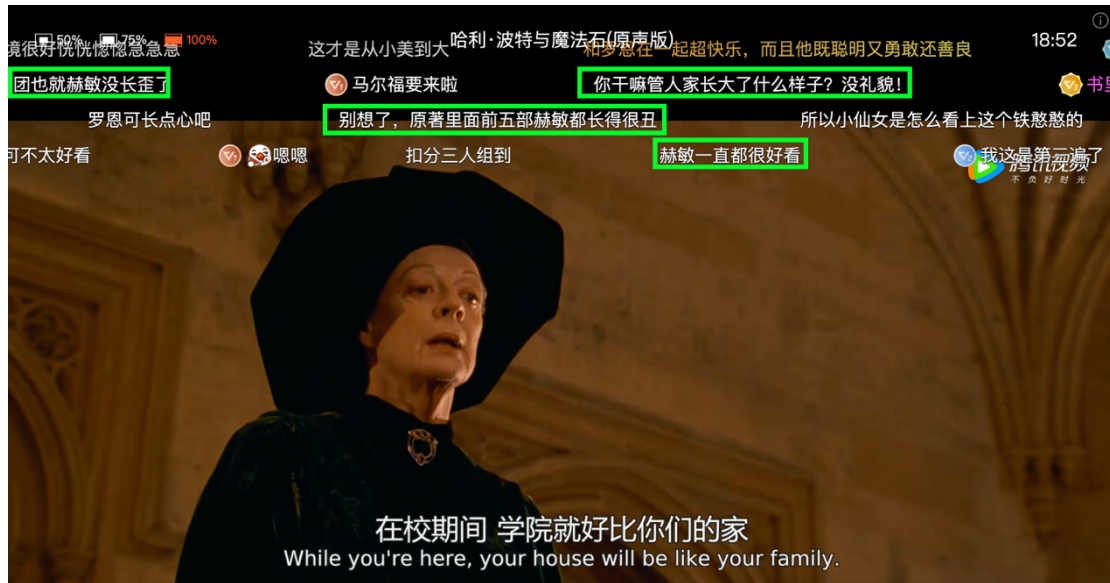
Figure 8. Screenshot of bullet screen from *Harry Potter and the Sorcerer's Stone* on Tencent Video. Translation of some bullet screen (from left to right) are: "Hermione is the only main character that still looks good after growing up", "Hermione always looks good", "don't think about it, Hermione is ugly in the first five years according to the book", "it's none of your business how she looks after growing up. So rude!"

A more general bullet screen pattern is explored using Python. Bullet screens from the movie on Bilibili and Tencent Video are extracted, and the same amount of 9500 random bullet screens from each platform are used to maximize the amount of data and ensure fair statistical comparison for the study.

For the top 20 most frequently-appeared bullet screens on Bilibili, they can be split into 3 categories: 11 of them are proper nouns from the movie. One example is "除你武器" (Expelliarmus, 1357 times); 2 of them show participation in the movie. One example is "生日快乐" (Happy birthday, 88 times), since the hero Harry Potter is having a birthday in the movie; other 7 bullet screens are expressions of feeling towards the movie. One example is "梦开始的地方" (This is where the dream begins, 47 times), which is a commonly used phrase in Bilibili bullet screen. It shows the love and strong bond of the audience towards the movie.

While for Tencent Video, the result is completely different. The top 20 most-frequently-appeared bullet screen for Tencent can be split into categories: 4 of them shows no clear meanings, for example, "1" (53 times), and "。" (Full stop in Chinese punctuation, 29 times); 7 of them are bullet screen about dates, for example, "2021" (34 times), which is completely unrelated to the movie; 7 of them are expressions of feeling towards the movie, for example "!" (23 times) and "哈哈哈" (Hahaha, 20 times); and only 2 of them are directly related to the movie. As we switch from Bilibili to Tencent Videos, it is easy to observe a general trend of decreasing relevance of bullet screens to the movie. And when irrelevant dates or other meaningless bullet screens frequently appear on the audience's screen while they are enjoying the movie, they will certainly feel distracted and annoyed.

After that, I split the bullet screens into individual words, with special attention to the proper pronoun, and did counting to them. Surprisingly, the result shows the bullet screens from the two platforms are similar in relevance to the movie as for the time main characters' names. However, this similarity in word count does not guarantee the quality of the discussion.

Figure 9. From left to right: top 20 most frequent bullet screens for Bilibili and Tencent Video
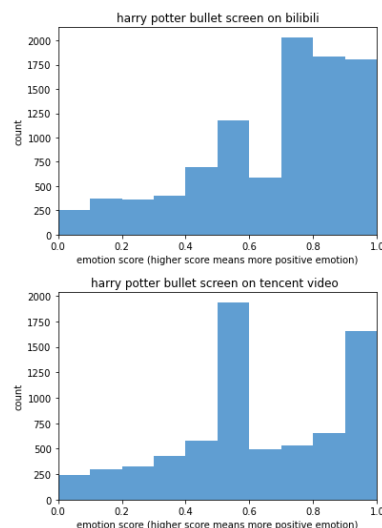

Figure 10. Emotion score histogram for Harry Potter movie

Sentiment analysis on the bullet screens has also been done with Python. Each bullet screen is analyzed and given an emotion score from 0 to 1, with higher means more positive. After that, histograms are generated to show the general pattern of bullet screen sentiments, as shown in **Figure 10**. By comparing the two histograms, it is easy to notice that Bilibili has a significantly more positive bullet screen than Tencent Video, and Tencent Video has more bullet screen that is neutral in sentiment. Among those bullet screens that got an emotion score of 0.5 for Tencent Video, there are a lot of dates and names (also unrelated to movies). This corresponds to the previous finding and further proves that, for Tencent Video, there exist a lot of bullet screens with no actual meaning.

Through analyzing the most-appeared words on the low-score bullet screen, the word "疫情" (pandemic) caught my attention. I searched the word in both Bilibili and Tencent Videos and found 2 results in Bilibili and 23 results in Tencent Videos. The meaning of those bullet screens is similar, either complaints about the pandemic or wishes for it to be over soon. This result shows Tencent Video users use bullet screens as a method for venting personal emotions in real life.

Bullet screen creations on Bilibili

Unlike Tencent Video and other video websites, the bullet screen on Bilibili not only serves as an alternative way for the audience to communicate but also as a tool for creation. The use of advanced bullet screens to create animation, as mentioned before, is one example, but creation can also be done using ordinary bullet screens.

For the English documentary *The Blue Planet*, both Bilibili and Tencent Video provided only Chinese subtitles, but not English ones. At the beginning of the documentary on both platforms, there are bullet screens asking "why there aren't English subtitles". Obviously, this lack of subtitles has caused trouble, probably for audiences who want to improve their English listening skill by watching the documentary. While the need exists for both platforms, the solution to it is only available on Bilibili—there are users sending the subtitles through bullet screens at the bottom of the video so people can check it. Though some of the subtitle bullet screens may not be seen anymore due to the limitation of the maximum amount of bullet screens to be displayed, this action shows the dedication of individual users on Bilibili to improve the video-watching experience through bullet screens.
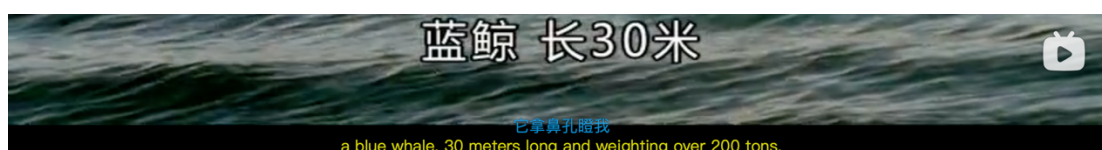

Figure 11. Screenshot of the manually-added subtitle for *The Blue Planet* episode 1 on Bilibili

Another popular user creation is filling lyrics using bullet screens. For the video shown in figure 12, which is the music Senbonzakura played by the traditional Chinese instrument guzheng, users of different interests write their own lyrics to fit the rhythm of the music. They use distinct colors to differentiate from each other, and put the theme in the brackets in the front. Some of the themes are science, Chinese history, The Three-body Problem (the Chinese science fiction novel), and Minecraft (the video game). The bullet screen lyrics have appealed to and amazed a large audience since it covers a large area of interest. With all those options available, it is easy for people to resonate and marvel at the creativity of Bilibili users.

Figure 12. Screenshot of different user-created lyrics added to Senbonzakura music video

Conclusion / What characterizes the sense of community empowered by bullet screen comments in Bilibili?

The adherence to ground rules

In the question "What's your opinion about Tencent Video bullet screen?" on Zhihu, 30 answers are given, and all of them are negative feedback, complaining about how awful those bullet screens are. This unanimous negative impression is the result of Tencent Video users' violation of the ground rules for bullet screens.

For Bilibili, if a user wants to send bullet screen, simply registering an account isn't enough, because an examination of bullet screen etiquette needs to be completed first. All questions in the exam are multiple-choice. Generally, the question gives users different kinds of bullet screens and asks which one of them is appropriate or inappropriate to be sent. One example of the question is shown in **figure 13**, and this question teaches the users they shouldn't send bullet screens like "xxx leaves his name on xx month xx day, xx year" since it is completely unrelated to the video and will jeopardize other audience's experience. The user can't move to the next question until they chose the correct answer for the basic questions, and they can only send bullet screens after passing the exam. This exam is a method for Bilibili to force users to be aware of the ground rules of bullet screen comments, so a better atmosphere can be gained for the bullet screen videos. Adherence to basic etiquette and rules are the prerequisites of community formation. While Bilibili can help the user to follow the rules, Tencent Video does not have a similar strategy, users are unaware of what should be sent and what should not. Therefore, this leads to a higher rate of violation of the ground rules in Tencent Videos, and the general viewing experience for users is compromised.

Figure 13. Screenshot of the examination before a user can send bullet screen on Bilibili

Positive comments and friendly discussion are also encouraged for bullet screen comments. The difference in opinions is acceptable, as long as the debates do not involve excessive language and evolve into unnecessary quarrels. The maintenance of harmony is a key characteristic of a mature

online community, and the employment of playful language can also be helpful in achieving this goal.

General high relevance toward video

Although the word count in Harry Potter analysis shows similarities in the time the main characters' names are mentioned by bullet screen in Bilibili and Tencent Video, this result can only imply a relevance to the movie, but cannot guarantee anything, since the focus of discussion could still be loosely related to the video content, like shown in **figure 8**. High relevance bullet screen does not refer to superficial chatting, but instead a high-quality discussions that are closely related to the video content.

The achievement of high relevance can also be supported by bullet screen features like the definition of new colors to create cohesion and connection, and the marking on the most-liked bullet screen, which help the audience focus on high relevance comments. The features mentioned here are all from Bilibili. The additional settings Tencent Video provides, on the other hand, are for VIP users to show off and feel superior but are not helpful for supporting relevance.

Agree of users' own accord

The formation poll-like bullet screen to support the four houses in the Harry Potter movie, and the spontaneous decision of not sending bullet screens to interrupt the animation of the advanced bullet screen all show the agreement of users' own accord. Another example of this is the usage of special bullet screen language in Bilibili videos. The formation of agreement with views and actions without previous consultation can form strong bonds between individuals.

User's contribution and creation

Last but not least, individual users' willingness to contribute and perfect the community is crucial. Actively answering bullet screen questions, making lyrics to support the community... These are all contributions bullet screen users can do, and their work and creation would further elevate the watching experience and foster community formation.

Scholar's interpretation

One important distinction between Bilibili and Tencent Video comes in the user group.

For Tencent Video, the bullet screen is a feature added after it already has a large variety of different users, many of whom may not be fans and are just people who occasionally seek entertainment through watching movies and shows. The bullet screen function is only meant to provide a new way of discussion. People won't come to Tencent Video only for this newly added comment function but come with the exact same purpose as before the introduction of the bullet screen.

As for Bilibili, things are different. Bilibili was the video website for ACG fans (Animation, Comics, Games) when it was first started. The Bullet screen system exists at the very beginning. Early users of Bilibili are all fans who are familiar with bullet screens and share similar interests in ACG culture. They are willing to dedicate themselves to what they feel passionate about, and constantly make contributions and creations to make the community be better. Their incentives play an important role in this. Therefore, it is easy for them to form cohesion through bullet screens and even create a bullet screen culture. The reputation of Bilibili's bullet screen has become well-known and is the exact reason why new users join Bilibili. People come to Bilibili to seek enjoyable co-viewing experiences and unique interactions between people who share the same interests as you. The more people attracted by the bullet screen, the larger resonance can form in the Bilibili community, and so it keeps attracting more people. A causal loop is formed in this way. Although nowadays some Bilibili users point out that as Bilibili expands from an ACG-based website to a video-sharing website, the growing number of users has resulted in a higher proportion of low-quality bullet screen—meaningless quarrels for example, and claim the original bullet screen culture that they love has gone, the bullet screen environment of Bilibili is still better than that of Tencent Video. Nowadays, bullet screen has empowered Bilibili to become one of the most popular video-sharing websites, and one of the most popular online communities in China.

Limitations and future research

The sentiment analysis done with Python is not completely accurate, since bullet screens are generally short in length and contain less information to perform analysis, and a large number of user-generated phrases are contained, which will be difficult for the algorithm to handle. If more accurate results are needed, machine learning training using a bullet screen with manually-added emotion scores should be used. Also, semantic analysis of bullet screens isn't done in this research because of similar reasons. If technical problems are to be solved, the researcher could use semantic analysis and sentiment analysis of the bullet screen to explore user feedback for the specific part of the video. This can be a possible angle for future research.

References

Nilsen, M., & Mäkitalo, Å. (2010). Towards a conversational culture? How participants establish strategies for co-ordinating chat postings in the context of in-service training. Discourse Studies, 12(1), 90-105.

Wang, A. (2021). Emergence and Development of Bullet Comments in China. Language Circle (Semarang), 16(1), 1-20.

Wan, A., Moscowitz, L., & Wu, L. (2020). Online social viewing: Cross-cultural adoption and uses of bullet-screen videos. Journal of International and Intercultural Communication, 13(3), 197-215.

Cao, X. (2021). Bullet screens (Danmu): texting, online streaming, and the spectacle of social inequality on Chinese social networks. Theory, Culture & Society, 38(3), 29-49.

Zhang, L., & Cassany, D. (2020). Making sense of danmu: Coherence in massive anonymous chats on bilibili.com. Discourse Studies, 22(4), 483-502.

Deng, H., & Zhan, D. (2022). Within a Carnivalesque Space: The Textual Identity of Danmu and the Rise of Mass Writing. The Journal of Arts Management, Law, and Society, 1-17.

Wang, R. (2022). Community-Building on Bilibili: The Social Impact of Danmu Comments. Media and Communication, 10(2), 54-65.

Teng, M., & Chan, B. H. S. (2022). Collective colouring in danmu comments on Bilibili. Discourse, Context & Media, 45, 100577.

Sun, S., Wang, F., & He, L. (2018). Movie summarization using bullet screen comments. Multimedia Tools and Applications, 77(7), 9093-9110.

Honey, C., & Herring, S. C. (2009, January). Beyond microblogging: Conversation and collaboration via Twitter. In 2009 42nd Hawaii International Conference on System Sciences (pp. 1-10). Ieee.

Perse, E. M., & Courtright, J. A. (1993). Normative images of communication media mass and interpersonal channels in the new media environment: mass and interpersonal channels in the new media environment. Human communication research, 19(4), 485-503.

Chen, Y., Gao, Q., & Rau, P. L. P. (2015, August). Understanding gratifications of watching danmaku videos–videos with overlaid comments. In International Conference on Cross-Cultural Design (pp. 153-163). Springer, Cham.

Jakobson, R. (1987). Language in literature. Harvard University Press.

Peng, Ting (2015) Jian li xing shi yu zhu ti jian xing: Danmu dian ying de guan ying mo shi fen xi [Alienation and inter-subjectivity: The analysis of viewing pattern of barrage film]. Contemporary Cinema 4: 146–149.

Larose, R., & Eastin, M. S. (2002). A social cognitive explanation of Internet uses and gratifications: toward a new theory of media attendance. International Communication Association.

García-Jiménez, A., López-Ayala-López, M. C., & Gaona-Pisionero, C. (2012). A vision of uses and gratifications applied to the study of Internet use by adolescents. Communication & Society, 25(2), 231-254.

Majchrzak, A., Faraj, S., Kane, G. C., & Azad, B. (2013). The contradictory influence of social media affordances on online communal knowledge sharing. Journal of Computer-Mediated Communication, 19(1), 38-55.

Sundar, S. S., & Limperos, A. M. (2013). Uses and grats 2.0: New gratifications for new media. Journal of Broadcasting & Electronic Media, 57(4), 504-525.