

Measuring film: A visual exploration of cinema under the wave of digital humanities

Hong Wang*

School of Humanities, Jiangnan University, Wuhan, Hubei Province, China

Abstract. Searching the relevant literature analysis in the CNKI database, it is found that the research boom of quantitative film science in the domestic academic community has been heating up year by year in recent years. Quantitative empirical research is integrated into the research of film ontology, which really finds a new path for the domestic film research academic community. According to Barry Salt, the director's personal style can be expressed in the external form of the film. Taking the inland China film "Spring Tide" and the Taiwan film "Little Big Women" as examples, the quantitative film thinking combined with narrative theory as a reference frame is used to conduct quantitative empirical research on the text of family ethics films in the same period between inland China and China Taiwan.

1 Introduction

Yuri Tsivian, a film studies scholar at the University of Chicago, at Cinemetrics The platform begins with a blunt statement: "Quantify everything you cannot". In the current era of Internet big data, the methodology of metrology and statistics is one of the important ways to study other disciplines, and the interdisciplinary research between domestic metrology disciplines and other disciplines has been around for a long time. For example, econometrics, computational communication, quantitative historiography, etc. But the combination of metrology and film ontology is indeed in the ascendant in China compared with the interdisciplinary research of other disciplines. In the academic field abroad, in 1975, the British scholar Barry Salt introduced digital measurement methods into the field of film research. The relevant research in the academic field in China is mainly reflected in the literature of the following scholars. For example, *Shizhen* Yang's "Theory, Methods and Applications of Metrology Filmology", "The Triple Transcendence of Scene Processing: A Perspective of 'Metrology Film science'", *Gang* Chen's "Visual Path of Metrology Filmology and Fei Mu Film Structure", *Daoxin* li's "Digital Humanities, Filmmaker Chronology and New Paths of Film Research", *Zhizhong* Fan's "Visual Path of Collective Creation of the New Mainstream Film Industry under the Threshold of Metrology Filmology", *Li* Gong's "Film Interpretation under the Threshold of Metrology Filmology- Taking the Text of the Film 'Extraordinary Task' as an Example".

Based on the "metrology" keyword search in the CNKI database (the search time is until March 31, 2022), the relevant research has only ten Chinese journal literature, including two

* Corresponding author: wh965121617@163.com

foreign translations. It can be seen that as a fledgling research paradigm in China, there are still many gaps in quantitative film science, which need to be supplemented by domestic experts and scholars. At the same time, "the significance of carrying out research on local Chinese metrology filmology lies in the fact that Chinese films occupy a place in the genetic sequencing of elements of world film forms, and this comparative perspective based on textual forms is easier to establish a dialogue relationship with the international film industry." This is another option for Chinese films to "go out" and "tell Chinese stories well". [1] Putting aside ideology and using the study of works to conduct dialogue, it is easier to make Chinese films develop synchronously with world films.

As Professor *Shizhen* Yang pointed out, "The film itself is the product of scientific invention, and its product medium (whether film or digital) has strict temporal and spatial attributes, and these attributes largely determine the psychological and emotional effects of the film on the audience." Therefore, the practice of studying and understanding the characteristics of films from a quantitative point of view has appeared for a long time. " [2] 1920s filmmakers Abel Gance with Dziga vertov and 1960s Peter Kubelka with Kurt Kren, has begun to calculate the frame rate problem of the film in post-editing, and at the same time draw charts for visual study of film data to grasp the rhythm of the film. Later, the British scholar Barry Salt, the Canadian scholar Charles O'Brien and related scholars in the United States began to study the calculation of the number of film shots, the Shot Length Structure (SLS), the Average Shot Length (ASL), and the Median Shot Length (MSL). The parameter forms of excellent classic films are similar, and the parameter forms of films with relatively average levels are also similar. "In order to discern the personal style patterns of a director in a film work, in addition to comparing the necessary data between his personal works, it is often overlooked to compare his work with the works of other directors of the same type in the same period. The purpose of this is to avoid considering the characteristics common in the works of the directors of the same period as unique to a particular director. [3] Based on Barry Salt's view, the research value of the comparison of the same type of film data in the same period cannot be ignored. Therefore, the author tried to select the film texts of the same period of family ethics, and compared the two with the combination of film science and narrative theory to analyze the narrative style and internal operation texture of its director.

2 The construction of a research framework for film text measurement

In order to achieve the purpose of comparison, in the course of this research, the film "Little Big Women" released in China Taiwan in 2020 and the film "Spring Tide" released in inland China in 2019 were used as the objects of measurement and analysis (excluding the beginning and end subtitle lengths of the film). This measurement is made using the scene editing detection tool in Adobe Premiere Pro. First, the study object is automatically split by the lens and the duration is counted in the minimum unit of measurement of the number of frames. Second, import the data synchronization Cinematics software for quantitative analysis, and generate raw parameters such as SLS, ASL (as shown in Figure 1, Figure 2). Finally, use the EXCEL function to make a visual graph (Figure 3, Figure 4). This method of comparison can be used to discuss not only the formal uniqueness of the director's work, but also the uniqueness of the content. Doing so may help reduce many of the random over-interpretations of the film. [4] Where the Shot Length Structure (SLS) is a dataset created for a film by recording the length of time (in seconds) of each shot. The Average Shot Length (ASL) is the most commonly used film style statistic by scholars. Used to describe the lens conversion frequency of a movie, also known as the Cutting Rate. When two films are compared, a low ASL value indicates a fast clipping rate, and a high ASL value indicates a slow clipping rate. However, in some films, individual shots are too long, but most shots are less than ASL,

which leads to a lack of symmetry in the shot length distribution throughout the film. As a result, ASL does not necessarily restore the stylistic characteristics of the film completely accurately. Therefore, some scholars prefer to use the Median Shot Length (hereinafter referred to as "MSL") as a reference standard. ASL is the arithmetic average, equal to the total length of the film divided by the total number of shots. MSL is the median value when arranging lens length data by orders of magnitude. If the dataset for lens duration contains an odd number of observations, MSL is the central value of sequential statistics; if the dataset contains an even number of values, MSL is equal to the average of the two intermediate values. [5]

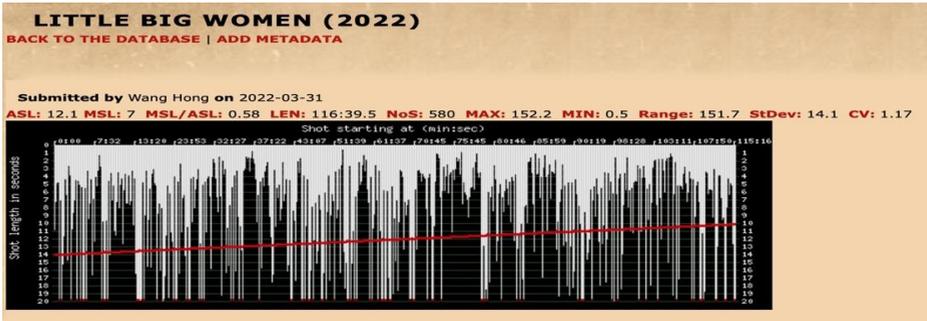


Fig. 1. "Little Big Women" clip frequency histogram.

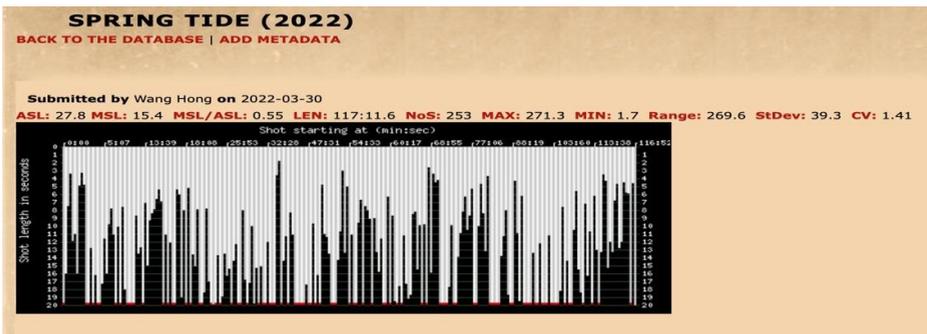


Fig. 2. "Spring Tide" clip frequency histogram.



Fig. 3. Function numerical comparison chart.

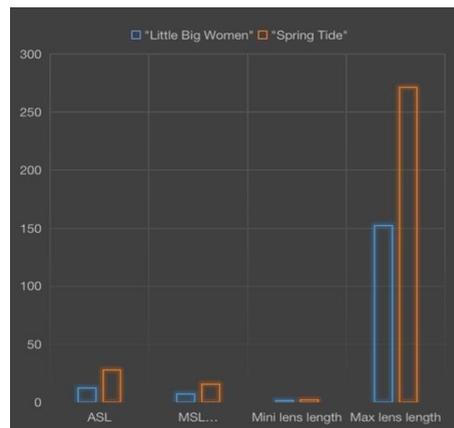


Fig. 4. A comparison chart of data in seconds.

At the same time, as an extension of structuralist literature, classical structuralist narrative science believes that when studying text objects, it is necessary to study the associations between different elements and compare them with each other in order to construct meaning. Therefore, when we conduct research, we explore the surface structure and deep structure of the internal grammar of an element, so as to refer to each other with other elements and sort out a set of rules and laws. [6] The author attempted to carry out this measurement study based on the combination of Genet's classical narrative theory and measured film parameters.

3 Film text measurement studies visualization paths

3.1 Measurement of narrative frequency and length of shots

According to narrative theory, there are two kinds of narrative time in the narrative of any text, namely "the time to tell the act itself" and "the time to tell the event". The two kinds of narrative time in the film can be understood as the time when the film narrates the event and the time when the event occurs in the story, and the proportion of the two narrative time and the number of interventions (narrative frequency) can reflect the director's creative style and method. According to whether it is single or repetitive, Genet divides it mainly into the following categories: single narrative, that is, telling things that happen once; special single narrative, that is, telling things that happen N times; repeated narratives, that is, telling things that happen N times; repeated narratives, that is, telling things that happen N times once; repeated narratives, that is, telling things that happen N times at a time. [7] Among them, repetitive narrative is simply understood as the reproduction of the same event from the perspective of different characters in the film. Yuri Tsivian believes that by analyzing the dynamic curves, three sets of data can be derived: Cinemetrics can show the fluctuations in the intensity of the movie clip (the standard deviation of the length of each shot from the average length of the shot), the length of each shot (the difference in seconds between the shortest and longest shots in the film), and its dynamic trend (reflecting the trend of the film's fluctuations in shot length over duration). [8] The author made statistics on the film length of the movies " Little Big Women " and "Spring Tide" (excluding the length of the subtitles at the beginning and end of the movie) and the relevant number. (as shown in Table 1) The Number of Lenses of "Little Big Women" was 582, and that of "Spring Tide" was 256. The ASL of "Little Big Women" was 12.1, and that of "Spring Tide" was 27.8. The MSL of "Little Big Women" was 7, and that of "Spring Tide" was 15.4. The Mini lens length of "Little Big Women" was 0.5, and that of "Spring Tide" was 1.7. The Max lens length of "Little Big Women" was 152.2, and that of "Spring Tide" was 271.3. The STDEV of "Little Big Women" was 14.1, and that of "Spring Tide" was 39.3. The CV of "Little Big Women" was 1.17, and that of "Spring Tide" was 1.41.

Table 1. Movie text data measurement table.

Film	Duration of the show (H:M:S:F)	Number of lenses (pcs)	ASL (sec)	MSL (sec)	Mini lens length (sec)	Max lens length (sec)	STDEV (Sample Estimation Standard Deviation)	CV (Discrete coefficient)
"Spring Tide"	01:57:11:17	256	27.8	15.4	1.7	271.3	39.3	1.41
"Little Big Women"	01:57:07:01	582	12.1	7	0.5	152.2	14.1	1.17

According to the relevant statistics in the table, the total narrative length of the two films is almost close, but the number of shots of " Little Big Women " is twice that of "Spring

Tide", which also confirms that the correlation between ASL and MSL reflecting the editing rate is negatively correlated with the number of shots. The average lens length time, intermediate lens length time, and STDEV function value of Spring Tide are more than twice that of " Little Big Women " (the STDEV function estimates the standard deviation based on the sample, and the smaller the value, the more the sample data value is aggregated and the larger the data The more discrete it is), it is clear that the editing rate of " Little Big Women " is higher than that of "Spring Tide". Due to the difference in averages between the two films, the CV coefficient is used to more accurately reflect the degree of variation in the length of their shots. The CV coefficient of "Spring Tide" (the CV coefficient is called the coefficient of variation or discrete coefficient, the larger the coefficient indicates that the data is more discrete, which means that the distribution of the length of the film lens is uneven) is higher than that of " Little Big Women ", indicating that the length of the shot in " Little Big Women " is evenly distributed, the fluctuation is small, and the length of the shot in "Spring Tide" is unevenly distributed, and the fluctuation is large, then the director will use more long shots for narrative expression. By splitting and comparing the two films, the author registers the repetition narrative frequency of the two films (such as Table 2 and Table 3).

Table 2. "Little Big Women" Narrative frequency measurement chart.

Event	Film	"Little Big Women"
Narrative frequency (pcs).		
6		Father stole Grandpa's seal to do business. Business failures led to the lin family breaking up and grandpa falling ill.
2		Father's "extramarital affair"
7		The eldest sister suffered from a cancer incident
9		Father's funeral

Table 3. "Spring Tide" Narrative frequency measurement chart.

Event	Film	"Spring Tide"
Narrative frequency (pcs).		
2		Father's past incidents of sexual harassment
3		The heroine meets the lover

3.2 Two-way analysis of narrative theory and measurement data

The narrative timing of "Spring Tide" is based on the original narrative of the events in the story, so there is little participation in the time of telling the act itself, and the narrative frequency of repetitive events is low. Instead, the talk in " Little Big Women " speaks of the

act itself time there is a lot of participation in the film. There is no original narrative according to the time of the events in the story, and there are more repetitive narratives, so the editing rate of the film is higher, the ASL, MSL and CV coefficients are low, and there is not much long shot used. The data measurements empirically show that the narrative frequency of the film is positively correlated with the editing rate of the film, and the relationship with the average length of the shot and the length of the middle of the shot is negatively correlated. Judging from the density of the histograms in Figures 1 and 2, the histograms of "Spring Tide" are more dispersed.

The directors of both films used the different perspectives and identities of the characters in the film to repeat the narrative of one thing to create contradictions and conflicts between the characters, but with different intensities. It is worth noting that the father characters in both films do not appear in the narrative at large lengths. For example, in "Spring Tide", through the plot of the "mother" crying to the lover and the reprimand of the daughter, he emphasizes that his ex-husband is perverted. The "mother" repeatedly mentions the incident of "sexual harassment" and the "mother" asks the daughter not to have contact with the father from an early age. At the end of the film, the monologue of the daughter standing in front of the window of the mother's hospital room is filmed through a long lens, so that the audience understands the origin of the matter, the image of the father is a loving father in the eyes of the daughter, and the root of the family's misfortune lies in the mother's strength and selfishness. Through the events of this link, the reason why the daughter in the film has been silent in the scolding of the mother is explained, and the foreshadowing buried in the front of the film is answered, and the father's incident is repeated only twice. Similarly, in the movie "Little Big Women", the director shows that the mother Lin Xiuying, the lover Miss Cai and the three daughters have different attitudes towards Chen Bochang. The funeral of her former husband Chen Bochang is the main plot line, and the incident of "stealing" the grandfather's seal is repeatedly mentioned as a "Yuan story", and the entanglement between the mother and Miss Cai is inserted in the main line, the recurrence of breast cancer and the marriage problem of the eldest daughter. It is worth noting that the second half of both films use long shots to express the emotions of the characters, Lin Xiuying in "Little Big Women" in the taxi alone on the day of her ex-husband's funeral, and "Spring Tide" in the daughter Guo Jianbo's eight-minute window monologue, in the second half of Figure 1 and Figure 2, the length of the white histogram is extended relative to the middle. Through the variation of the length of the shot, you can see the arrangement of the shot editing and rhythm of the two films. There is no fixed distribution pattern for the length of the shots of "Spring Tide", and the overall length of the shot time distribution is very long. The length of the shots of "Little Big Women" shows an alternating combination of "long-short-long-short", and the narrative presents an orderly rhythm of "slow-fast-slow-fast". The result of the analysis in Cinematics software is the red trend line of "Little Big Women", the rhythm of the film from the beginning to the end is a gradual upward trend, and the red trend line is not analyzed in "Spring Tide".

The difference in the director's narrative method in the two films leads to the above difference. In "Little Big Women", the director tries to increase the frequency of repetitive narratives and add various character events to establish a network of characters in the relationship between the two families. This better reflects the events of the previous generation and makes it easier for the audience to understand the behavior and motivations of the characters. In "Spring Tide", the director emphasizes handheld camera shooting, most of the narrative timeline is the timeline of the story, lacking the flashback plot of the mother-daughter estrangement story, and the audiovisual language is too monotonous to bring the audience into the story within the limited time period of the film. For example, a daughter chooses to avoid and remain silent for a long time in the face of her mother's cursing and nagging, which leads the audience to be suspicious.

4 Summary

Chinese films about everyday family ethics have been the best of our Chinese films. For example, in 1947, "The river flows to the East" directed by Cai Chusheng and Zheng Junli, and "Long Live the Wife" directed by Sang Hu. In 1989, Taiwanese director Chen Zhuhuang's "My Beloved" and so on. Back to the present, the motifs of "Little Big Women" and "Spring Tide" are based on the mother-daughter relationship in family ethics, the narrative topic involves the opposition and dissolution of mother-daughter emotions, the narrative techniques are different, but whether it is based on the "time to tell the event" to develop the causal relationship of the story, the use of large-scale long shots, the combination of subjective realism and objective realism to show the director's "authorship", or both, similar to the commercial film genre narrative, are the director's artistic methods to tell the story and mobilize the audience's emotions. It is also a useful exploration of the common development of family ethics films on both sides of the strait. In addition, some data on the form of film can reflect the trend of the creative style of the same type of work in the same period. These data reflect the characteristics of the film as an overlooked part of the qualitative analysis. In domestic film research, qualitative analysis is usually influenced by the subjective factors of film critics, resulting in our inability to correctly understand the artistic value of films and the ideological and cultural values on this basis.

Mr. Chen Yinke once said in the "Preface to the Aftermath of the Dunhuang Raids of Chen Yuan": "The scholarship of an era must have its new materials and new problems. The use of this material to study the problem is the new trend of scholarship in this era". In this sense, as a combination of technology and art, film requires more scientific analysis and argumentation to be added to the research process, pay attention to the study of ontological data, and get out of the old way of interpreting film texts purely with various "Theories". Of course, emphasizing the quantitative analysis of the data of the film ontology is not to replace the current research paradigm or to destroy the qualitative research methods of the film, but to find the anchor point of quantitative and qualitative research, film theory and data support, so that the academic research of Chinese film can better integrate with the academic research of world cinema.

References

1. Shizhen Yang. Theory, *Method and Application of Metrology Film Science*[J]. Contemporary Cinema, **36**, 38 (2019)
2. Shizhen Yang. Theory, *Method and Application of Metrology Film Science*[J]. Contemporary Cinema, **36**, 33 (2019)
3. Barry Salt. *A Study on Statistical Methods and Directing Styles*. Translated by Yang Yusheng. Contemporary Cinema, **36**, 39 (2019)
4. Barry Salt. *A Study on Statistical Methods and Directing Styles*. Translated by Yang Yusheng. Contemporary Cinema, **36**, 39 (2019)
5. Gang Chen. *Metrology Filmology and the Visual Path of Fermus Film Structure*[J]. Film Art, **65**, 48-49 (2020)
6. Zhu Gang. *Twentieth Century Western Critical Theories*. Shanghai: Shanghai Foreign Language Education Press (2001)
7. Bowen Yang. *Analysis of the film "Lonely Taste" with Renette's Narrative Theory*[J]. Drama House, **32**, 163 (2022)
8. Gang Chen. *Metrology Filmology and the Visual Path of Fermus Film Structure*[J]. Film Art, **65**, 47 (2020)