

# Analysis of Blank Space in Chinese Painting Sketches Based on Grey Interval Prediction Model

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## Abstract

White space is an important category in traditional painting theory, and Chinese painting sketches further sublimate its connotation and become a Existing research is mostly formal analysis or aesthetic discussion, lacking macro guidance. Today 's interdisciplinary research has become normalized, and the isolated development of knowledge systems no longer exists. As the highest form of perceptual cognition, is it feasible to intervene with completely rational mathematical tools? Taking this as a starting point, this paper describes the optimal range and development trend of the white space ratio in numerical form by constructing a The subsequent analysis not only provides theoretical evidence, but also puts forward many thoughts and suggestions.

## Keywords

Chinese painting sketches; Leave blank; Grey interval prediction model.

## 1. Introduction

The post-Qin Indian Buddhist scholar and translator Hatoma Roshi was the first to propose the term "small works" in his translation of the Prajna Sutra in the 4th century A.D., which was divided into "Great Works of Prajna" (27 volumes) and "Small Works of Prajna" (10 volumes) according to the level of detail of the translation. In contrast to the larger works, the smaller works are gradually favored by the public because of their short, compact and easy to recite volume, and now their broad concept covers painting, literature, drama, performance, medicine and many other fields, with different audiences but the same core. Chinese painting miniatures are not only named because of their size, but also not a simple sum of brush and ink, inscriptions and seals.

## 2. Artistic Characteristics of Chinese Painting Miniatures

### 2.1. Spring and Autumn Writing, Microcosm

The most intuitive external characteristic of Chinese paintings is their small size. For the purpose of improvising and expressing their feelings, they are mostly chosen in the form of booklet, Doufang or fan, which are delicate and easy to play with. The subjects depicted are all-embracing, large enough for allegorical narrative, small enough for the purpose of expressing one's thoughts. The tradition of literati painting has nurtured the unique aesthetic interest of Chinese painting miniatures, regardless of the intensity of emotion or not, regardless of the depth of thought or shallow, are placed in a handful of paintings, according to the brush and ink white, inscriptions and engravings for interpretation, this interpretation often do not make it obvious, as Zhuangzi said: "the machine heart in the chest, then pure white is not ready. Pure white is not ready, then the gods are uncertain. The Gods are unsettled, and the Tao is not carried"[1], the inner clarity and simplicity of the picture can only be penetrated through its pattern of lightness and its mysterious rationale, through the ancient and modern view,

excellent Chinese painting miniatures always enlighten the viewer, unlike the magnificent and epic sense brought about by the large volume of works, the miniatures with the spring and autumn brushwork, the small words of wisdom to tell the story, the size and shape of the intimacy created. The intimacy created by the size and shape of the painting is a blend of the inside and the outside of the painting, creating a tranquil place in the world.

## 2.2. Using books to paint, complementing each other

The relationship between calligraphy and painting has been discussed in numerous books since ancient times, and it is needless to say that calligraphy and painting have the same origin, but in the case of Chinese painting miniatures, the connotation is more condensed and even amplified, becoming a self-contained aesthetic program from the inside out. Zhang Yan Yuan's "Chronicles of Famous Paintings" says: "Zhang Zhi used to learn the method of Cui Yuan and Du Du's cursive calligraphy, and thus changed it to become the body of the present cursive calligraphy. But Prince Jing understand its deep purpose, so the word at the beginning of the line is often followed by its previous line, the world is called a book. Later, Lu Tanwei also made a stroke, continuous, so it is known that calligraphy and painting with the same method"[2], the creation of small works of art pay attention to the flow of water, a breath, the same as the calligraphy "to change and coherence" of the way of the chapter, the line of slow and staccato, tight and strong continuous for the collection of gas to start the momentum, deeply influenced by the traditional Chinese view of life, "Zhuangzi - Zhuangzi - Zhi Bei You": "The birth of man is the gathering of qi. Gathering is life, scattering is death"[3], as the essence of life in the creation of painting and calligraphy is held as a guideline, brushwork and strokes because of the gas, depending on the gas and change, Wang Xizhi "Mr. Baiyun book tips" said: "the book of gas, must reach the road, with the mixed elements of reason"[4], depending on the gas for the order of the universe, its importance can be seen. Chinese painting is mostly thick and thin, the overall breath can not be broken nor scattered, Su Shi "Wang Wei Wu Daozi painting" said: "Daozi real masculine, as vast as the sea wave over, when its hand wind and rain fast, the pen has not reached the gas has swallowed"[5], the intention in the pen first, the gas out of the rainbow.

Calligraphy, painting, printing, the natural integrity of the meaning of the small pieces even more, the layout of the piece often have more to stay, calligraphy, printing can fill the air to complete the form, more picture of the extension of interest, such as Zhang style "painting Tan" cloud: "title painting must be reflected with the to. The title and painting with the hair, the party is not envious of the text, is the painting of the painting, painting the meaning." [3]<sup>94</sup>The layout of small objects is sparse and dense, with the book, the seal is tied, that is, it has the use of Zhenbai and the momentum, but also can be scattered into a whole, give its rhythm and rhyme.

## 2.3. Remember the white when black, virtual reality

The way of yin and yang, emptiness and reality has been flowing for thousands of years, and has become an a priori law permeating the superstructure of ancient and modern concepts, and in terms of painting, Confucianism, Taoism, and Buddhism are numerous, all of which hold the two images of black and white to the height of the essence, and the void has become an indispensable vital existence. Gu Kaizhi's "On Painting" says: "If you see the subtleties of the painting and seek its placement, it is the change of the painting." [3]<sup>191</sup>, like a Zen Buddhist verse, the Chinese painting miniatures focus on "subtleties" and emphasize the overall life force after induction and simplification, which is a philosophical aesthetic that specializes the white space. This philosophical aesthetic specializes in leaving white space, so that it can be remembered as black, as Guo Xi's "Landscape Training" says: "What is meant by not taking the essence? A thousand miles of mountains can not be all strange, a hundred miles of water can not be all show? Taihang pillow Huafu and the face of the Lin consider; Taishan accounted for Qi Lu and the victory of Longyan, a general picture of the, what is the difference in the map? All these and so, the blame lies in the taken is not refined also"[6], remember the white when the black

intention with the coarse to take the essence, small works need to be in the shape of the simple road to the depth of meaning, to show the meaningful and timeless.

The psychology of creation is crucial to the shaping of the mood, and is also the root of the artistic value of Chinese painting miniatures. "The word "simplicity" usually appears together with "stillness" and "emptiness", reflecting the intrinsic requirements of the traditional theory of form and spirit. The white space in the sketch is the natural flow of "writing the spirit with the form", serving for the concretization of the creative mind, which is as vain as the valley, isolated from the hustle and bustle of the world, as the Tao Te Ching says: "To the extreme of emptiness, to keep quiet"[7], and as the University says: "Knowing the stop and then have fixed, fixed and then can be quiet, quiet and then can be safe, safe and then can be considered, considered and then can be safe. After the peace and can consider, consider and can get"[8], the heart of the vain quiet for the various advocates, is the beginning of the realm of painting is also the gas rhyme of the key, such as Yun Shouping "Ou Xiang Museum" talk: "the intention is precious far, not quiet not far. The situation is deep, not curved not deep. A spoonful of water also has a curved place, a piece of stone also has deep. The absolute vulgarity is far away, the sky travels is quiet"[9], the small works are tourable, the real and the imaginary are built its heaven and earth.

### 3. Quantitative Analysis

#### 3.1. Model selection

The sample group constituted by the vast art works in the long history has special characteristics. For the sample data series containing many subjective influencing factors and random changes, the mean GM(1,1) model suitable for the oscillation series is selected, which is derived from the gray system theory proposed by Deng Julong in 1982 in "Gray Control System", and after continuous development and improvement, the theory has been used in scientific research and After continuous development and improvement, the theory has achieved remarkable results in a wide range of neighborhoods in scientific research and production life. Unlike traditional probability theory and mathematical statistics, which rely on large sample data to ensure their accuracy, gray systems can build scientific and effective predictive models for uncertain systems, where the sample set of all artworks in time evolution is an uncertain system. The gray prediction modeling weakens the random uncertainty of the original sequence through sequence generation, and uses differential equations to approximate the development law of the system. For the prediction problem of small sample oscillation sequence with large oscillation amplitude in this example, the gray interval prediction model is constructed. Firstly, a non-equivalent interval GM(1,1) model is directly established for the upper and lower boundary sequences of the original sequence, and the upper and lower envelope curves of the fetching envelope are obtained to describe the boundary of the system development; then the calculation methods of the interval prediction value and the basic prediction value of the original sequence are given, and the interval prediction algorithm is established.

#### 3.2. Data sources

This sample has reference value and typicality, and the sample size is in line with the scope of application of the gray prediction model. Using AutoCAD to separate all picture subjects including images, inscriptions and seals, and calculate the area of the picture subject and white space and the proportional relationship with the total picture size respectively, the following table is obtained.

**Table 1. Sample Data**

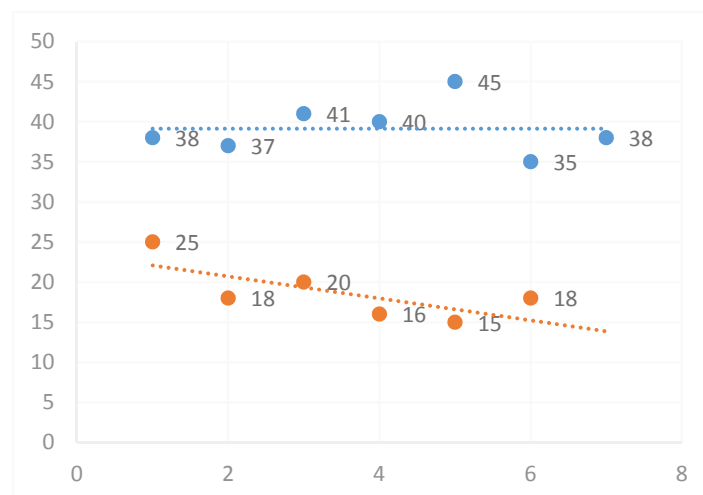
Works	Zhao Ji's "Peach Dove	Ni Zan's Six Gentlemen Painting	Ren Renfa's Bamboo Bird Painting	Shen Zhou's Ink and Vegetable Painting of Xin Yi	Wen Zhengming's Autumn Flowers
Full picture	56630.7111	67136.9625	23902.3519	328062.5999	17473.0833
Part	16090.8898	25604.0301	6845.4728	122600.8657	5752.0044
Proportion	28.414%	38.137%	28.639%	37.371%	32.919%
Works	Xu Wei's Ink Grape Painting	Bada Shanren's "Looking Out of the Corner of Independence	Jin Nong "Wild Flowers and Little Grass	Yun Shouping's Album of Imitation of Ancient Landscapes	Ren Bonian's Flower and Bird Painting
Full picture	48536.3426	45860.6211	19203.5112	57615.6511	34519.1789
Part	15172.3779	11414.1587	7821.3166	10280.2298	10162.1612
Proportion	31.260%	24.889%	40.729%	17.843%	29.439%
Works	Wu Changshuo's Teapot with Orchids	Chen Shizeng "Peony and Plum Blossom	Qi Baishi, Lotus and Dragonfly	Pan Tianshou's "Watching the Red Pomegranate in the Sunset Rain	Fruits and Vegetables by Zhang Daqian
Full picture	49303.7398	136377.6408	54732.8384	33606.7048	68875.2598
Part	19871.2243	27289.8854	8948.1953	10603.1902	12028.8842
Proportion	40.304%	20.011%	16.349%	15.395%	17.647%
Works	Li K'ung Chan's Chicken Breeding	Pu Ru's "Gathering in the Cold Mountain	Ma Shunxian "Birds	Li Xiaojun "Watermelon Buddha Hand	Liu Dazhi's Flowers and Birds Miniatures
Full picture	23363.6903	91415.3636	114363.3905	126682.3678	150268.5167
Part	10423.0977	29297.4524	35427.8345	45049.7893	57705.0187
Proportion	44.612%	32.049%	30.978%	35.561%	38.401%

### 3.3. Modeling calculation

The sequence of all proportional compositions is

$$X^{(0)} = (x^{(0)}(1), x^{(0)}(2), x^{(0)}(3), \dots, x^{(0)}(18), x^{(0)}(19), x^{(0)}(20)) \\ = (28, 38, 29, 37, 33, 31, 25, 41, 18, 29, 40, 20, 16, 15, 18, 45, 32, 31, 36, 38)$$

After analyzing this sequence, it was decided to use the envelope band method for its interval prediction. The fold line  $X^{(0)}$  and its upper envelope curve  $f_s(t)$  and lower envelope curve  $f_u(t)$  are shown below.



**Figure 1. Upper and lower envelope curves**

$f_s(t)$  The corresponding upper envelope sequence is.

$$X_s^{(0)} = (x_s^{(0)}(1), x_s^{(0)}(2), \dots, x_s^{(0)}(7)) = (38, 37, 41, 40, 45, 35, 38)$$

Its 1-AGO sequence is.

$$X_s^{(1)} = (x_s^{(1)}(1), x_s^{(1)}(2), \dots, x_s^{(1)}(7)) = (38, 75, 116, 156, 201, 236, 274)$$

The immediate mean value of its  $X_s^{(1)}$  generates  $Z_s^{(1)}$  as

$$Z_s^{(1)} = (z_s^{(1)}(1), z_s^{(1)}(2), \dots, z_s^{(1)}(6)) = (56.5, 95.5, 136, 178.5, 218.5, 255)$$

Among them  $z_s^{(1)}(k) = 0.5x_s^{(1)}(k) + 0.5x_s^{(1)}(k-1), k = 1, 2, \dots, 7$

Establish the grey differential equation.

$$X_s^{(0)}(k) + aZ_s^{(1)}(k) = b, k = 2, 3, \dots, n$$

Corresponding whitening differential equation.

$$\frac{dX^{(1)}}{dt} + aX^{(1)} = b$$

Let the parameter vectors be  $\hat{x}, \hat{x} = (\hat{a} \ \hat{b})$ , and the valuation of  $\hat{x}$  by the least squares method as

$$\hat{x} = [\hat{a} \ \hat{b}]^T = (B^T B)^{-1} B^T Y$$

Where:  $B = \begin{pmatrix} -Z_s^{(1)}(2) & 1 \\ -Z_s^{(1)}(3) & 1 \\ \vdots & \vdots \\ -Z_s^{(1)}(n) & 1 \end{pmatrix}, Y = \begin{pmatrix} -X_s^{(0)}(2) \\ -X_s^{(0)}(3) \\ \vdots \\ -X_s^{(0)}(n) \end{pmatrix}$

The corresponding functional prediction model for GM(1,1) is.

$$\hat{X}_s^{(1)}(k+1) = \left[ X_s^{(0)}(k) - \frac{\hat{a}}{\hat{b}} \right] e^{-\hat{a}k} + \frac{\hat{b}}{\hat{a}}$$

The grey model development coefficient  $a=0.006$  and the amount of grey effect  $b=40.208$  were calculated

Then make a cumulative reduction of it to obtain the original sequence as

$$\hat{X}^{(0)}(k+1) = \hat{X}^{(1)}(k+1) - \hat{X}^{(1)}(k)$$

Absolute model error.  $\varepsilon_s^{(0)}(k) = X_s^{(0)}(k) - \hat{X}_s^{(0)}(k), k = 1, 2, \dots, 7$

Model relative error.  $\Delta_k = \left| \frac{\varepsilon_s^{(0)}(k)}{X_s^{(0)}(k)} \times 100\% \right|, k = 1, 2, \dots, 7$

**Table 2.** Model errors (upper envelope series)

Serial number	Actual data	Simulation data	Residuals	Relative simulation error
2	37	39.885	-2.885	7.796%
3	41	39.662	1.338	3.262%
4	40	39.442	0.558	1.396%
5	45	39.222	5.778	12.84%
6	35	39.003	-4.003	11.438%
7	38	38.786	-0.786	2.069%

The average relative simulation error for this group is 6.467% and the model accuracy is 93.533%. The accuracy is barely qualified for the next prediction step. The maximum predicted values for the next ten steps based on the model are.

**Table 3.** Predicted values (upper envelope series)

38.57	38.355	38.142	37.929	37.718	37.508	37.299	37.091	36.885	36.679
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$f_u(t)$  The corresponding lower envelope sequence is.

$$X_u^{(0)} = (x_u^{(0)}(1), x_u^{(0)}(2), \dots, x_u^{(0)}(6)) = (25, 18, 20, 16, 15, 18)$$

According to the above formula and steps there is a 1-AGO sequence as

$$X_u^{(1)} = (x_u^{(1)}(1), x_u^{(1)}(2), \dots, x_u^{(1)}(6)) = (25, 43, 63, 79, 94, 112)$$

The immediate mean value of its  $X_u^{(1)}$  generates  $Z_u^{(1)}$  as

$$Z_u^{(1)} = (z_u^{(1)}(1), z_u^{(1)}(2), \dots, z_u^{(1)}(5)) = (34, 53, 71, 86.5, 103)$$

Gray model development coefficient  $a=0.03$ , gray effect amount  $b=19.452$

**Table 4.** Model errors (lower envelope series)

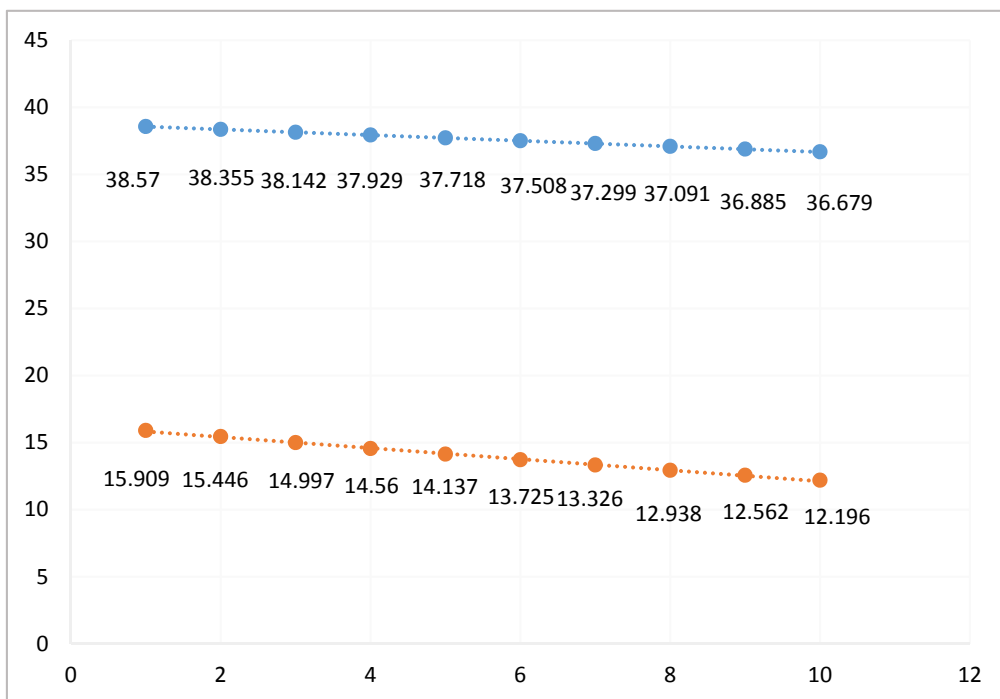
Serial number	Actual data	Simulation data	Residuals	Relative simulation error
2	18	18.441	-0.441	2.447%
3	20	17.904	2.096	10.48%
4	16	17.383	-1.383	8.643%
5	15	16.877	-1.877	12.514%
6	18	16.386	1.614	8.967%

The average relative simulation error for this group was 8.61%, and the model accuracy was 91.39%. The accuracy is barely qualified for the next step of prediction.

The minimum predicted value for the next ten steps according to the model.

**Table 5.** Predicted values (lower envelope series)

15.909	15.446	14.997	14.56	14.137	13.725	13.326	12.938	12.562	12.196
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**Figure 2.** Distribution of predicted values

## 4. Theoretical Analysis

The predicted data exhibit certain regular representations, analyzed by two properties of the predicted data sample.

### 4.1. Value domain analysis

Prediction results of the value of the domain for the upper and lower boundary function and the composition of the inner interval, let all the predicted values constitute a set of  $S$ , then there are  $S_{\max} = 38.57$ ,  $S_{\min} = 12.196$ , that is, the ideal range of values for the theoretical white space (with fluctuations), Qing Hua Lin "South Zong Fu secret" said: "And in the blank space through the width of the stay, especially when cautious. There is a potential when the wide, narrow, it is gas and detention; there is a potential when the narrow, wide, it is gas slack and scattered. Make sure that the blankness of the whole body is not forced, not scattered, not too sporadic, not too silent, not repeated rows of teeth, then the blankness of the whole body, that is, the whole body of the dragon's vein carry on"[10], the narrow and wide width of the painting should be balanced and harmonious, constrained by a certain range of scale, unlike the history of painting based on mathematical logic in the West, Chinese painting is based on traditional Chinese philosophy, and the cultural lineage of the times and the economy, its starting point in Its starting point is "Tao", and its foothold is "Yi". Zhou Yi is the core of traditional Chinese philosophy, "Yi" says: "One yin and one yang is called the Tao"[3]<sup>74</sup>, which is returned to the original source, and the two images of yin and yang are embodied in black and white ink and wash, nurturing and nourishing the life force of Chinese painting. The two images of yin and yang are embodied in black and white ink and wash, nurturing and nourishing the vitality of the essence of Chinese painting. Qing Dai Deqian's "Questions and Answers on the Heart of Painting": "Because of the changes in the Tao of painting, it coincides with the principles of Yi"[3]<sup>74</sup>.

View the upper world has loss trigrams to explain the, mountain ze loss trigrams all over the gain and loss of progress, loss and benefit of the way of circumstance, "Tuan" said: "loss, loss under the benefit of up, its way up. Loss and there is a Fu, Yuanji, no blame, can be chaste, the benefit of the future, where to use? Two gui available to enjoy. The two gui should be sometimes, loss of rigidity and benefit of flexibility sometimes. The loss and gain of surplus and deficiency, with the time." [11]The trigrams are very auspicious, reduce the loss of the lower and gain on, should be with the two Gui harmony, cut the strong to help the weak, with the evolution of the time and plan, from loss into benefit, loss of the lower and upper can be seen in the layout of Chinese painting plan, black and white yin and Yang opposing each other, through the "qi" of heaven and earth, loss of ink to benefit the remaining balance, "Xiang" said: "Under the mountain there is a zephyr, loss. The gentleman to punish the wrath and stifle desire"[11]<sup>124</sup>, its reasoning through "for the road day loss", powder and ink literary decorations in the pursuit of the road is the second, this is strong then it is weak, so should "punish the wrath and stifle desire", the layout of the painting in the real part when the loss, should not be more than half, loss of the first line of the hexagram lines said: "has been something Trent to, no blame; discretionary loss of"[11]<sup>125</sup>, the reduction to discretionary measurement, the proportion of the harmonious party to reach the "Yigei" of the product, Huang Huofu "Yizhou famous painting record" said: "clumsy rules in the square and round, despise fine research in the color painting. The simple shape of the brush is natural"[3]<sup>355</sup>, and even more so for the small works, which respects the "Way" and emphasizes the "gas" with the kernel of literati painting, and must be good at managing its position if it is to be vivid. According to the previous analysis, the predicted value of the upper boundary and its fluctuating neighbors is in line with the way of loss and gain, complementary to reality and gain and loss, yin and yang harmonization and gas pulses through, throughout the layout of Chinese painting miniatures, the main body of figure painting

is mostly down, standing on the ground to stay in the sky, the escape brush, dynamic and not lose the transcendence; landscape painting landscape are white, the perspective is mostly flat and distant, tantalizing, far away; flower and bird painting main body mostly in the middle, back to the basics, wonderfully interesting, as As Guo Xi's "The High Spirit of the Forest and Spring" says, "Whenever you operate a brush, it must fit heaven and earth. What is heaven and earth? It means that the upper part of the painting is like a foot and a half, leaving the position of the sky and the position of the earth in the middle. See the world's beginners, suddenly put the pen down, the rate of the intention to touch the mood, scribbled all over the width, look at the fill of the human eye, has been unpleasant, that can be appreciated in the dash, see the feelings of the high!" [6]<sup>93</sup>On the contrary, the ratio of white space to the main subject of the picture is 38.57:61.43  $\approx$  0.628, which is not far from the golden mean 0.618 that originated from the Pythagorean school and continues to influence the judgment of Western aesthetics. The Gestalt school of psychology, represented by Max Wertheimer, Krut Kauffka and Wolfgang Köhler, based on Kantian philosophical ideas and the concept of physical field theory, proposes the wholeness of perception and uses behavior and consciousness as the medium to view psychological research. Gestalt psychology points out that the perceptual experience of facing a flat visual image has the characteristics of wholeness, specificity, organization and constancy, such as enjoying a flower sketch. For example, when viewing a floral sketch, the perception of the subject flower is not to determine the parts of the flower such as petals and leaves and infer the subject from these parts, but to immediately perceive the flower as a whole, which is called holistic perception; also, when facing a landscape sketch, the white space is perceived as the water or the sky, although the fact that it is not depicted, this perceptual experience contains generativity and ambiguity, which is called concrete perception. For the creator, the layout of the picture is the overall perception under the law of perception, which needs to be consistent with the aesthetic expression and philosophical connotation of the whole, leaving white space as a means of generation to serve the overall rhythm presented by the work, forming an a priori factor influencing the creative process. The absolute a priori criterion in the Western philosophical system and the "Tao" and "yin and yang" in the traditional Chinese philosophy have a commonality, and have been extended and elevated to an axiom that blends rationality and sensibility for thousands of years, and the prediction value of the upper boundary concretizes this axiom and provides a reference scale in accordance with the law of reason.

View the lower world has not Ji Gua interpretation of the theory of infinite reciprocity, at the end of the 64 hexagrams, "Xiang" said: "fire on the water, not Ji; gentleman to be careful to identify things living in the square"[11]<sup>195</sup>, fire on the water, misalignment and not each other, the gentleman should examine the situation, to identify right and wrong. Things are inexhaustible, and are subject to the end of the unhealthy, to the end of the end, everything is eliminated, and the cycle tends to be bland, from "that is," to "unhealthy", the painter washed away the lead, inward and quiet, to explain the way of vividness, Chinese painting miniatures, such as the first As Jing Hao's "The Essentials of Landscape" says, "The intention is in the brush first, far away is to take its potential, near is to take its quality." [3]<sup>192</sup>, the form and intention is the basis, and the shape is to write the gods, which must be timeless and not fall into the mold. Although Chinese painting is based on the simplicity of the Great Way and the invisibility of the elephant, it is important not to make any pretense of being profound, or to be Qi Xi Li Cao, but to have something to say. Lu Ji's "Shi Heng on Painting": "The greatest thing to declare is words, and the best thing to preserve the shape is to paint"[3]<sup>89</sup>. If the pursuit of subtle words and meaning leads to vagueness and failure to preserve the shape, painting will also lose its original meaning. Susan Lange, a semiotic aesthetician, has proposed a logical form that is different from the external form in a broad sense, first of all, it is related to the external shape of things, and it can be understood through the traditional Chinese aesthetic dualism of form and god, secondly, the logical form is often hidden and obscure, and it needs to be understood in abstraction, and



it can be multi-polar correspondence and dynamic change, such as the fisherman's father in the hidden, which is symbolized by multiple mappings and rises to one of the classic painting themes. Art as a symbol of emotion based on life form has logical form specificity, fused with emotion and exists according to the whole, unlike other forms that can exist independently, art form is a steady state, color, line, composition have their own connotation and inseparable, the smallest constitutive unit is the minimal state of logical form, life has the basic structure to maintain its metabolism, art form also has the minimum threshold to express the meaning of its existence, sensory stimulation difference threshold experiment The experiments show that the overall size of the painting is proportional to the sensitivity of the human being to the stimulation generated by the change of the internal structural proportion, and the change of the structural proportion is inversely proportional to the sensitivity of the human being to the visual stimulation, small paintings are often small and delicate, and any change of the visual unit will cause a stronger stimulation, the smaller the proportion of the main body of the picture, the more easily its subtle changes are perceived, and beyond the threshold, the form will be scattered, and the lower boundary of the predicted value gives this minimum value The lower boundary of the prediction value gives this minimum value, and it is necessary to meet the square in order to see the big with the small.

#### 4.2. Monotonicity analysis

The sequence of predicted values is monotonically decreasing, which is a simulation of the generalized development trend of white space under long time spacing, and can glimpse the existence path of Chinese painting miniatures in the contemporary cultural context and social ecology. Pan Zhichang has said, "The transformation of contemporary culture is mainly related to two things. One is the unprecedented intervention of technology, which has led to the emergence of a technological culture. The second is the unprecedented intervention of commodity, which has led to the emergence of consumer culture." [12] After being branded with the label of consumer, the Chinese painting miniatures have brought decorative and imitation interest to an unprecedented height due to the limitation of volume, bringing many changes to the operation of the picture. According to Gombrich's theory of order, human visual perception instinctively resists devoting too much attention and energy to things that cannot grasp a sense of order, and our intuition prefers simple order structures such as straight lines, rectangles and others, and decorative beauty comes from the unity of monotony and chaos in diversity. This kind of imitation is mostly mechanical and dogmatic, and a large number of works have been reduced to clichés, and the idea of Zen thinking and leisure interest is actually an appendage to elegance. However, there are many artists who still tirelessly seek a new life for Chinese painting sketches, either by blending comic elements in their techniques or by returning to the mundane and earthly genre, while the expression of their own thoughts is put in the first place. Although its evaluation by society and academia was mixed, as Chen Shizheng said, "The so-called "simple rather than flashy, clumsy rather than clever, ugly rather than demonic, absurd rather than neat, purely innocent, not pretentious, is sufficient to give full play to individuality, to invigorate the spirit of independence, and to correct the soft beauty of the posture, the attitude of smearing" [13]. Under the collision of the old and the new, this kind of exploration has positive significance in the search for a new era of identity for Chinese painting miniatures. In his article "Keeping the Bottom Line of Chinese Painting," Zhang Ding points out, "A good Chinese painting has many elements, but the basic one is the brush and ink. Because of the existence of this last bottom line of brush and ink, we have not lost our ability to recognize and evaluate Chinese painting amidst the frenzy of Western learning." [14] The acceleration of contemporary social life has made the in-depth study of brush and ink almost extravagant, and artists are constantly seeking alternatives to show their innovation. However, there is no doubt that brush and ink is the essence of Chinese painting and calligraphy, and innovation is meaningless if it is expressed as a capitulation. [3]<sup>169</sup>The traditional philosophy of Chinese

painting and calligraphy is constructed by the brush and ink, which have become the symbols of cultural identification, such as the two images of yin and yang, as Wang Sash of Ming Dynasty said in his book "The scholar seeks the law from the brush and ink, and the divine reason from the ink and brushlessness; moreover, the scholar seeks the law from the ink and brushlessness, and the divine reason from the ink and brushness. At the extreme, as a natural outflow of brushwork and ink interest, the white space is also worthy of careful deliberation. This is a kind of spiritual exile under heavy social pressure, and the return of Chinese painting miniatures to the trend of "loud sound and invisible elephant" is also inevitable under the call of the times.

## 5. Conclusion

The preliminary demonstration shows that the prediction model works well, the interval definition is reasonable, and subjectivity is taken into account; the development prediction is in line with the situation, and coincides with the logic of survival of Chinese painting miniatures today, and the "business position" is organized according to the new method, which is a positive exploration under the wave of informationization. It is worth noting that the prediction data should be interpreted as a reference value with fluctuation, and subsequent research is necessary for fuzzy treatment. In recent years, the talk of the "decline" of literati painting has become very popular, and Chinese painting miniatures are not immune to it. The elegant charm of leaving white space is gradually dissipating at a speed visible to the naked eye, and "it is easy to wave five strings with one's hand, but difficult to see off the returning Hong Kong." seems to be more and more obvious. At the same time, it is also necessary to return to the beginning, to raise the white space to the psychology of creation, to find the empty valley under the steel and concrete.

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