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## An Analysis of Interactive Technology's Effect on the Appreciation of Traditional Chinese Painting

### A Review of Case Studies

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# An Analysis of Interactive Technology's Effect on the Appreciation of Traditional Chinese Painting: A Review of Case Studies

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*Abstract: From a perspective of safeguarding Intangible Cultural Heritage, this paper discusses how to enhance the appreciation of traditional Chinese painting through the support of interactive technology. The author analyses extensive yet current case studies based on the findings from the interactive appreciation of and engagement with paintings. The author then summarises four aspects of how to design interactive technology in order to support the appreciation of and engagement with traditional Chinese paintings: (1) deepening the aesthetic understanding of traditional Chinese paintings should not be a neglected aspect during the design process; (2) current case studies have not considered distinguishing the user experience between professional artists and amateurs (who are unskilled at painting); (3) it is vital to exploit interactive technology to improve the originality and subtlety of traditional Chinese painting; and (4) employing interactive systems to engage users in participatory appreciation (through encouraging them to talk about art or discussing their understanding of it) could provide potential design insights for future studies.*

*Keywords: Traditional Chinese Painting, Intangible Cultural Heritage, Interactive Technology, Cultural Appreciation*

## Background

Based on the Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO 2003), Lin and Lian (2018) summarised Intangible Cultural Heritage (ICH) into the following five categories: (1) oral traditions and expressions, including language as a vehicle of the intangible cultural heritage; (2) performing arts; (3) social practices, rituals, and festive events; (4) knowledge and practices concerning nature and the universe; and (5) traditional craftsmanship. ICH is the global wealth that contains and embodies the extensive cultural and spiritual heritage of all humans. The importance of ICH “is not the cultural manifestation itself but rather the wealth of knowledge and skills that is transmitted through it from one generation to the next” (UNESCO 2018a). ICH, transmitted across generations, is constantly recreated by communities and groups in response to their environment, as well as their interactions with nature and their history. In addition, ICH provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity (Zhao and Kirk 2016).

UNESCO launched its “Memory of the World Programme” to promote the digitisation of cultural heritage around the world, as well as to safeguard humanity’s documented heritage in an electronic format. The efforts of this initiative included twenty-three new inscriptions on the Memory of the World Register of Documentary Collections in 2003 (UNESCO 2016). In 2005, the General Office of the Chinese State Council issued a report on how to enhance the safeguarding of Chinese ICH (State Council of the People’s Republic of China 2010). The report indicates that China has a huge amount of tangible and intangible cultural heritage. The modernisation of China’s infrastructure and economy has heavily influenced its cultural ecology, thus, strengthening its ICH has become critical. The report points out that “the work of cultural safeguarding needs to use text, audio and video recording, as well as digital media to make real, comprehensive and systematic archives and databases” (State Council of the People’s Republic

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of China 2010). It also emphasises cultural education for adolescents: “The safeguarding of Chinese [ICH] needs to include immediate actions [related to] recording vanishing [ICH]” (State Council of the People’s Republic of China 2010).

Some researchers have argued that all heritage should be considered intangible (Smith 2006; Smith and Akagawa 2009); Harrison (2010) explained the reason for this perspective: the intangibility of knowledge and authority is the determining factor of cultural heritage. In essence, artefacts and cultures are not exactly valuable. It is upon professional observation by anthropologists, historians, or archaeologists that these artefacts and cultures become precious (Kirshenblatt-Gimblett 2004; Giglito 2017). For instance, because traditional Chinese painting was not included in the list of Chinese ICH (UNESCO 2018b), most researchers believe that Chinese paintings exist on paper, silk, and other tangible materials that people can touch directly. However, touching tangible art is not the main method of appreciating traditional Chinese paintings, and viewers are not able to touch most of the ones in galleries and museums. The viewers acquire intangible knowledge to understand the history behind the paintings and to grasp the artists’ emotions. Although a painting is tangible, its story is not (Zhao et al. 2018; Zhao 2019). This fact has led to the perception that Chinese paintings, as one of Chinese cultural heritage, are extremely important and need to be safeguarded. Based on the fuzzification of the definition of ICH, as well as the techniques and background of traditional Chinese painting, the author examines the safeguarding of the country’s ICH.

In recent years, governments, communities, and academics have increased efforts to maintain national ICH (Lowenthal 1998; Beardslee 2016). Digital technology offers novel ways to safeguard, disseminate, and provide access to cultural patrimony; it also allows for the inclusion of historically marginalised voices (Liu and Huang 2005; Affleck and Kvan 2008; Kenny 2009; Stevens, Flinn, and Shepherd 2010; Giaccardi 2012; Nitzky 2013). Its rise has led to the creation of a new interdisciplinary domain known as: the “digital heritage sector” (Petrelli et al. 2013), which addresses the interactions with, and visualisation, safeguarding, and documentation of, cultural heritage (Bonn, Kendall, and McDonough 2016). Human computer interaction (HCI) scholars have applied the development of this field to countless issues, specifically enhancing the visitor experience (Fraser et al. 2003). Researchers argue that aspects of ICH require a specific approach and technology to facilitate audience appreciation and the public’s experience (Bonn, Kendall, and McDonough 2016). Yet despite this, few studies have investigated how digital technology supports audiences’ understanding and appreciation of heritage through contextual, in-depth activities and analyses. Hence, before incorporating digital technology into Chinese patrimony, it is necessary to examine the opinions of professionals, stakeholders, and audiences in order to gain insight into potential designs that support the cultural significance of traditional Chinese ICH. Next, the author considers the dilemmas and current state of safeguarding of Chinese painting.

## The Safeguarding and Diffusion of Traditional Chinese Paintings

Painting has existed since the beginning of civilisation. The Han dynasty emerged between the Yangtze and Yellow river basins, absorbing a wide range of cultures (Zhou 2011). Han culture developed a unique form of painting that was exposed to the wider world by Western missionaries during the Ming Dynasty (1368–1644). Chinese painting differs from the characteristics of Western art (Zhang 2014). In addition, Chinese painting expresses national autonomy and a sense of patriotism in relation to Chinese culture (Xiong 2007).

Compared to European and American states, since the fourteenth century, China has lagged behind in terms of economics and science. China viewed the West as a model to aspire to for nearly 200 years, which subsequently led the country to neglect its own culture (Chen 2006). Some researchers, like Liu and Liu (2003), expressed that there is a feeling of cultural anxiety developed both at home and abroad in regard to the development of Chinese painting. From a domestic angle, Chinese painting needs to be explored in order to pass on the country’s

patrimony to future generations and to develop a sense of innovation. From a foreign perspective, there is a need to determine how to bring traditional Chinese culture and painting to different societies (Gan 2011). Thus, it is necessary to maintain the original elements of traditional Chinese painting, and to scrutinise the specific methods used to spread it.

As early as the 1970s, UNESCO had already emphasised the significance of “culture and self” in one of its cultural education programmes. Liu and Liu (2003) mentioned that the World Alliance for Arts Education (InSEA), part of UNESCO’s subordinate groups, was implemented in 1985. They emphasised that: “Developing countries are facing the decline of indigenous traditional cultures and a humanistic spirit” (Liu and Liu 2003, 6). Hence, the safeguarding of traditional Chinese painting should move beyond the borders of technical repairs and the occasional exhibit (Zhang 2012). With traditional painting as the essence of Chinese culture, the author believes that there is a need to investigate how to facilitate appreciation of Chinese art among a greater number of multicultural ethnic groups and to help them explore the humanistic spirit of traditional Chinese painting.

Using Ma’s (2005) analysis of traditional Chinese painting, the author believes that the diffusion of this art form should be based on an understanding of traditional Chinese colours, texture, and composition. However, such aesthetic knowledge has become disconnected from daily life, especially for non-Chinese viewers and teens. Thus, helping viewers grasp the aesthetic meaning of traditional colours and other relevant elements is a potential starting point that supports them to understand the cultural significant of the traditional Chinese paintings.

## **Interactive Technology in Traditional Chinese Paintings**

Here the author explores extensive research, which shows that using interactive technology supports the appreciation and engagement of paintings. The goal is to reveal insight for potential designs.

### ***Methods***

Since the 1980s, digital heritage studies have become an independent research area (Sørensen and Carman 2009). Text analysis and relevant archival research are frequently used techniques to grasp the essence of past occurrences and to trace the changing meanings of heritage (Soderland 2009). Specifically, the author adopts three steps which include (1) evaluating other studies; (2) selecting the studies to include in the review; and (3) organising the review. In the first step, the author mainly evaluates extensive case studies that use interactive technology to experience the traditional Chinese painting, as well as comments on each study’s value and validity. In the second step, the author chooses studies that are most relevant and most important for the support of the appreciation and engagement of traditional Chinese painting. In the third step, the author organises the different themes based on different interactive technology to explore the potential design opportunities and insights.

### ***Interactive Technology to Support Appreciation of Paintings***

This section presents immersive exhibits and cultural information sharing as two appreciation methods that involve different interactive technologies. These two different techniques are interrelated in many ways. Based on appreciation at both general and specific levels, the author discusses potential designs that could facilitate the appreciation of traditional painting.

### **Originality and Subtlety in Immersive Exhibits**

Most interactive art exhibits are shown in museums and galleries. A prime example is an exhibit of the Chinese scroll *Painting along the River during the Qingming Festival* (Lin et al. 2009),

which depicted a panorama and contained a multi-finger, tangible user interface (TUI), allowing viewers to browse the entire painting. A steerable projector offered a 360-degree perspective with high resolution to portray the original painting to the fullest possible extent. The originality and subtlety of the painting provided viewers with a sense of reality that created an immersive appreciation experience. Digitised replicas of traditional Chinese paintings has become a common alternative means of showcasing them (Chu and Tai 2001). Since 2001, multi-perspective modelling techniques have been used to re-display Chinese paintings (Chu and Tai 2001; Zhu et al. 2004). Likewise, the *Bian River Scroll* system exploited high-resolution gigapixel images, annotated with stereo sounds from nature, to create a sense of 3D space for viewers (Ma et al. 2011). The combination of sound and animation has also been widely used. Using forty-two projectors, the exhibit *Landscape Transformed* used simple 3D animation and music to describe the seasonal transitions of the painting *Huang Gongwang and Dwelling* in the Fuchun Mountains (Huang and Lioret 2013). All of the abovementioned paintings in those interactive systems are similar to long scrolls. For instance, *Along the River during the Qingming Festival* is a long scroll (35.6 x 1,152 cm) (see Figure 1). The painting's shape and length provided enough details and content to support a 360-degree perspective and an immersive 3D experience. Long-scroll paintings are not very common in traditional Chinese painting, which limits the adaptability of a 360-degree perspective for displaying other types of Chinese paintings.



Figure 1: The portion of *Along the River during the Qingming Festival*, twelfth century, Song Dynasty  
Source: Photograph by Baidu Tieba

In the abovementioned case studies, interactive technology used for an immersive experience only focused on digitised replicas. Viewers' visual and acoustic enjoyment was improved to a certain extent, giving them more opportunities to appreciate the authentic details and content of ancient Chinese paintings. However, their background knowledge and the aesthetic meaning of the ancient Chinese paintings were disregarded (Foni, Papagiannakis, and Magnenat-Thalman 2010). Moreover, the paintings examined in these case studies were all elaborate ones, rather than freehand brushwork. Elaborate paintings, which display specific characters, buildings, or environments differ from freehand brushwork, which carries much symbolic significance, cultural meaning, and emotions. Thus, ways of revealing cultural and aesthetic knowledge in an immersive experience remain undeveloped, limiting viewers to simply browsing. In other words, the implied significance of Chinese paintings supports viewers' understanding; hence, it is necessary to emphasise aesthetic meaning.

### Aesthetics in Sharing Cultural Information

Some research focuses on the dissemination of cultural information, such as the graphic nuances of paintings, relevant historical details, and information on the artists. The table-top is one of the most common interactive technologies that has been used to help viewers acquire cultural knowledge. For instance, Hsieh et al. (2013) designed an interactive table-top that offered viewers a platform with which to browse different paintings. The viewers could flip left or right to choose different pieces, just like when reading a book. Based on foveal area technology, the system helped viewers use multi-touch gestures to enlarge sections of paintings by three or four times in order to reveal their subtlety (see Figure 2). Background knowledge (e.g., the name of the painting, information on the artists, the era in which painting was made) was shown on the interface. The information provided by the system mainly focused on graphic details (Pan, Lu, and Zhai 2003; Li, Wang, and Sate 2003; Hu, Bao, and Lou 2009). Relevant cultural information only included basic details. Compared to the immersive experience, the table-top provided some cultural knowledge. However, viewers' evaluations reveal that they were limited to browsing the paintings and checking their details. They did not mention aesthetic meaning and cultural significance. For instance, Hsieh et al. (2013, 20) reported the viewers' feedback: "The interactive table-top provides a comfortable way to view paintings. Now we can see details that were neglected before.... This application would benefit researchers."

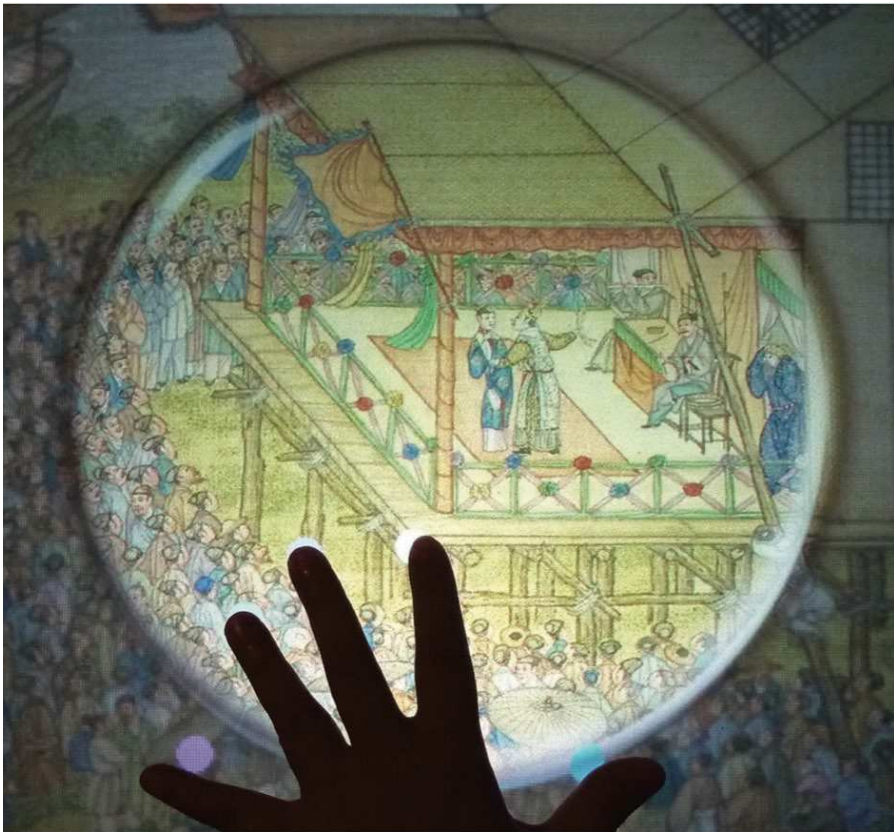


Figure 2: An example of foveal area technology  
Source: Wilson 2005

The above figure shows another example of an art installation with multi-touch screens embedded in the gallery space, the tourists could browse different paintings to gain relevant

introductions (Alexander, Barton, and Goeser 2013). In this installation, the artworks were grouped under themes (e.g., *chronology and media*) to allow tourists to browse pieces. Furthermore, the classification of the art offered tourists the opportunity to browse and explore relationships between paintings categorised under the same theme. A prototype called the interactive art installation (IAI) also used a series of themes to integrate art, literature, and music from traditional Chinese paintings, which demonstrated not only how to help viewers stay in the “browsing” or “watching” stage, but also how to improve the spread of Chinese culture and philosophy (Huang and Lioret 2013). Thematic classification not only made browsing more convenient, but also subtly encouraged tourists to follow their curiosity to explore more relevant aesthetic information.

Providing information through interactive technology is beneficial. However, helping viewers to appreciate the subtlety of paintings is also an important element of interactive technology (Hudelot 2008). Although previous research has been valuable, the author assumed that digital appreciation should be based on introductory aesthetic knowledge and participatory expression—not only specifics on displaying or interpreting a painting’s details. The appreciation of traditional Chinese paintings should not be oversimplified (Jin 2017). To this end, Miyashita (2009) offered an approach called “the awareness of the visual characteristics” whereby a painting’s characteristics help viewers to develop visual awareness. Furthermore, Miyashita (2009) also mentioned that the features of multiple paintings could enhance viewers’ understanding of paintings’ historical context. In sum, the author believes in an alternative approach that uses interactive technology to present the elements and imagery of Chinese painting potentially facilitate greater viewer appreciation of the aesthetic principles of Chinese paintings.

### ***Interactive Engagement with Paintings***

HCI has long been employed in the design and research of traditional cultural domains. This encompasses digital safeguarding, exhibition aids, the use of technologies, and interactive engagement. Some research has examined how to use interactive technology to improve viewers’ experience of traditional Chinese paintings (Lang, Findlater and Shaver 2003; Vandoren et al. 2008; Otsuki et al. 2010). These experiences include drawing, touching, and other possible methods. This section discusses case studies where digital tools were exploited to support users’ drawing and that analyse other forms of engagement with help from interactive technology.

### **The Operation of Digital Tools**

Many case studies have centred on the paint brush and canvas (the most important tools of painting) in the context of interactive technology; their main goal is to provide users with a more realistic drawing experience. CoolPaint uses digital paint brushes with a prop-based system to facilitate drawing on a table-top interface (Lang, Findlater, and Shaver 2003). With a digital brush, the prototype allows users to directly interact with the surface of the screen; it also offered different patterns of brushes referenced from Adobe Photoshop. Like CoolPaint, IntuPaint also utilises electronic brushes with a tangible interface to capture subtlety (Vandoren et al. 2008). IntuPaint also offers realistic results that help professional artists to develop more elaborate work. Furthermore, Vandoren and colleagues (2009) designed FluidPaint, which allows real wet brushes to interact with a surface, thus getting even closer to the traditional and normal method of painting. Unlike the two previous systems, MR-based Artistic Interactive (MAI) designed a mixed-reality (MR) system that allows for the use of a digital brush to draw on physical objects in the real world (Otsuki et al. 2010). To simulate live painting, Park (2006) created digital canvases with real brushes to facilitate an authentic drawing experience. His findings highlight the interaction of real ink brushes with a digital screen, and his creation offers a tangible platform for users to experience line art in Chinese painting.





Figure 3: Selected artworks by the participants made with IntuPaint  
 Source: Vandoren et al. 2008

All of the above systems' target users were professional artists or users with a satisfactory understanding of digital sketching applications (e.g., Adobe Photoshop). Users' artwork from research conducted by Vandoren and colleagues (2008) reveals their skill in employing the brush and its direct impact on their experience (see Figure 3). The author wondered whether supporting amateurs without the skills to experience a drawing is a potential direction for design, specifically in terms of enhancing users' operation of digital tools. Current digital tools do not help users to engage with elaborate paintings, which have more complex colour assortments and compositions.

### Combining Painting with Other Art Forms

Engaging with paintings is not limited by the functions of digital tools; other studies have focused on using interactive technology to integrate painting with other kinds of art (such as music and calligraphy) to create a complete painting experience. For instance, Melodic Brush creates a cross-modal musical system that combines Chinese ink-brush calligraphy and music to give its users a novel auditory experience (Huang et al. 2012). The system does not require users to be skilled at painting; they can combine their understanding of art with their knowledge of painting and music to exercise creativity. However, users need to understand the aesthetic meaning of a painting and traditional music. One of the themes of the interactive art installation (IAI) project (Huang and Lioret 2013), *Secrets to Depicting Landscapes*, allows users to interact with different parts of a painting in order to create their own piece of art. In terms of another theme, *Listening to a Painting*, projective paintings are animated with different kinds of music to display the harmony of space and time. Users had more autonomy to engage with the paintings based on their own understanding. According to Huang and Lioret (2013), Chinese ink painting does not merely require imitation; rather, it involves conveying the painter's feelings. Thus, the key goal of designing for engagement is to help users understand the culture and spirit behind traditional paintings. Several other studies link drawing and music to use cross-modal mappings, thereby leading to the development of new art forms (Jo 2008; Yeom and Lee 2012; Kang, Gu, and Gay 2013); according to this research, music and other kinds of art fostered a sense of participation among users. Based on the user reports of aforementioned projects, it is easy to see how using a combination of alternative art forms to improve user participation is effective; however, users need to have a basic understanding of the art in question. Furthermore, drawing with brushes is not the only way of helping users to experience a painting; for example, combining combining an element-based or theme-based archive with interactive technology could ensure the integrity of users' artwork.

Most research has focused on delivering experiences to users with the same or similar cultural backgrounds, as well as users that may already have common knowledge of the aesthetics of painting. To the best of the author's knowledge, no research has explored how to help amateurs from different cultural backgrounds engage with traditional paintings. For this reason, future studies could survey cross-cultural viewers who are less likely to share aesthetic principles with each other.

## Discussion

Based on the findings described in the sections Interactive Technology to Support Appreciation of Paintings and Interactive Engagement with Paintings, the author summarises four aspects of how to enhance appreciation of, and engagement with, traditional Chinese paintings: (1) understanding the painting; (2) simple operations; (3) a high degree of integrity for the artwork; and (4) collaborative participation. Firstly, it is crucial to investigate ways to help potential users grasp the aesthetics of traditional Chinese paintings before they appreciate the artwork, especially for users from different cultural backgrounds (Zhao et al. 2019). Deepening their aesthetic understanding of traditional Chinese paintings should not be neglected in the design process. Secondly, recent case studies have not considered distinguishing the user experience between professional artists and amateurs (who are unskilled at painting). Plenty of studies have intended to improve the subtlety of interactive equipment; however, they have ignored ways to support amateurs in using digital equipment. In other words, if users are not skilled enough to use ink brushes, their operation of digital tools will be restricted. Thirdly, helping users to create more complete artwork during their interactions with traditional Chinese paintings is significant. The integrity of users' artwork directly affects their interests and experiences. It is vital to properly exploit interactive technology to improve integrity, as well as to retain the subtlety of traditional paintings. Last of all, the user experiences described in these case studies reveal that users did not collaborate or communicate with their peers. Interactions only took place between users and systems. Thus, employing interactive systems to involve users in participatory appreciation (whether by encouraging them to talk about art or discuss their understanding of it) could be potential design strategies for future studies.

## Conclusion

For most amateurs, appreciating Chinese painting is an appropriate step prior to learning more deeply about the topic. Compared to acquiring drawing skills, gaining awareness of this aesthetic form is a more suitable approach for engaging the public in the arts (Ryokai, Misra, and Hara 2015). Knowledge of this field can deepen one's understanding of its cultural meaning and humanistic background (Zhao et al. 2018). Artistic appreciation and interaction emphasise the unity and diversity of traditional art (Beardsley 1982). Furthermore, the structure of aesthetic participation implies focused attention in response to a visual stimulus (Csikszentmihalyi and Robinsón 1990). In other words, the features and form of aesthetic appreciation provide a specific design technique to support the viewers' experience. However, cultural diversity brings specific challenges to foreign viewers (Csikszentmihalyi and Robinsón 1990). Diverse understandings and multiple cultural backgrounds influence aesthetic awareness of traditional Chinese painting in different ways.

Furthermore, how to promote audiences' or viewers' interest in traditional Chinese painting is a key aspect of safeguarding it. Through analysing extensive case studies that integrate interactive technology, the author believes that the current case studies do not make a clear distinction between learning and appreciating traditional Chinese painting, which may indirectly lead audiences or viewers to misunderstand the cultural significance of traditional Chinese painting or lose interest in it. Most digital applications place too much emphasis on improving a specific skill to learn traditional Chinese painting, but most cross-cultural audiences or viewers

do not have professional knowledge of it; their only experience with it is through random browsing. The key to designing for the appreciation of traditional Chinese painting should be focusing on enhancing the understanding of cultural significance and incorporating participants' stories or emotions into their appreciation. In addition, conducting extensive fieldwork with traditional Chinese painting professionals and stakeholders, as well as joint investigations with cross-cultural audiences or viewers, is necessary to identify barriers to appreciation and how to strengthen it. Data collection for these activities before the design and development phase could provide a theoretical foundation for the appreciation of traditional Chinese painting, as well as help designers avoid integrating their subjective opinions into the design stage.

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