



# Digitalization Practice of Ancient Dian Bronze Culture Based on Artificial Intelligence Technology

Houjie Yu<sup>1</sup>, Xin Tang<sup>2</sup>, Shaojiang Zheng<sup>1,\*</sup>

<sup>1</sup>Southwest Forestry University, Kunming, Yunnan, China.

<sup>2</sup>Guangzhou Academy of Fine Arts, Guangzhou, Guangdong, China.

**How to cite this paper:** Houjie Yu, Xin Tang, Shaojiang Zheng. (2024) Digitalization Practice of Ancient Dian Bronze Culture Based on Artificial Intelligence Technology. *Journal of Humanities, Arts and Social Science*, 8(6), 1490-1495. DOI: 10.26855/jhass.2024.06.033

**Received:** May 10, 2024

**Accepted:** June 7, 2024

**Published:** July 4, 2024

\***Corresponding author:** Shaojiang Zheng, Southwest Forestry University, Kunming, Yunnan, China.

## Abstract

In order to elucidate the developmental challenges facing the ancient Dian bronze culture and analyze the current shortcomings in integrating artificial intelligence technology with this culture, the author explores its contemporary design applications through programming and the creation of modern graphic art. This involves incorporating patterns and elements from ancient Dian bronze artifacts. The author conducted field surveys at the Yunnan Provincial Museum and the Lijiashan Bronze Artifacts Museum, engaging in in-depth interviews with local administrators. Furthermore, the author reviews personal artistic work experience in creating "Dance of Bronze". A painting system named "Dance of Bronze" based on p5.js, has been developed. This system enables users to choose ancient Dian bronze artifacts to generate digital art, highlighting the elements and features of ancient Dian bronze culture through graphics, animations, and other media. It concretizes the ideas of users and presents them in a digital interface, enabling bidirectional interaction between artificial intelligence, generative art, and ancient Dian bronze culture. "Dance of Bronze" not only provides a more diverse way to express ancient Dian bronze culture through digital methods but also promotes the dissemination and development of this exceptional traditional culture with entertainment value. Additionally, it eliminates the limitations of time and space in communication, enhancing interaction, exchange, and fusion between different cultures through bronze artifacts as a medium.

## Keywords

Bronze, Ancient Dian bronze culture, Digital development, New media dissemination

## 1. Background

On February 27, 2023, the Central Committee of the Communist Party of China and the State Council pointed out in the "Overall Layout Plan for the Construction of Digital China" (hereinafter referred to as the "Plan") that "building a digital China is an important engine for promoting Chinese-style modernization in the digital age and a strong support for building a new competitive advantage for the nation" (Chinese government website, 2023). In addition, the "Plan" particularly emphasized the need to "promote the digital development of culture, deeply implement the national cultural digitalization strategy, build a national cultural big data system, and form a database of Chinese culture". This proposal not only brings new opportunities for the digital transformation of traditional Chinese culture but also provides effective inspiration for the digital development of culture in other Asian countries. The practice of cultural digitalization must seize the historical opportunities of social changes, draw experience and strength from the long river of development history, reflect on the current relationship tensions under the circumstances of the

nation-state, and continuously promote the connection between artificial intelligence technology and excellent traditional culture, significantly enhancing the influence of cultural digitalization in serving the national development strategy.

Bronze Ware, known as "jin" or "jijin" in ancient times, is an alloy of red copper and other chemical elements such as tin and lead, and its copper rust is bluish-green. More than 2,000 years ago, there was an ancient civilization called "Dian" along the Dianchi Lake in Yunnan Province, which created a splendid bronze culture. According to Records of the Grand Historian, in 109 BC, Emperor Wudi of the Han Dynasty set up Yizhou County in Yunnan, named the king of Dian as the "King of Dian" and gave the "Seal of the King of Dian". "Dian" is a primitive kingdom established by ancient ethnic minorities in the southwest frontier of China, mainly distributed in the central and eastern areas of today's Yunnan Province, with Dianchi Lake as the center (Lu Hexun, 2005). Ancient Yunnan bronzes play an important role in the history of Chinese bronze because of their realistic, vivid, and natural artistic characteristics. They are deeply influenced by the culture of Central Plains, but the unique regional culture and national customs of Yunnan give them a strong mysterious color. Ancient Dian bronzes is the heyday in the history of Yunnan arts and crafts. It is novel in conception, and highly unified in artistry and practicality. It wins with lifelike three-dimensional shapes of characters and animals and is a human ode full of realism (Li Xuefei, 2020). Ancient Dian bronzes have profound meanings. They are not only a symbol of wealth and power but also record the religious and sacrificial scenes at that time. They are important objects for us to explore the politics, ritual system, religion, and other aspects of the ancient Dian State (Zhou Jun, 2018). More than 4,000 precious cultural relics unearthed from Lijiashan, Jiangchuan, Yunnan Province, such as bronze, gold, silver, jade, and stone tools, are the historical testimony of the splendid culture of ancient Yunnan, and the last glory of Chinese bronze culture (Liang Yin, 2017).

Due to the changes in the political center today, it is obviously of urgent and practical significance to break out of the regional restrictions and place the bronze culture of ancient Yunnan into the cultural belt of the "Belt and Road", examine the history and culture of Lijiashan Bronzes from a diversified and global perspective, and re-evaluate its historical status and cultural value (Xing Lin, 2017). Specifically, such topics mainly discuss the realistic challenges faced by the promotion and development of bronze culture in Ancient Yunnan under the background of "One Belt and One Road". By combing through the existing research results, this paper intends to summarize the predicament of the current artificial intelligence technology in protecting, inheriting, and developing the bronze culture of the ancient Dian State, and demonstrate the possibility of narrowing the distance between artificial intelligence technology and the bronze culture of the ancient Dian State by analyzing the Dance of Bronze in my personal art practice, and explain the specific problems that cutting-edge works can solve and their value. It is expected to provide reference for the application of artificial intelligence technology in the inheritance and development of intangible culture, and to help the promotion and development of bronze culture in ancient Yunnan in China and even in the world.

## 2. Challenges in the Promotion and Development of Ancient Dian Bronze Culture

In the field investigation of Lijiashan Bronze Museum, the author found that most tourists would choose to go to Yunnan Provincial Museum which is close to the city center because it is far away, as shown in Figure 1. Therefore, it is a challenging task to break out of the regional restrictions and place the bronze culture of Ancient Yunnan on the cultural belt of the "Belt and Road", so that it can expand its cultural influence and propaganda ability (Guo Jia, 2016).

Based on field investigation and in-depth interviews with local personnel, the author finds that there are mainly the following reasons for fewer tourists: First, the location is relatively remote. Visitors usually choose the nearby museums in Yunnan Province because of the distance. Second, the network publicity is not enough and is less interesting. Nowadays, with abundant Internet resources, if the publicity is strong enough, more tourists will be attracted. In addition, although the ancient Dian bronze culture is well-known in China and the world, it still lags behind other museums in terms of design innovation. Therefore, it is urgent to use emerging technologies to enable more people to understand and spread ancient Yunnan bronze culture, break the development bottleneck of traditional culture in modern society, and enable it to form more effective dissemination and development (Chen Yang, 2016). Among them, linking artificial intelligence technology with ancient Yunnan bronze culture is an urgent research direction that needs to be further explored.

## 3. Solution Strategies Based on Artificial Intelligence Technology and Their Insufficiencies

In recent years, many interdisciplinary researchers have attempted to enrich the dissemination methods of the ancient

Dian bronze culture through artificial intelligence technology, striving to address issues such as insufficient promotional efforts and the remote locations of museums that hinder the promotion and development of the ancient Dian bronze culture. The research outcomes based on this underlying logic can be categorized into three types according to the creative form: Firstly, the use of 3D visualization technology. For instance, Dong Hongjuan's team attempted to draw some bronze wares using 3D modeling technology, employing simple interactive operations to render the texture decorations and corrosion effects on the bronze wares, restoring the charm of the ancient Dian bronze wares from multiple perspectives, with the aim of reviving the lost ancient Dian bronze culture (Dong Hongjuan et al., 2017). Secondly, the fun transformation of bronze wares. For example, in order to adapt to the context of the integrated media era, Guo Shuxian used digital technology to innovate the language expression method, and practiced the derivative construction and emoticon design of Jin bronze wares, exploring more design works, aiming to inherit and disseminate the culture of the Three Jins (Guo Shuxian, 2023). Thirdly, the AR display of bronze wares. For instance, Yu Pengfei from Northwest University presented Western Zhou bronze wares in a virtual reality manner through Augmented Reality Technique (AR), which is increasingly realistic, interesting, simulated, and interactive, playing a very important role in the digital protection and reasonable development and utilization of cultural heritage (Yu Pengfei, 2022). Undoubtedly, existing research outcomes have endowed the inheritance and development of bronze wares with more possibilities, especially their groundbreaking progress in virtual space provides an important reference value for the creative transformation and innovative development of bronze wares.



**Figure 1. Lijiashan Bronze Museum exhibition.**

However, these attempts are still confronted with two main issues. On one side, the restriction of style is a significant challenge that all current attempts to connect artificial intelligence technology with bronze ware face. Most technical methods result in bronze ware that can only be generated within 3D visualizations, where users are unable to perform secondary generation based on their needs, leading to a lack of flexibility. On the other side, the issue of interactivity is also a major problem that these new media artworks need to resolve. Current works only permit a single output from the computer in terms of interaction, meaning that after users input certain parameters or make choices, they can only wait for the computer to automatically produce predictable patterns. This mechanized and low-interaction approach not only restricts the level of user participation and the element of fun in the secondary creation process but also prevents users from experiencing the unpredictability of artistic creation, making it difficult to fully stimulate their creativity and curiosity. It is evident that the current innovative attempts relying on artificial intelligence technology to promote and disseminate the charm of the ancient Dian bronze culture have not yet maximized their potential in achieving the goal of promotion and dissemination.

#### **4. "Bronze Dance" as a Solution**

The above problems show that simply combining artificial intelligence technology with ancient Yunnan bronze culture can not achieve the purpose of creative integration. Because of this, in order to fundamentally solve the above problems, the author developed a set of painting system named "Bronze Dance" based on p5.js. The system helps users directly participate in the secondary creation process of bronzes in a one-to-one real-time interactive way, such as shape, texture and color selection, fine tuning of details, real-time preview and so on. In this way, even untrained ordinary people can use the system to turn their ideas into reality. This shows that "Bronze Dance" has the role of stimulating users' interest, creativity, and enthusiasm for participation.

This study mainly uses p5.js as a key tool for image generation. First, before starting to write the code, we collected

image resources related to ancient Dian bronze culture, including an image of a hunter-head bronze sword ("knife.png") and a texture image (" texture.jpeg "), as shown in Figure 2.



**Figure 2. Hunting head bronze sword.**

Secondly, a code is written using p5.js library to show the elements of ancient Dian bronze culture. Here are the main steps of the code: 1. In the 'setup()' function, a canvas is created with the same size as the window, and the background color is set to black. 2. In the 'preload()' function, the knife image and texture image are loaded and stored in the 'knifeImg' and 'textureImg' variables, respectively. 3. In the 'draw()' function, a series of image operations are performed, including scaling, translation, blending mode setting, rotation, and drawing the image, as shown in Figure 3.

```

> sketch.js

1 var knifeImg
2 var textureImg
3
4 function setup() {
5   createCanvas(windowWidth, windowHeight);
6   background(0)
7 }
8
9 function preload(){
10  knifeImg=loadImage("knife.png")
11  textureImg=loadImage("texture.jpeg")
12
13  // flowerImg=loadImage("flower.png")
14 }
15
16 function draw() {
17  // image(flowerImg,0,0,width,height)
18  scale(0.5)
19  translate(width,height)
20  blendMode(LIGHTEST)
21  blendMode(DIFFERENCE)
22  rotate(frameCount)
23  //translate(random(-5,5),random(-5,5))
24  image(knifeImg,0,0,width+frameCount,60)
25  image(textureImg,0,0,width,60)

```

**Figure 3. Code flow.**

Finally, a digital work of art is created from the above code, which shows the elements of ancient Dian bronze culture, as shown in Figure 4. These elements are presented in an abstract way on the canvas in the form of images, including the image and texture of the knife. By incorporating elements of ancient Dian bronze culture into digital art, we try to transcend geographical limitations and spread this culture to a wider audience. Digital art can be easily distributed globally without being constrained by geographical location. This opens up new possibilities for artistic creation and cultural preservation.



**Figure 4. Renderings.**

## 5. Conclusion

Ancient Dian bronzes, as a unique bronze culture in Yunnan, are highly unique in the world (Yang Yong, 2011). Even so, the author still found in practice that due to the remote location and insufficient publicity, the development of ancient Yunnan bronzes in modern society is still greatly limited. In recent years, with the vigorous promotion of the development of cultural digitalization, some researchers who have both the concept of traditional cultural inheritance and the concept of pioneering technology use have participated in the creative transformation and innovative development of ancient Yunnan bronze culture and exported many practical schemes based on artificial intelligence technology.

In this context, the author developed a painting system named "Bronze Dance" to solve the problems of limited style and insufficient interest in the existing research results. Based on p5.js, the system integrates artificial intelligence and generative art into ancient Yunnan bronzes. The digital art display in this study is an attempt at cross-cultural communication, introducing the elements of ancient Dian bronze culture into the digital platform through creative expression. Although the current code is only a start, it represents a potential way that cultural heritage can be promoted and publicized. Future work can be further expanded to include the development of more interactive applications of digital art, as well as integration with channels such as online exhibitions and virtual museums to enhance the impact and accessibility of culture. Therefore, the Dance of Bronze not only offers more diversified expression methods for ancient Dian bronzes through digital means but also enriches the digital representation of ancient Dian bronze culture. It also eliminates the communication limitations brought by time and space and uses bronze as the medium to enhance the communication, exchange, and integration between different cultures, providing practical operability for cultural transfer and integration in the era of cultural globalization, as well as the construction of a community of human destiny and the development of art without borders.

## References

- Chen Yang. (2016). Study on process schema, characteristics and value of Lijiashan bronzes in Jiangchuan, Yunnan Province. *Journal of Huaibei Normal University (Philosophy and Social Sciences Edition)*, (04), 103-106.
- Chinese Government Website. (2023). "The Central Committee of the Communist Party of China and The State Council issued the Overall Layout Plan for Digital China Construction" [EB/OL].
- Dong Hongjuan, Gong Ping, Yao Li, & Li Zishi. (2017). 3D visualization of bronzes from the Kingdom of Yunnan: A case study of Lijiashan Bronze Museum. *Information Technology Education in China*, (07), 79-83.
- Guo Jia. (2016). Shengshi Jijin Yunnan Provincial Museum collections Jiangchuan Lijiashan Ancient Yunnan bronze ware appreciation. *The Collector*, (06),17-26.

- Guo Shuxian. (2023). Design and practice of digital emoticons of Jin bronzes based on Jin Culture research. *Art and Design (Theory)*, (08), 47-50.
- Li Xuefei. (2020). An analysis of animal shapes on Lijiashan bronzes. *Identification and Appreciation of Cultural Relics*, (03), 5-7.
- Liang Yin. (2017). Analysis of Bronze cases in Yunnan Bronze Age. *Yellow River. Loess. Yellow Race*, (14), 21-26.
- Lu Hexun. (2022). Jiangchuan Li Jiashan: The last glory of Chinese bronze culture. *Yuxi Daily*, April 19, 005.
- Xing Lin. (2017). Analysis of animal images of Yunnan cultural bronzes. *Cultural Relics of Sichuan*, (01), 37-46.
- Yang Yong. (2011). Research on bronze fastenings unearthed in Yunnan-Guizhou Plateau. *Journal of Archaeology*, (03), 327-352.
- Yu Pengfei. (2020). Master of AR Display Research on Digitalization of Western Zhou Bronzes (Dissertation, Northwest University). Master.
- Zhou Jun. (2018). Analysis on the special technology of Lijiashan bronzes. *Cultural Monthly*, (03), 162.