Research on the Application of Digital Virtual Technology in the Protection and Innovation of Intangible Cultural Heritage in China —Three Types of Carvings in Huizhou as an Example

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ABSTRACT
As a human-oriented living culture, intangible culture is an important part of human civilization. It's also a vivid witness of human history, a pearl of human wisdom of creativity and innovation, an important symbol of national spirit and culture, national cohesion and centripetal force, and has high cultural, economic, social and academic values. However, with the changing factors of the times, such as the concept, environment and human activity, the intangible cultural heritage sites all over the world, especially those in China, are facing a big challenge of endangerment and extinction, and the prospect of the remaining relics--stone carvings, wood carvings and brick carvings in Huizhou (a city of southern part of Anhui province) is worrying. So how to preserve those remaining relics is very important. This article, on the basis of researches on the existing problems in its protection, intends to address the challenges and put forward some suggestions: with the help of rapid development of digital virtual technology, we can update concepts, broaden channels and adopt more approaches in its protection and innovation in order to achieve that goal.
Key words: *digital virtual technology, intangible cultural heritage, protection and innovative development, application*

1. ANALYSIS OF THE CURRENT SITUATION OF INTANGIBLE CULTURAL HERITAGE PROTECTION AND INNOVATION DEVELOPMENT IN CHINA

As one of the origins of world civilization and a mufti-ethnic country with a long history, in the long process of cultural heritage and evolution, China has the main cultural characteristics of distinct national characteristics and mutual promotion. So it gives birth to the rich and brilliant intangible cultural achievements and has an important influence and positive promotion on the development of world civilization. In recent years, the Chinese government has attached increasing importance to the protection, management and innovative development of intangible cultural heritage. The State Council has issued a series of documents, including the notice on strengthening the protection of cultural heritage and the law of the people's Republic of China on the protection of intangible cultural heritage. The four-level protection system of "state + province + city + county" has been continuously strengthened, and the working policy of "protection first, rescue first, rational utilization, inheritance and development" has been gradually implemented. The protection of intangible cultural heritage has achieved remarkable results [1]. According to statistics, China has recorded 1372 items of national intangible cultural heritage in four batches, of which more than 40 items have been selected into the UN intangible cultural heritage project list, making it the country with the largest number of world-class intangible cultural heritages[2]. At the same time, solid steps have been taken in the construction of organizational system, system mechanism and protection measures and achievements, which provide a more successful example for the protection of world intangible cultural heritage[2].

Although China has made initial achievements in the protection of intangible cultural heritage and formed a certain atmosphere, and has established a good foundation on people's cognition of intangible cultural heritage, there is still a big gap between the overall working expectation and reality. There are still two outstanding problems. First of all, a problem exists in the application and project establishment of intangible cultural heritage. At present, 1372 intangible cultural heritages are only a small part, and a large number of folk arts, languages, folk customs and handicrafts with long-standing regional and national characteristics have yet to be further verified, sorted out and reported for approval[3]. At the same time, there are still some problems in the process of application and project approval, such as the system is not perfect, the

application is not standardized, the demonstration is not sufficient, the audit is not scientific, and the program is not perfect. Secondly, there are significant deficiencies in the protection and utilization of intangible cultural heritage. Due to the late start of this work, coupled with the impact of various factors such as regional environment changes and technological backwardness, there are still few intangible cultural heritages that can be effectively protected. For example, a large number of intangible cultural heritage protection of folk art has encountered such problems as the intermittence of performance inheritors, the loss of props production skills, the disappearance of the original culture of the script, etc.; many valuable painting, sculpture or architectural and carving entities have been destroyed but hard to repair; some handicrafts with regional characteristics and folk cultural values, such as paper cutting and Guqin, have even lost the potential to continue, or namely Death[3]. What's more, due to the old concept and poor implementation of policies, local governments and people's awareness of intangible cultural heritage culture is still insufficient, such as the deviation or even distortion of value orientation, the serious tendency of utilitarianism and homogenization, and the problem of using more than protecting, especially in the market economy environment, some intangible cultural heritage culture has become a cultural card under the leadership of the local government, but it is not from the perspective of cultural protection and innovative development, but it has become a cash cow for the local one-sided pursuit of economic benefits. It is not uncommon for intangible cultural heritage culture to be further accelerated by predatory development. At the same time, a large number of so-called innovative development of intangible cultural heritage do not start from the cultural roots, and then combine with modern culture, ideas and technology to carry out cultural regeneration innovation. Instead, in order to cater to the market or tourists' taste, in the relatively rough process of cultural integration, the original cultural personality of intangible cultural heritage has constantly been consumed, resulting in the constant appearance of similar cultures and a growing convergence because of mutual copying or following suit.

In recent years, with the rapid development of image technology, computer hardware and network information technology, a small number of intangible cultural heritage cultures have begun to introduce spectral analysis, graphic image and digital network technology to carry out protection work, made breakthroughs in the urgent protection and technical restoration of intangible cultural heritage culture, and achieved excellent results[4]. However, due to such factors as ideas, policies and funds, the application of modern technology in the protection and innovation of intangible cultural heritage is still too simple and one-sided and fails to form a more active and extensive overall application effect[5].

2. APPLICATION WAYS OF DIGITAL VIRTUAL TECHNOLOGY IN INTANGIBLE CULTURAL HERITAGE PROTECTION AND INNOVATIVE DEVELOPMENT

2.1 Characteristics and advantages of digital virtual technology

In the early 1990s, with the continuous development of computer hardware and software and network technology, digital virtual technology came out. This technology, referred to the most cutting-edge interdisciplinary, fully integrates the computer graphics and computer simulation, human-computer interface, multimedia, sensor and other fields of technology. The core principle of digital virtual technology is to generate a special environment to meet the specific needs through computer data processing. At the same time, combined with image technology, "human beings" are projected into this environment, and then the environment is set up by controlling various sensing devices, and finally demonstrating the clip with all kinds of information exchange and project operation that cannot be realized in the real environment[4]. Compared with the traditional computer and its digital technology, the current digital virtual technology has many characteristics and advantages, such as high resource utilization, low management cost, strong personnel participation, wide application range, etc. In view of the core point of this paper, it focuses on the following aspects:

2.1.1 Real immersion

By fully integrating video, music, voice, animation and game elements, digital virtual technology applies powerful virtual 3D projection display system to display the high-resolution 3D / VR scene generated by VR workstation in the way of large-scale stereo projection, so as to present the 3D virtual world to the participants with high fidelity and build a super-high simulation at the visual level. The "real environment" of VR provides VR users with a highly immersive virtual reality environment as if they were standing on the spot and experiencing all directly. So it easily creates a real atmosphere with fake[4]. At present, digital virtual technology is widely used in science fiction film, safety education, theme exhibition hall and some mulch-dimensional game projects, so that the audience can get immersive experience.

2.1.2 Real time interaction

Digital virtual technology is different from traditional digital technology and animation technology, because it can not only provide a high simulation, immersive virtual

reality environment, but also can make participants form a high sense of presence and participation in this highly lifelike three-dimensional virtual world by manipulating related sensing equipment, so that "human beings" really become the main body to interact with the scene and corresponding objects. Using this technical feature, operators can complete various predetermined actions through appropriate control of virtual peripherals such as data gloves, various interactive handles, sensors, etc., and data processing is carried out from different angles and orientations by the action tracking and capture system, so as to realize real-time interaction and experiential communication between operators and the three-dimensional virtual world, and finally achieve the target of cooperation in relevant experiments, operations and bodies test[4].

2.1.3 Broad commonality

As the power of science and technology in the century, digital virtual technology is constantly changing the public life, because of its perfect integration of multiple disciplines and it has a wide range of compatibility and common functions. The essence of digital virtual technology is the interconnection between man and computer. With the help of computer and its associated technology, we can construct anything or environment existing in the world in a physical or functional sense. In this way, it can support almost any human activity and apply to any field. In the early stage, this technology made a breakthrough in the practical application in medicine, aerospace, archaeology, safety education and other fields, and made remarkable achievements in scientific research, education, cultural relics protection, national governance, social development and other fields[6]. With the continuous maturity of this technology and the application and promotion of 5G network, digital virtual technology will further extend the horizon of human beings to have a better understanding of themselves and explore nature, and have a good application and promotion effect in more extensive fields.

2.2 Analysis on the application of digital virtual technology in the protection and innovation of intangible cultural heritage

At present, in the context of vigorously advocating cultural diversity, intangible cultural heritage culture has attracted increasing attention from all over the world, among which the protection and innovative development of intangible cultural heritage culture has always been one of the core tasks. However, due to the loss of the original culture of intangible cultural heritage, the evolution of the living environment, the lack of the representative inheritors and of policy and technical support, the protection endeavour faces many difficulties. In view of the inherent characteristics of digital virtual technology, if we can do a good job in the overall design and rational application of intangible cultural heritage protection and innovation and development, and give full play to its technical advantages, we will be able to make a breakthrough in the protection and innovation of intangible cultural heritage. Taking three types of carving in Huizhou as an example, this paper focuses on the application of digital virtual technology in the protection and innovation of intangible cultural heritage.

The three types of carving in Huizhou refer to the wood, brick and stone sculptures in the ancient Huizhou traditional settlement culture, which focus on the social customs, clan concept, folk house culture and folk art in the Ming and Qing Dynasties. They are the vivid expression carrier of Confucian culture and the spirit of Neo Confucianism, and emphasize the ethical and moral expression in social education and aesthetics. They have the characteristics of regional and national culture. They are bright pearls of Chinese wisdom of traditional culture and world civilization[7]. In May 2006, the three carving sculptures of Huizhou were selected into the first national intangible cultural heritage list, and this is the first step in the protection and inheritance. However, after more than ten years of efforts, due to the damage or loss of a large number of high-quality products, the lack of technical theory system, the disconnection of inheritors, the lack of innovation of inheritance mode and the poor foundation of social recognition, the work of protection and inheritance of Huizhou three carvings still faces a serious situation, and there is a large gap from the target.

The foundation of cultural development lies in inheritance, and the key lies in innovation. Without effective inheritance, innovation has no foundation. Without good innovation, and cultural development will have no vitality and sustainability . As an excellent and typical element of Huizhou culture, the three carvings in Huizhou have great cultural, aesthetic and socio-economic values. The state has always attached great importance to the protection and inheritance of the three sculptures in Huizhou. However, according to relevant statistics, the current situation of protection and inheritance of the three sculptures in Huizhou still fails to achieve the expected results. The root causes are from many aspects, such as serious system defects (incomplete technical and theoretical systems, a large number of fine works left missing, hard to repair without trace, etc.), limitations of ecological characteristics (cultural environment migration, live cultural hand-on-hand transmission, as the key to intangible cultural heritage inheritance. The major causes are still the lack of innovation in the mode of protection and inheritance[7]. The traditional means of protection, communication and publicity media are inefficient and cannot adapt to the pace of modern world. In view of this, giving full play to the many functional advantages of digital virtual technology in the protection and innovation development of three sculptures in Huizhou is bound to form a positive boost effect.

2.2.1 Solid restoration

In the long time of inheritance of Huizhou three sculptures, due to the humid climate and man-made destruction, a large number of exquisite sculptures have been damaged or peeled off the main part as a whole, or partially lost. If The integrity of the three sculptures' art system was seriously damaged, and its aesthetic, cultural and spiritual values could greatly be reduced. In the course of protecting the three sculptures in Huizhou, it is always a great technical bottleneck and restriction factor to complete the repair of the damaged parts on the premise of maintaining a high degree of unity in the overall style, techniques and contents, and it is also difficult to realize via traditional technology.

By using the powerful data processing and statistics, comparison and analysis ability of computer technology, we can fully integrate the data of three sculpture restoration objects from content to form, from carving techniques to artistic style, and then combine the graphic processing technology to complete the form and style expression of restoration objects, and finally combine the three-dimensional modeling with 3D printing and other technologies to better complete renovation of damaged parts on the three sculpture works[4]. This method can give a full picture of the advantages of data richness, comprehensiveness and also is easy to modify. With the participation of artists and inheritors of the three sculptures art, it can build a relevant database the repeated adjustment, ensuring the spiritual unity of the restoration object and the mother copy on the cultural level and the style coordination on the artistic level to the greatest extent. All those can play an important role in the entity restoration work.

2.2.2 Technology recovery and innovation

As a typical representative of Huizhou culture, the three carving-sculptures in Huizhou have a long history, with the exquisite skills and complete technological process. They are the epitome of Chinese traditional farming culture and the epitome of manual carving art, and have immortal cultural and artistic values[8]. According to the difference of environment and function, wood, stone and brick are used as raw materials to carve upon. According to the theme and use demand, line carving, relief carving, round carving, openwork carving and other carving techniques are used. The artistic expression of the three sculptures is rich, diverse and related to each other, and presents an integrated pattern with Huizhou culture. Before the Ming Dynasty, the style of the three sculptures tended to be simple, with no emphasis on perspective and single technique, emphasizing symmetrical aesthetics. In the Qing Dynasty, it was more and more delicate and complicated, emphasizing the details of points, lines and expressions, rich in themes and focusing on the description of the plot. The composition of the picture was rigorous and full of variations, regardless of style. Among them, brick carving is limited to crispy material of small size, which is mostly represented by line carving and light relief carving. Openwork only exists in a small amount in local areas to form embellishment, and usually cuts through the back from the side. In the later period, the level of brick relief continued to deepen, and a large number of expression techniques such as vertical axis, fan and scroll in traditional painting were absorbed in the layout of rules. Huizhou is rich in wood, with the most wood carvings distributed and preserved. Compared with brick and stone materials, wood has certain advantages off hardness and flexibility, so woodcarving techniques are the most abundant. Various carving techniques, such as line carving, deep and shallow relief, circular carving and openwork carving, are brilliant, with vivid and detailed designs, and have the charm of " The sashes worn by the figures in Wu Daozi's paintings flutter gracefully like in the wind, while the clothing in Cao Zhongda's paintings cling fast to bodies as if it just emerged from water". As a whole, wood carving emphasizes collocation with clear layers and strong three-dimensional sense. The stone is hard, thick and strong in volume, which is quite different from the quality of brick and wood. Stone carvings are mainly relief and round carvings, supplemented by line carvings and openwork carvings. The saber technique is rough and strong, with the combination of points, lines and faces with concise modeling. It emphasizes the beauty of overall thickness and simplicity. After years of carving, it becomes more and more attractive[9]. However, with the gradual development of farming culture and the continuous loss of carving skills from generation to generation, many core techniques are difficult to reproduce in a short period of time, which seriously hinders the protection and inheritance of three sculptures in Huizhou[8].

The key to the restoration of the carving technology of the three sculptures in Huizhou lies in the two links of technical analysis and simulation reproduction. The core work is to establish the visual graphics and image data from the static three sculptures. At present, although there are serious defects in the three sculptures in Huizhou, the overall system is still in place, and all kinds of carving techniques can be found in Huizhou architecture. We can combine the data arrangement with graphics processing technology to discover the hidden rules in the classified comparative data analysis of a large number of sculpture works. Under the guidance of the inheritor of the three sculptures, with the help of the relevant data functions in the digital virtual system, we can fully perceive the information in the virtual world and make a choice or corresponding operation actions, step-by-step simulation tests on material performance, tool performance, knife holding, knife running, strength, angle mastering, etc., complete the collection and integration of relevant data, and then use virtual reality technology to complete step decomposition and overall expression, and finally form the refining and summary of various carving techniques such as line carving, relief, circular carving and openwork, forming a visual, interactive and perceptible materials, build all kinds of technical databases of three sculptures in Huizhou, and constantly improve the technical system in

the repeated testing and revision work, so as to lay a solid foundation for further study, combining the current cultural elements of human settlements and modern scientific and technological achievements to carry out technological innovation and development[4].

2.2.3 Construction of archives exhibition hall

Digital virtual technology has a power of digital processing, storage and media communication functions supporting multiple formats, which makes the digital archive system more convenient for preservation, adjustment, communication and operation compared with traditional paper archives. It can optimize energy efficiency in the construction of Huizhou three carving archives and cultural communication[7]. Through the on-the-spot investigation and data collection on the historical evolution, cultural spirit, theme content and artistic aesthetics of the three sculptures in Huizhou, combined with the further integration of relevant government, industry and folk materials, the archives database of the three sculptures in Huizhou will be constructed, which will further enrich and improve the original archives, effectively improve the single and flat status of the three sculptures, and form a comprehensive system. The purpose of this paper is to develop a three-dimensional file system, and then to realize the development from simple preservation to research, inheritance and application. At the same time, the digital archive system can integrate audio, video, animation and other elements, combine holographic projection and hand-held mobile terminals and other techniques, lay the foundation for the construction of Huizhou three sculpture network Museum, digital virtual exhibition hall, experience hall and other carriers, form multi-directional resource sharing. Therefore the publicity and display of the three sculpture culture can be transformed in a way, from passive to interactive, from static to dynamic, from viewing to experience. The transformation from partial to comprehensive becomes reality, and then completes the transformation from simple knowledge and aesthetic display to cultural and inheritance display[7]. Such archives and exhibition halls can not only break the geographical restrictions, expand the scope of publicity, shorten the communication cycle, but also change the passive role of spectators or visitors, so that they can get a sense of first-hand experience and direct interaction, optimizing the communication effect.

2.2.4 Education and publicity

As a kind of "living" culture, intangible cultural heritage, in addition to the collection and preservation of the material carrier, which represents intangible cultural heritage, is particularly important for the reconstruction of cultural context and the cultivation of inheritors. That is to say, it is necessary to strengthen the propaganda and education of inheritors in combination with the actual situation so that the intangible cultural heritage can be acquired through group inheritance. In this way, it can get a novel and lasting vitality in its innovative development in the current and coming days.

With the accelerating urbanization in our society, the three sculptures in the ancient architecture of Huizhou are no longer compatible with the modern living culture, and gradually lose the living soil. At present, the changes of young people's values, lifestyles and methods of information acquisition make the art of three sculptures gradually lose its mass base and heritage group. In particular, the young generation is no longer interested in the culture and spirit behind the three sculptures in Huizhou[8]. In modern residential culture, the application of the three sculptures is mostly simple patchwork or rough grafting.

At the same time, the number of representative inheritors is very small, and it is no longer realistic to train talents through the traditional teacher-apprentice system. As the most avant-garde cultural form, digital virtual technology is loved by young people and has a huge consumption base. By using this technology in combination with modern media and hand-held mobile terminals and other channels, we can carry out the popularization publicity of the culture, art and social spirit of the three sculptures in Huizhou, and improve the convenience, participation and interest of public information acquisition, which will surely form a great optimization of information dissemination effect. At the same time, we should be encouraged to take advantage of digital virtual technology in the training of personnel in aerospace, archaeology, medical and other industries, use the network multimedia, animation and virtual reality technology in the digital virtual technology to establish a database, and fully display its immediate interaction, repeated demonstration, key training and other functions in the training of inheritors, which will further improve the learning effect and training quality. And that is more conducive to the development of interactive[9], experiential, three-dimensional and comprehensive inheritance mode with personality "Tao" as the core of inheritance, to overcome the phenomenon of emphasizing "technique" rather than "Tao" in Intangible Cultural Heritage Inheritance, and to avoid the separation and fragmentation of the rich individual cultural connotation of three sculptures in Huizhou due to one-way inheritance.

2.2.5 Industrialization development

In recent years, with the in-depth adjustment of China's economic structure, the development trend of cultural industrialization is constantly improving. In modern society, the vitality and survival value of any culture has been closely related to economic development; of course, intangible cultural heritage is no exception[10]. At present, the protection and inheritance of the three sculptures in Huizhou are facing great difficulties. In addition to the above factors, they are limited by the cost

of technology, so it is difficult to form an industrialized situation, and then produce a strong economic values, which is also an important reason why they are eliminated by the times. In order to revive three carvings in Huizhou, and foster their sustainable and innovative development, they have to stand the test of time and the market economy.

We, under the guidance of the government, can actively support the heirs of Huizhou three carvings to carry out appropriate industrial operation, improve their legitimate labor income, protect their legitimate interests and rights, and form market vitality and value. For example, in recent years, the city of Mianyan in Sichuan Province has created conditions for Qiang embroidery inheritors to be masters and bosses to carry out productive inheritance and protection of carvings embroidery (Qiang, a minor nationality in northwest Chian,Sichuan.). At present, there are more than 2000 embroiderers in Mianyang, which has become a new force for local people to get rid of poverty and become rich[11]. Moreover, under the condition of protecting and inheriting the main body of three-carving culture in Huizhou, the authorities should actively encourage the digital development mode of Huizhou culture publicity, technology research and development, cultural and creative products and derivative manufacturing industry, utilize the network communication and consumption advantages of digital virtual technology, multiply approaches of industrial development, while reducing the operation cost and enhancing the operation vitality. At the same time, we should make full use of digital virtual technology to build three sculpture theme museum, interactive experience exhibition hall and other cultural tourism projects to promote the development of tourism and related industries of three sculptures in Huizhou[12].

3. CONCLUSION

Intangible cultural heritage is not renewable, or its incomparable cultural charm and social value can not be replaced by other cultures, which requires the more attention and increased awareness of common protection in the whole society. The intangible cultural heritage is limited to its inherent disadvantages and the influence of acquired factors, which makes it constantly encounter the crisis of extinction in today's society. So, its protection and innovation development work needs further exploration in its potential in terms of culture, and it also needs to cultivate and emancipate the mind in the light of the current practical environment, and to bring vitality to the intangible cultural heritage by bringing in advanced culture and technological force, so as to generate strong independent vitality and fecundity[13].

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