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The Path of AIGC Helping Construct Cultural Digital IPs --Taking the Construction of Hemudu Digital Cultural IP as an Example

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ABSTRACT

In the context of the digital era, cultural IP design faces the dual challenge of the constraints of traditional creative forms and the imperative for innovative breakthroughs. This paper takes Hemudu culture as the research subject and explores the application path of artificial intelligence generated content (AIGC) technology in digital cultural IP design. Combining cultural gene decoding by multimodal technology, the research utilizes AI language model to assist in building digital cultural IP that possesses robust narrative capabilities, aesthetic expressiveness, and formal innovation. During the design process, by tapping into the deep historical and artistic value of Hemudu culture, the deep integration of culture and technology is successfully realized, and a series of digital cultural IP design results with visual appeal and cultural connotation are initially formed. AIGC technology streamlines and enhances the efficiency of digital cultural IP design, enriches its forms, and empowers the development of digital culture IP industry. The study shows that AIGC technology can significantly improve the efficiency and creativity of digital culture IP design, providing new momentum for the cultural industry. It also reveals the key challenges of standardization and sustainability in the application of the technology. The study provides practical references and theoretical support for promoting the innovative development of digital culture IP industry.

Keywords: AIGC Technology; Cultural IP Transformation Path; Media Culture

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1. Introduction

In China, the digital culture industry has emerged as a crucial content of strategic development, During the International Symposium commemorating the 2565th anniversary of Confucius' birth and the opening ceremony of the fifth general meeting of the International Confucian Association, President Xi Jinping made an important speech in the field of cultural innovation, "we should strive to achieve the creative transformation of traditional culture, innovative development, so as to make it compatible with the real culture" has become the guiding objective for cultural industry practitioners, a series of digital cultural industries have been undergoing continuous development and renewal. The "to strive to realize the creative transformation and innovative development of traditional culture, so that it can be blended with the real culture" has become the goal of cultural industry workers, and a series of digital culture industries are also in the process of continuous development and renewal [1]. The policy support and trend orientation indicate that the development prospect of digital culture industry in China is good.

In recent years, the digital culture industry has had remarkable development results, and the construction of digital culture IP is widely supported.With the growth of the internet industry, the network literature, animation, and film and television sectors have established solid foundations, cultivating a substantial audience receptive to digital culture. At present, there is still a lack of research direction on the conversion of traditional culture to digital culture in China, and the market is still promising. How to distill the essence of traditional culture, which has endured through history, and how to open up the traditional culture from traditional limitations and put it into a more macroscopic level for a more long-lasting development are the issues worth researching.

Through the assistance of AIGC technology, users can quickly obtain design inspiration, Huang J.N. [2] shorten the design cycle and improve design efficiency. According to the Report on the Development of Generative Artificial Intelligence Applications (2024) published by the China Internet Network Information Center (CNNIC), AI-generated imagery demonstrates significant advantages in temporal efficiency. Taking government affairs scenarios as an example, the Haidian District Government reduced the time required for icon design and report drafting from 5 days to 30 minutes through a government affairs large model, achieving a 24-fold increase in efficiency. In the field of image generation, leading domestic AI tools such as Tongyi Qianxiang and Meitu can generate a single image in under one minute, whereas human designers average 2 to 4 hours to complete creative designs of comparable complexity.

Therefore, utilizing AIGC technology to build digital culture IP is a new trend in the future digital culture industry [3].

Transforming traditional culture into digital cultural IPs and employing new technologies can attract young people to understand and appreciate traditional culture [4,5]. Disseminate excellent traditional cultural content to a wider audience, improve the cultural confidence of the people [6], enhance cultural identity, and improve the national cultural soft power.

2. Materials and Methods

The materials involved in this study are all from publicly disclosed information, and the reference images used in the research process are from Hemudu literature and Hemudu Museum. The images and videos generated by this research are available for public use, and the right of interpretation belongs to the author, and the source should be indicated.

3. Results

3.1. Application Path of AIGC on Digital IP Construction

This study constructed a digital cultural IP creation path based on AIGC, encompassing four modules: data collection and analysis module, narrative construction module, appearance design module, and human value alignment module [7]. The application path is shown in **Figure 1**.

Figure 1 . Application path.

3.2. Data Collection and Analysis

3.2.1. AI Collection of Cultural Resource Data

The core of integrating digital cultural IP with AIGC technology lies in cultural creativity.It relies on computers, the Internet, digital processing and other information technology for production, and the products are presented in digital formats. As a product of "big data + high computing power + robust algorithms", AI language model is able to store and learn a large amount of cultural resource data, and make unique content presentation. This means that AI big model can digitally store and analyze a large amount of traditional culture data, providing a basis for further research and protection [8].

Adopting AI language Model for cultural resources collection proves more efficient, detailed and comprehensive than the traditional search mode, It can provide users with a wealth of accurate data, offering more selectable cultural resources while avoiding the drawbacks of the traditional mode and preventing the omission of cultural resources. Most AI models available in the market can automatically integrate the effective contents of cultural resources and present them in orderly chunks, which logically conforms to the user's way of thinking and makes the design presentation easier [9,10].

Simultaneously, using AI to analyze the target audience and derive the cultural data that meets the IP audience.This facilitates subsequent users in efficiently screening and applying the elements required for AI - based image design [11].

3.2.2. Extraction of Cultural Genes and Symbols

This research requires manual extraction of cultural genes and cultural symbols.

According to the content of the culture itself for cultural cognition, and extract the valuable and prominent part of it for cultural overview, after extracting the cultural genes and using cultural intelligence technology for cultural gene translation. Based on the original cultural genes, new forms of cultural symbols that conform to contemporary characteristics and have practical significance are created. Moreover, by connecting with the emotions and values associated with these cultural symbols, the symbols are enriched and given a three – dimensional quality [12].

3.2.3. Narrative Construction

The Demand for Background Stories in Digital Cultural IPs

As an image constructed by the integration of novel cultural elements, digital culture IP image itself needs to be supported by cultural elements to make the IP image more three-dimensional and full, more symbolic and competitive [13]. A comprehensive and captivating backstory can make the digital culture IP image more three-dimensional and vivid, so as to create emotional resonance with the audience. Through the backstory, we can dig deep into the inner world of the IP image and show its unique character and growth trajectory. These narrative elements not only give the IP image a soul, but also provide a reasonable explanation and basis for its behavioral performance in different scenes. Upon learning these stories, the audience can better understand every decision and action of the IP image, thus forging a deeper emotional bond with it.

Simultaneously, the underlying backstory facilitates the subsequent development of the IP by utilizing the backstory to present a complete and self-contained virtual world, which contains the social environment in which the IP image is located, its historical background, and its network of relationships with other characters. These elements together constitute the unique cultural context of the IP image, which enables it to convey richer and more diversified cultural information in the process of communication. Backstory also provides infinite possibilities for cross-media narrative of IP image. Whether it is novels, animation, movies or games, backstories can provide inspiration and background support for these different forms of creation, enabling IP images to be continuously exported

and extended in multiple fields.

In fact, the mere accumulation of single cultural elements rarely garners audience favor. Instead, it is essential to employ a more appealing narrative that can logically integrate these cultural elements [14,15]. When an IP image lacks the support of cultural elements, it appears contrived and shallow, and the construction of scenario stage and background story for IP can provide support for digital cultural image, enriching and enhancing it, making the settings more three –dimensional. Furthermore, creating animations based on the story background for further presentation and extending the narrative process can lead to a more effective presentation of digital cultural IPs [16].

AI Builds IP Background Story

AIGC technology through the market of successful IP series of deep learning, insight into the psychology of the audience, the design of the same charismatic characters and fascinating stories, to accelerate the expansion and deepening of the IP content. AIGC can also analyze the original characters and story lines to generate new characters and plot branches, the development of the story line can be flexibly adjusted according to the audience's feedback.

As a creative assistance tool, AIGC technology can significantly enhance users' efficiency in constructing IP backstories. The basic story derived from the AI algorithm can break through the limitations of traditional thinking and offering inspiration for the user, including but not limited to image character, background shaping, story direction, etc [17].This provides great convenience for users' subsequent creative endeavors, improving both the efficiency and quality of their creations.

The role of AIGC in backstory generation is auxiliary, the user inputs prompt words and cultural genes, AI creates a popular story blueprint according to the basic requirements. Subsequently,the user adjusts and beautifies the backstory, and conducts in-depth excavation and extraction of attractive and unique creativity of traditional culture, ultimately creates a backstory that better aligns with contemporary aesthetic preferences and more effectively reflects the characteristics of cultural genes.

3.3. Appearance Design

3.3.1. Descriptor Setting

When leveraging an AI large - language model, descriptor debugging and setting are essential. This involves extracting cultural symbols and elements from the data collected by AI, conducting in-depth excavation and analysis, and determining the descriptors that best align with AI's descriptive paradigm [18].

During this process, AI tools can be used to generate module splitting, such as generating AI images in line with the image of Dunhuang, from the action, image of demeanor, clothing were formed, and then the various parts of the split, many times, carefully adjust the content of the text input. This aims to obtain detailed descriptors that are comprehensible to AI tools. Once the input is finalized and fed into the image - generation tool, more appropriate generation results can be achieved.

3.3.2. Generate IP Shape through AI Modeling

The use of generative AI models for IP image drawing can shorten the duration of IP image drawing.

In the traditional IP image design industry, designers are tasked with distilling the essence of traditional culture for abstract development.This typically necessitates designers to experiment with diverse painting styles, image characteristics, and color combinations to create designs that are distinctive, appealing to the audience, and retain the essence of cultural heritage.This process often takes a lot of time and energy, and the difficulty in completing the design drawings as the source can lead to unsustainable development of subsequent products.

The use of AI drawing models for the first draft of the design or inspiration from AI-generated images can accelerate the design process [19,20]. Currently, AIGC drawing can already draw according to the designer's own style and input description, and Midjourney can input the desired style, color, shape, details, etc. to generate, so that the design task can be completed more efficiently while retaining the design's own creativity. You can also modify the expression and movement of the resulting image with one click through AI, making the image thickness more three-

dimensional and multi-faceted.

3.3.3. Optimization with Reference to Modern Aesthetic Trends

AI is able to make real-time technical updates through big data analysis technology to capture painting styles that meet modern aesthetics and user preferences. After the initial image is generated, dynamic adjustments are made based on user feedback and real-time data to optimize the language model in order to improve the image generation effect. This real-time feedback mechanism makes content production more efficient and enables a quick response to market changes.

For example, if you use Beanbag AI for image generation, you can select a reference image generated style to meet the different aesthetic needs of users.

3.4. Human Value Alignment

AI tools enable rapid generation of IP expression forms, effectively breaking through the limitations of conventional design thinking. Utilizing platforms such as Midjourney, designers can obtain diverse IP model samples, significantly enhancing the efficiency and creativity of form design. In contrast to traditional expression design which typically demands extensive manual efforts for sampling and iterative refinement, AIGC technology enables the rapid creation of numerous sample images [21]. By systematically screening and optimizing these AI-generated samples, designers can identify the most effective expression forms, ultimately improving both the efficiency and quality of product form design. Beyond traditional IP imagery, AI tools extend their capabilities to video, music, and other multimedia formats, enriching the diversity of IP representation. These tools frequently transcend traditional creative constraints, enabling novel and imaginative expression forms that would otherwise be difficult to achieve.

For instance, AI video generation models such as Vincennes have been employed in creative advertising, exemplified by 'Balloon Man', a project by Shy Kid Studio [22]. This advertisement utilizes AI-generated scenes and visuals to achieve a unique artistic style that traditional filming techniques would struggle to realize, demonstrating the efficiency and flexibility of AI in media production. Similarly, AI-powered music generation has seen rapid advancements, with models such as Beanbag, Tiangong AI, and SUNO providing customizable music generation [23]. By setting input parameters—such as song themes, styles, and vocal types—users can generate foundational compositions, which can be further refined through enhanced descriptions or reference track inputs. This approach streamlines the music production process, making AI-generated music more adaptable to user preferences while fostering innovation in digital content creation.

3.5. Artificial Value Alignment and Modification

Due to the limitations in the pre-existing database of the large-scale model employed in this study, the AI-generated content exhibits deficiencies in domain-specific expertise, leading to inconsistencies and contradictions between the generated results and real-world historical or cultural contexts. As a result, manual intervention is necessary to ensure that the output meets established usability and accuracy standards. In particular, the research primarily utilizes domestic general-purpose large models with limited LoRA fine-tuning, which leads to misalignment in generated images. Common issues include anachronistic objects held by characters, facial features that do not align with the target ethnic group, and discrepancies in historical or cultural settings. These inaccuracies necessitate manual corrections to achieve a higher level of value alignment with the intended research objectives.

To address these challenges, two primary manual value alignment methods are proposed. The first method capitalizes on AI-assisted local modifications based on the original image. For instance, tools such as Beanbag AI allow manual erasure of erroneous elements, enabling further AI-based refinement. Meanwhile, Midjourney allows users to use the original image as a reference and guide AI generation with detailed modification prompts. This approach requires users to construct precise and specific textual cues to direct the AI but offers high generation efficiency. When used effectively, it can significantly reduce research time while maintaining consistency with historical and cultural authenticity. However, it necessitates a strong understanding of prompt engineering and iterative refinement techniques to optimize results.

The second method involves direct manual adjustments using professional drawing software, including Procreate, Photoshop, and SAI2, to ensure strict compliance with the characteristics of the original data. Unlike AI-assisted modifications, this methods allows designers full control over image content, directly addressing issues such as misrepresented artifacts or incorrect character depictions. While this method demands advanced artistic skills and a longer processing time, it eliminates the need for multiple AI iterations and ensures that the final output aligns precisely with historical and cultural accuracy. Importantly, throughout the value alignment process, the designer's agency is crucial in critically evaluating AI-generated content, making informed modifications, and ensuring that all visual elements strictly adhere to the original dataset's features and research integrity.

3.6. The Application Cases of AI Technology in the Construction of Digital Culture IP

3.6.1. Hemudu Site Culture Data Collection

Since the discovery of the Hemudu site, Ningbo has made great efforts in the excavation, protection, inheritance and development of Hemudu culture, in which the research on Hemudu culture is the majority in Yuyao, there are over 40 prehistoric sites related to Hemudu culture The excavation of sites such as Jingtoushan site, Tianluoshan site and Hemudu site has provided a large amount of cultural data base for the source of Hemudu culture, and the research on Hemudu has already had a deep cultural heritage after years of accumulation. a deep cultural heritage [24,25].

For the data collection of Hemudu culture, take the results of Kimi AI as an example, the keywords of basic data extracted by AI are: age and culture layer, rice culture, wooden building site, bone tools, pottery, etc., and select one aspect for in-depth questioning, and the results are shown in **Figure 2**:

> *Hemudu culture's rice - planting culture is its most notable feature. The following are the detailed contents:*
> *1. The origin of rice - planting agriculture: The discovery of the Hemudu site has effectively verified the "Chinese origin of agriculture". The rice remains and more than 200 bone plows found at the Hemudu site have corrected the traditional view that Chinese cultivated rice was introduced from India and japonica rice from Japan, pushing China's rice - planting cultural history forward to 7000 years ago.*
> *2. The discovery of rice paddies: In the fourth cultural layer of the Hemudu site, large - scale wooden architectural remains and ash pits were found, and many exploration pits discovered rice paddy accumulation layers with a total thickness of more than 100 cm. The discovery of these rice paddies has corrected the traditional view that Chinese cultivated rice was introduced from India, proving that the Hemudu people had already started rice cultivation 7000 years ago, which is the earliest and richest rice - planting cultural site in the world.*
> *3. Rice - planting techniques: During the Hemudu culture period, people had already used complete sets of rice - planting tools, such as bone plows and bone sickles, indicating that they had already transitioned from the slash - and - burn farming stage to the stage of widespread rice cultivation. A large number of bone plows were unearthed in the fourth layer of the Hemudu site, fully indicating that agriculture had already transitioned from slash - and - burn farming to the stage of transplanting rice seedlings.*
> *4. The scale of rice - planting: After five excavations at the Tianluoshan site and the soil in the cultural layer was washed and sieved, archaeologists obtained about 200,000 carbonized rice grains. Such a large quantity and well - preserved state are rare among world - known ruins, indicating that large - scale rice cultivation had already begun at Tianluoshan at that time.*
> *5. Rice - planting and social structure: The*

cultivation of rice enabled society to have a large amount of surplus grain, leading to the emergence of differences between the rich and the poor. Culture also entered a new stage.

6. Rice - planting and art: The Hemudu culture has also unearthed many artworks related to primitive agriculture, such as "fish - rice basins" and "pig - rice basins". Art originates from life. Without the prosperity of rice cultivation at that time, it is hard to imagine that the Hemudu people could create such vivid scenes.

7. Rice - planting and environment: The rice unearthed from the Hemudu site includes various types such as japonica, indica, and intermediate types. Among the 81 carbonized rice grains sampled, 4 were wild rice grains. According to pollen analysis reports, the pollen grains of single - hole non - flowering plants in the fourth cultural layer of the Hemudu site are generally about 45 microns in size, with a maximum of 56 microns, similar to modern rice pollen, and the content of rice pollen in the pollen spectrum is very high, reaching up to 70% of the total pollen amount.

These contents show Hemudu culture's outstanding achievements in rice - planting agriculture. It has not only innovated in agricultural production technology but also had a profound impact on social structure and cultural development.

Figure 2 . Cultural decoding content derived from large language models.

In this result, the user extracts keywords including stilt wooden architecture, rice cultivation and social structure, as well as rice cultivation and art,etc. Based on this, the user can choose to search the cultural materials in depth for understanding, and extract the contents in the cultural materials to identify the key cultural genes in the Hemudu rice farming culture for the subsequent creative design.

3.6.2. AI - Construction of the Hemudu Background Story

In recent years, the application of large-scale artificial intelligence models in cultural heritage preservation has garnered increasing attention in recent years [26,27].This study utilizes the Hemudu rice culture, an integral component of early Chinese agricultural civilization to show the potential of AI in generating narrative content. By extracting key cultural elements—referred to as "Hemudu genes"—AI constructs a short story that embodies the characteristics of rice farming in Hemudu. Given the theme "A Day of Farming in Hemudu",the AI model is instructed to imitate the humorous style of WHCTY's work 'Wannabe', generating a complete script that includes scene descriptions, dialogues, character expressions, cinematographic details, and estimated durations, as shown in **Table1**. Following the initial AI-generated output, modifications are introduced to optimize the script's coherence, historical accuracy, and cultural representation. This approach not only demonstrates AI's ability to synthesize cultural elements into engaging narratives but also highlights the intersection of AI-driven storytelling and cultural heritage studies.

By inputting the prompt "the creative IP inspired by Hemudu culture and woven it into an animation story," an animation script is generated that depicts a series of historical developments of the Hemudu ancestors, encompassing key aspects such as farming, daily life, and pottery-making. This process facilitates the seamless incorporation of the pre-defined digital cultural IP image into the narrative, constructing a comprehensive backstory that enhances the depth and authenticity of the Hemudu cultural IP [28]. Through this structured storytelling approach, the IP image is rendered more multidimensional, reinforcing its historical significance while optimizing its adaptability for digital creative applications [29].

Table 1. Script generated with AIGC.

Shot	Scene	Lines	Duration
1	On the film set, a modern person is dressed in the costume of a Hemudu man and holding a prop wooden stick. There are cameras and crew members around.	Modern person (with a helpless expression): "Alas, I have to play the role of a Hemudu man again. It's really troublesome."	0:00-0:10
2	Suddenly, a strong flash of light appears. The modern person disappears from the film set and appears in the Hemudu village. There are real Hemudu people working around.	Modern person (surprised, shouting): "Holy cow! What's going on? Did I really time-travel?"	0:10-0:20
3	A Hemudu man comes over, looks at the modern person curiously, and hands him an osseous plow.	Hemudu man (gesturing and making simple syllables): "Yiya." Modern person (puzzled, taking the osseous plow): "Is he asking me to do some work?"	0:20-0:30
4	The modern person clumsily imitates the Hemudu man to plow the land with the osseous plow, panting heavily from exhaustion. The surrounding Hemudu people laugh at him.	Modern person (wiping sweat, complaining): "This is so tiring. So Hemudu people were this hardworking."	0:30-0:40
5	At night, the Hemudu people gather around the campfire and dance, pulling the modern person to join them. The modern person is reluctant at first but then starts dancing randomly.	Modern person (dancing and laughing): "Hehe, it's quite fun actually."	0:40-0:50
6	The next day, another strong flash of light appears. The modern person returns to the film set, still holding a small pottery item from the Hemudu period in his hand.	Modern person (looking at the small pottery item, muttering): "Oh, I really hope I can time-travel again. But still, the modern world is better." Then the director shouts: "Get ready for the next shot!" The modern person quickly hides the small pottery item and gets ready to continue filming.	0:50-1:00

3.7. Appearance Design

In the process of generating digital cultural IPs based on Hemudu cultural genes, this research continuously refines the methodology to ensure accuracy and cultural authenticity. Descriptors for generating Hemudu cultural elements are systematically derived through the extraction of cultural symbols and characteristic motifs, enabling a structured representation of these elements within the digital framework [30,31]. Electronic files containing the characteristic patterns from Hemudu excavated relics are processed and incorporated, facilitating precise debugging and seamless integration into the generative model, thereby enhancing the fidelity and usability of the generated outputs.

3.8. Innovative Transformation of Hemudu Ripples

The preliminary phase involved generating a substantial corpus of images using multiple large-scale AI models, followed by an initial screening process to assess variations in style, composition, and visual characteristics. Midjourney was employed to facilitate the innovative transformation of traditional Hemudu ornaments. high - resolution files of Hemudu ornament designs were input into the Midjourney model, accompanied by descriptive keywords such as "minimalist," "atmospheric," and "black and white" to align the generated designs with contemporary aesthetic preferences. Additionally, the prompt "apply the generated pattern to silk scarves" was incorporated to explore potential applications in textile design. By further refining the input to "apply the generated pattern to a silk scarf" the model was able to generate direct previews of lifestyle products featuring Hemudu motifs, including thermos cups, silk scto "apply the generated pattern to silk scarf," arves, and other consumer goods [32-34]. The following are some of the initial results obtained from this process, as shown in **Figure 3** and **Figure 4**.

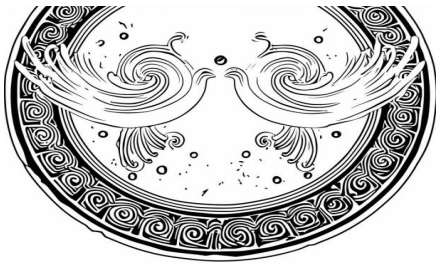

Figure 3. Double bird sunrise pattern generated by AIGC.

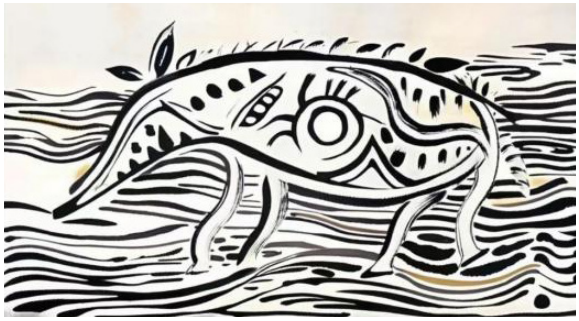

Figure 4. AIGC generated pig stripes.

3.9. Hemudu Characteristic Image IP

This study constructed a systematic methodology to constructing the Hemudu character image IP by integrating manual design with AI-assisted generation, ensuring cultural authenticity and historical accuracy.Through iterative refinement, encompassing AI - driven feature extraction and manual adjustments, the final design significantly enhances both aesthetic allure and cultural representation. The methodology contains 6 steps.

Step1 Identification of Cultural Elements and Symbolic Features

The initial phase of this study involved defining the key cultural elements and symbolic representations of Hemudu to ensure accurate visual expression [35].By meticulously analyzing AI - generated reference cultural symbols and conducting an exhaustive literature review, the research team identified crucial cultural motifs associated with Hemudu, with particular emphasis on those related to rice cultivation. Based on these findings, the study established a thematic direction for the Hemudu character image IP, emphasizing agricultural heritage [36,37].

Step2 Preliminary Manual Illustration of the Hemudu Character

Subsequent to thematic determination, a preliminary version of the Hemudu character IP was manually illustrated to integrate distinctive cultural symbols. The design deliberately emphasized a combination of Hemudu ornaments and rice culture elements. Specifically, the attire and accessories incorporated significant Hemudu cultural motifs, such as the double-bird sunrise pattern and sun pattern, while period-specific accessories, including bone mats and animal teeth, were added to enhance historical authenticity. Additionally, wheat ear imagery was introduced to reinforce the visual representation of rice culture, complemented by an earthy and yellow color scheme that aligned with the cultural and environmental context of Hemudu society.

Step3 AI-Driven Image Generation and Feature Extraction

Upon obtaining initial evaluation feedback, the research team utilized AI to refine and enhance the character design. The manually drawn preliminary version served as a reference image for AI-assisted generation, facilitating the extraction of Hemudu people's physical features, clothing attributes, and other culturally significant characteristics. By inputting carefully selected cultural keywords, AI models generated iterative design outputs, providing additional inspiration for modification and improvement. This AI-assisted process allowed for the systematic integration of cultural and historical elements while expediting the character refinement process.

Step4 Evaluation and Iterative Optimization of AI-Generated Images

During the AI-based modification phase, a large-scale dataset of cultural images was analyzed to determine an optimal stylistic direction. However, several challenges emerged, including significant discrepancies between the AI-generated images and the expected characteristics of Hemudu individuals, excessive stylistic deviations, and insufficient emphasis on Hemudu cultural features. Furthermore, some generated images exhibited distortions that were historically inaccurate and misaligned with the Hemudu era's background. These issues impeded the research progress, requiring extensive discussions and repeated experimental refinements.

Step5 Model Adjustment and Manual Refinement

To address these challenges, the research team explored multiple AI models, including Dream AI, Midjourney, and Keling AI, to improve the fidelity of generated images. Through multiple iterations, adjustments were made to body proportions, posture, artistic style, color scheme, and clothing details to enhance the cultural and historical accuracy of the Hemudu character. Following extensive experimentation, the research team determined the final modification direction and proceeded with manual corrections to ensure consistency and authenticity in the image representation.

Step6 Final Enhancements and Optimization

Building upon the AI-generated outputs, additional refinements were introduced to further enhance the Hemudu character IP. Agricultural tools characteristic of the Hemudu period were incorporated, hairstyles and postures were adjusted, and the overall artistic style was refined to create a more visually appealing and historically grounded depiction. These modifications aimed to improve cultural authenticity while enhancing the aesthetic appeal of the character [38]. The current versions of the Hemudu character images reflect these refinements; however, they remain subject to further evaluation and optimization before finalization.

4. Discussion

The findings of this study demonstrate that the application of AIGC in digital cultural IP construction significantly enhances the efficiency of cultural creative transformation and innovation while reinforcing the utilization of traditional cultural value [39]. By leveraging AI-driven content generation, the process of cultural digitalization is accelerated, enabling more dynamic, interactive, and widely accessible cultural IPs. This study further provides a reference framework for the application path of AIGC in digital cultural IP construction, offering practical insights for future research and industry practices. Compared with previous studies, this research not only explores the realization of digital culture transformation and the enhancement of cultural value utilization but also addresses the existing research gap regarding the application path of AIGC. The lack of systematic application pathways in prior studies has limited the scalability and replicability of AIGC-driven cultural digitalization, whereas this study proposes a structured approach that facilitates the broader implementation of AIGC in digital culture, thereby strengthening its shared value and making it more aligned with the policy directive that emphasizes public participation in digital cultural transformation. Moreover, this study contributes to the development of talent cultivation strategies in the field of digital culture transformation, providing solutions to the growing demand for professionals proficient in both cultural heritage and AI technology.

A significant contribution of this research lies in its originality within the field of cultural IP generation. It provides novel perspectives on the application pathway of AIGC, the augmentation of the shared value of cultural digitalization, and the strategic implementation of AI technology in the creative industries. Unlike previous studies that primarily focus on the technical aspects of AIGC, this research integrates interdisciplinary perspectives to construct a comprehensive and practical framework for AI-assisted cultural innovation. The proposed application path not only improves the efficiency of digital cultural IP generation but also ensures that traditional cultural values are preserved and repurposed in ways that maximize both cultural significance and commercial potential. Furthermore, by emphasizing the shared value of digital cultural resources, this study aligns with global trends in digital cultural governance, promoting a more inclusive and participatory model for cultural innovation.

Given the rapid evolution of AIGC technology, this study primarily focuses on the most widely adopted large-scale language models in China while incorporating limited discussion on foreign AIGC models. This focus reflects the current landscape of AIGC applications but also presents opportunities for further research. Future studies can refine and expand upon the proposed application path by incorporating a more diverse range of AIGC technologies, cross-cultural comparisons, and case studies from different digital cultural ecosystems [40]. Additionally, further investigations could explore the integration of multimodal AI models that combine text, image, and video generation to create more immersive and interactive cultural experiences. These advancements would contribute to a more profound, comprehensive, and scalable application path, further promoting the widespread adoption and sustainable development of AIGC-driven cultural innovation.

5. Conclusions

In the context of the imperatives for cultural creative transformation and innovative development, the integration of traditional culture with emerging technologies has emerged as an inevitable trend. As digitalization accelerates, leveraging advanced technologies such as Artificial Intelligence-Generated Content (AIGC) to enhance cultural preservation and dissemination presents new opportunities for sustainable cultural development. However, ensuring that cultural genes—comprising the historical essence, symbolic significance, and contextual depth of

traditional culture—are preserved with integrity and authenticity remains a crucial challenge. To surmount this, it is imperative to invest in digital culture research that prioritizes both technological advancement and cultural heritage protection. By continuously utilizing AIGC for the construction of digital cultural IPs, cultural creative industries can achieve more efficient and intelligent production processes, significantly enhancing the creative capabilities of digital cultural workers. This not only optimizes the workflow in content creation but also enables more precise and high-quality translation of digital cultural genes into engaging and meaningful forms. Furthermore, the integration of AIGC into cultural IP development provides a fresh impetus for the cultural industry, fostering diversified and personalized content that caters to contemporary audiences while maintaining cultural authenticity. As digital cultural IPs evolve, the innovative development of the industry is further accelerated, giving rise to novel business models and immersive interactive experiences that enhance public engagement with cultural heritage.The synergy between AIGC and digital culture not only reinforces the sustainability of cultural value transmission but also aligns with global trends in digital transformation, making it an essential strategy for the modernization of cultural industries. Moving forward, interdisciplinary collaboration between cultural scholars, AI researchers, and industry practitioners will be essential to refining application frameworks, addressing ethical concerns, and maximizing the potential of AIGC in the digital cultural landscape.

Author Contributions

Conceptualization, H.L. and W.J.; methodology,H. L.; validation, H.L., W.J.; investigation, H.L.; writing—original draft preparation, H.L.; writing—review and editing, H.L.; supervision, W.J.; project administration,W.J..All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement

Not applicable.

Data Availability Statement

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Conflicts of Interest

The authors declare no conflict of interest.

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