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Intelligent Generation of New Media Art Based on User Experience Design

Caixian Ye[1], Lijun Xu[2,*], Jun Tang[1,*]

[1]School of Information and Intelligent Engineering, Guangzhou Xinhua University, Dongguan 523133, China

[2]School of Artificial Intelligent and Data Science, Guangzhou Xinhua University, Dongguan 523133, China

*Correspondence to:

Prof. Lijun Xu, School of Artificial Intelligent and Data Science. Guangzhou Xinhua University, 248 Yanjiangxi Road, Machong Town, Dongguan 523133, China. E-mail: xulijun1474@xhsysu.edu.cn

Prof. Jun Tang, School of Information and Intelligent Engineering, Guangzhou Xinhua University, Dongguan 523133, China, E-mail: tangjun@xhsysu.edu.cn

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Abstract:

New media art (NMA) usually requires users of interaction and participation, and users expect to get real-time feedback in the process of their participation. This paper proposes using sensors to collect the data generated in the process of user experience in real time combined with internal data mining and the deep-learning model,GAN, to evaluate and obtain the standard data set as prompt transmitted to AIGC for real-time generated content. The design team uses the AIGC technology to reorganize and continuously optimize the model to get a new media art that meets the needs of the user experience. This method can help artists to avoid the exhaustion of inspiration. And to help enterprises quickly produce different new media art works with different characteristics, so as to improve the penetration rate of new media art in the society.

Keywords: AIGC, CART algorithm, GAN,new media art, user experience design

1. Introduction

With the application of modern information technology in the network environment, the generation of information and the application of new media art has been significantly improved. The personalization, usefulness, interactivity and high efficiency of user experience design are bound to be the higher requirements of users for new media art[1]. However, the intelligence level of new media art is relatively low at present, and the application of data mining, machine learning and artificial intelligence technologies is few. The production efficiency is low, taking a long time and high cost of new media art, which is difficult to meet the requirements of user experience design[2]. To this end, this study tries to introduce the data mining algorithm--decision tree CART algorithm[3] and sensor technology[4] to collect user experience data for training NMA models. Apply AIGC technology to improve the intelligent level of creation of new media art accurately and efficiently

promote the generation and optimization of new media art based on user experience.

Use external data collection and internal data mining to quickly understand user experience and user needs, GAN model be used and quickly optimize new media art works[5]. AIGC will greatly reduce the marginal cost of creation, greatly improve labor productivity and economic value, and realize the generation of new media art's original works at one tenth of the cost and thousands of times the production speed[6]. Since new media art is an art form with new media as the carrier and supported by new media technology, new media art is a multidisciplinary modern art[7]. By designing attractive user interaction interfaces, creative interactions and interesting experience processes, users' interest and participation impulse can be stimulated, so that they can participate more in art works. With the development of science and technology, the close combination of art and science brings more possibilities to the new media art[8,9], and the expression forms of the new media art are more and more diversified[10]. New media art is different from any form of previous art which breaks the traditional way of viewing and brings unprecedented experience. The audience is no longer the viewer of the art work, but the participant and creator of the art work, narrowing the distance between the artist and the audience[11]. To understand the user experience, the design team has to collect data about the user experience for processing and analysis afterward for decision making.

However, data collected from experimental environments are often incomplete, noisy and ambiguous[12], which requires a data preprocessing process that makes the data well structured, normalized and easy to process with formulaic algorithms[12,13]. Establish a shared database that can collect and process data in users' experience environment in an intelligent way. Data mining algorithms are a well-established framework designed to intelligently discover knowledge and principles which are hidden in large amounts of data[14]. To ensure that people's different psychological and behavioral responses in virtual reality' fields are effectively collected, sensors are used to collect physical and psychological response data in real time[15,16]. The design team can understand the user's reaction in a special situation timely to judge the user's thoughts, emotions and real thoughts, and uses AIGC to optimize the initial new media art model with the basic content, such as text, pictures, sound, short video, etc which generated by AIGC according to the user's sense of use and gain. Finally, the user retrains the NMA model, the design team continuously optimizes the model until the NMA model meets the users' expectations are produced.

2. Overview of user experience design and intelligent generation

2.1 Ideas of user experience design

Focusing on experience, interaction, and encouraging participation have become the top priorities of new media art. How to develop better products to meet the most relaxed and favorite experience of users has become one of the most important problems facing the media. How to create the maximum experience demand of the audience and how to create the scene and mechanism that can interact with the audience are the substantive issues that cannot be ignored in the new media art. In the golden age of traditional art, artists, artistic activities and artistic works are all unilateral static existence, without or rarely considering the audience's perception and experience. In contrast, in the context of new media art, user experience is placed in the position of the altar, which is the highest and also the most core. User experience design refers to innovative application and aesthetic value design. The use of

new media art works should be planned and designed according to users' preferences and habits, and with the increasingly diversified and individual needs of users, they should also consider satisfying the multi-angle experience of different types of individuals, so as to find the best use experience that most complies with everyone's demands.

In the past decade, the form of new media art is, to some extent, the integration of digital media and art elements, which doesn't meet the requirements of real-time interaction of users ideal. Therefore, the real-time interactive demand design and innovation of new media art are extremely important. The artistic feeling varies from person to person, and everyone has his own style and aesthetic preferences. Using big data to analyze users' feelings, applying artificial intelligence technology to interact with users in real time. This can make the current new media art not only the expression of aesthetics, acoustics and vision, but also the interdisciplinary application of computer science and art, psychology, sociology, life engineering and other disciplines which attach importance to user experience, communication and interaction and experience acquisition.

New media art is a new art integrating the discipline of psychology. The physiological, psychological and behavioral data of users in the virtual environment of the new media art are collected through sensors to discover influences and mechanisms. In order to achieve the new media art modeling process, it is necessary to design and implement virtual scenes to effectively induce user interaction and response,and obtain user physical, psychological and behavioral data synchronously. Based on these multimodal data, especially for typical, special, or hazardous task interactions with the environment, the predicted results of user stress levels can be associated with the parameters of these activities. In this way to improve user pleasure and viscosity and provide data assistance and decision assistance. In the virtual environment of VR, the new media art establishes a recognized model of the using process, as shown in Figure 1. Gather data from the process in real time through the user experience in a VR environment,afterward using data preprocessing, user data monitoring and identification,then multimodal data integration analysis and data mining algorithm modeling[17], and using AIGC to automatically generate the basic content of the personalized user experience requirements[18]. Finally, the first draft model of new media art is produced by the art team who masters AIGC technology.

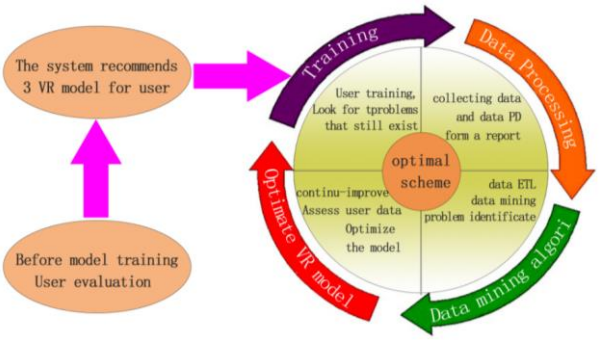


Figure 1. Design ideas of new media art based on user experience.

Applying big data and artificial intelligence to new media art design, attaching great importance to scientific thinking, adding the cultural factors, emphasizing the interaction, communication, cooperation and cultural feelings of individuals in modern new media art, analyzing its diverse

characteristics and user experience, taking full advantage of the viewer's personalized experience design, using technological advantages and interdisciplinary characteristics, the new media art to be loved and recognized by people[19-21]. We combine culture and art with modern technology means to present different spatial fields and provide different dreamlike immersive experiences for different users according to the user's gender, age, and personality characteristics as shown in Figure 2. It provides a new media art generation scheme for the business operation model.

Figure 2. Different user experience diagram of new media art.

2.2 Ideas of intelligent generation

The use of advanced computer technology can perfectly integrate the virtual and real art elements, create a new art form beyond the real life, to bring people a different visual experience, and aesthetic experience, which is incomparable for the traditional art design[22]. Therefore, the original demand and continuous innovation of new media art is very important. Due to the new media art is not only the visual aesthetic feeling of users or the auditory enjoyment, but also the demand of user interaction with the new media art[23,24]. The process of communication and interaction between users and new media art is the process of natural human-computer interaction. People can interact with the machine by using voice, gestures, expressions, eyes and body language as communication with each other in daily life.

At present, the rapid development of virtual reality, mobile computing, universal computing and other technologies. In addition to developing a friendly and realistic three-dimensional user interface, based on sound, action, expression and other natural channels, the researchers have also invented a large number of new interactive devices. For example, Sutherland, a pioneer of computer graphics and the Massachusetts Institute of Technology, developed the helmet-type stereo display as early as 1968, which became an important foundation of modern technology of virtual reality. Nowadays the important methods of natural interaction mainly include handwriting recognition, speech recognition, posture recognition and so on. The sensor in this study as the technical device of natural human-computer interaction technology was used to gather real-time data from the users.

In order to realize the human-computer interaction creation, the traditional new media art needs a certain space to support and the environmental art design. Such as sound, light and various artistic graphics and animation production. Firstly, conduct the space design. LED, 3D, VR and other technologies through reasonable arrangement can present a more perfect artistic effect. It can allow the audience to enjoy diverse audio-visual enjoyment in term of full spatial art. Secondly, animation design and production. Integrating 3D animation production into the new media art, matching with

high-end emerging technologies such as modelling and vectorization, not only can you get a more perfect visual effect, but also to ensure that the quality of the animation is increased. Thirdly, design a dramatic stage. The important feature of new media art is the realization of natural human-computer interaction. New media art should cater to users' usage habits and feelings, not only should artistic content be presented to users to watch, but also should provide users with an appropriate environment for interaction. Through the application of voice, lighting and other aspects, the audience can feel the charm of the dramatic stage personally, and can feel as if they are in the real environment. At last, conduct the environmental art design. New media art wants to emerge the real feeling of the virtual environment is very important. Designers must ensure the quality of the computer drawings, must be skilled in operating a variety of graphics processing software. For sample, CAD mapping, Photoshop, 3 D MAX, etc. Currently the digital language represented by digital images, new media and CG equivalence has become a pillar industry in the rapid operation of the information age, thus giving full play to the significant promoting role of new media art. However, the production process of traditional new media art works is quite complex and needs a high level integrated team who understands the project and effective cooperation. Both the participation of designers with art theories and technicians who master the above graphics processing software and scene layout often need their full communication and cooperation. It is difficult to ensure that the designer’s thinking is not interrupted during the design process. Consequently, the traditional new media art design and production process are time-consuming, consuming materials, high cost, and not easy to achieve. Therefore, the research goal of this study is to employ new information technology for intelligent generation of new media art.

This study mainly introduces the relevant aspects of virtual reality related to new media art, AIGC, data mining and other information technologies. With the user experience as the core concept, and the new media art process of intelligent generation of new information technology. The Research method is shown in Figure 3. The results of the analysis, calculation and decision making of user experience data in the environment of virtual reality, by the wearable wristbands, cameras and other sensors to sense, measure and subsequently generate the data that the machine can identify. Then through the internal data mining and decision tree CART algorithm processing to obtain the priority order of the data, using AIGC in a prompt manner to generate basic content such as text, images or audio and video. Finally, the design team who masters information technology reorganized or reconstructed the new media art model by AI, and continuously optimized the model and finally obtained the works that satisfied by users.

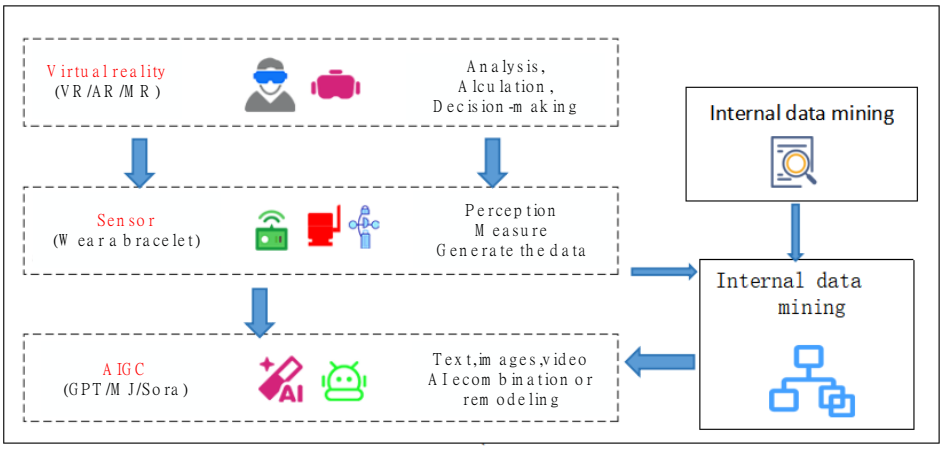


Figure 3. Research method.

The key steps of rapidly intelligent generating new media art through model training are as follows:

(1) Use AIGC to generate the basic content(text, music, character role, images, etc..), and the design team uses AIGC to combine the basic content into 9 types of first drafts of new media art models;

(2) The system applies the data mining algorithm to recommend 3 types of draft models from the 9 types for user training under the questionnaire results and user characteristics;

(3) User surveys are conducted before, during and after each training to collect data, and continuously optimize the new media art model;

(4) The optimal scheme was confirmed according to the modification rate of the empirical study method.

3.Intelligent generation process of new media art

From computational intelligence, perceptual intelligence to the advanced development of cognitive intelligence, AIGC(Artificial Intelligence Generated Content) has opened the door to cognitive intelligence for the human society. AIGC brings data elements to the core-position resources of this stage, which to some extent accelerates the digital transformation process of the whole society.

3.1 AIGC create procedure

The description of Prompt Keyword can be understood as the medium of communication with AI creation. We require describing the picture in our minds with the appropriate prompt words,and through them to narrow the space for AI imagination. Subsequently, AI can understand and produce satisfactory pictures. It is also worth notice that,the order of words and the relationship between words before and after will affect the output of the content even if the same description of the text content. So the write method of the keyword description is crucial. In this study, through the application of CART algorithm, the priority of keywords can be obtained as the keyword of AIGC.

3.1.1 Figures and backgrounds were generated according to the prompt

The general generated way is composed of several parts: the main part, the environmental atmosphere, the composition, the style, and other Setting. The first is the description of the main content, usually can be disassembled into what kind of subjects exist, what they are doing, and what

other actions. The second is to add a spot or environment for the main content, such as a given location or object. In the process of debugging the create content, we can adjust the vocabulary one by one to minimize the randomness of the content. Furthermore there is the composition and lens, style and reference direction, we can add the artist name or directly write out the image style. Below is an prompt instance. That can generate figures as shown in Figure 4.

Prompt: a girl in a pink dress with blond wine red hair is posing for a magazine, in the style of oshare kei, eye-catching jewelry, blown and silver, transparent/translucent medium, hallyu, light gray and red, photo realistic eye.

Modification Prompt: real person character, western beauty, bright smile, romantic tender background, curly hair, wind, no jewelry.

Figure 4. AIGC generated the characters.

Scene prompt: Pond full of blooming flowers, goes to the leaves, just the lotus flowers. Petals fly everywhere, pure light blue sky, white clouds. petal.

Modify prompt: Full pool of beautiful lotus flowers in full bloom, bloom in the green pool of water, less leaf, more lotus flowers, just like a beautiful picture scroll. Petals as soft as silk, flying in the pure light blue sky, as if it is a dreamlike feast.

Figure 5. AIGC generated the background.

As shown in Figure 5, the design and modification of prompt for AIGC can get the desired background. With the generated character and background design split scenes, the petals transform into butterflies realize a dreamy feeling. scene one: The camera slowly narrowed, an elegant woman wearing a white dress, the breeze blowing her long hair, smiling in her eyes, fingers gently touching the blooming lotus. The lotus petals are slowly falling, turning into colorful butterflies, dancing around her. Scene two:The camera switch, the woman closed her eyes, lotus slowly rising

from behind her, wrapping her. Lotus petals flying in the air, forming a gorgeous petal rain curtain, the woman slightly open her arms, to welcome this dreamlike feast. Scene three: The camera gradually pulled away, the whole lotus pond was covered by a gorgeous rain of petals, women dancing like fairies, surrounded by countless fluttering butterflies.

3.1.2 Generate the basic content through the pad drawing and description

We need to send the mat figure or reference graph to the AI generation tool. Composition and other features to add an appropriate description, then we can get the basic content elements based on the scene combined with the intention style, as shown in Figure 6.

Prompt: the girl stand in a dream of flower petal,hazy beauty,photo exposure effect, high contrast,gradient background, graphic design, 8k, ultra realistic, super high detail level.

Figure 6. AIGC generate the basic content.

Prompt With the ability of the generating platform,automatically generate the material needed for the new media art, multiple forward and reverse training was then performed. AI understands what humans claim about through machine learning, and generates what they need. we can choose the appropriate platform to carry out experiments according to the split shots, as shown in Figure 7.

Figure 7. AIGC generate split shots for video mode.

3.1.3 The role of the AIGC in the new media art

AIGC is driven by algorithms which have the potential to identify the underlying patterns of the input, generate similar outputs, and provide high-quality content. The role of the AIGC in new media

art is as follows:

(1)AI helps to create an character image. To hide the true image of individual who is not willing to reveal their identity for any reason, or to create user images by AI. It will not lead to infringement disputes such as portrait right, also do not have to spend money to purchase the right to use the image. In the new media art, the character image is very important.

(2)A better understanding of the abstract theory. Machines are not acute enough to understand some abstract concepts that may be encountered in a real or simulated world, and AIGC is the tool for addressing this challenge. Refik Anadol, whose art exhibitions are regularly showed around the world,including the US, Europe and Asia. Those surreal art installations are actually achieved by AI. The principle behind it is to use the big data analysis fulfill completed by AI. Through Refik Anadol's works, we can intuitively understand the abstract theory[17,25].

(3)Improve the quality of production. The shuttle operation mode used in self-learning GANs is very useful for obtaining high-quality images, video or audio, even if the input is far from perfect. AI obtained different angles of the object from thousands of photos, learning algorithms to generate visual associations and data models of buildings, using the 360-degree projection device to create a series of representative dynamic images of different states, so as to improve the quality of new media art works.

(4)Upgrade enhanced machine learning. New media art production needs to restructure from the thousands of photos, representing the thousands of time nodes. When the AI learns from the memories of these input data, it can create another visual reality, which Anadol calls "machine dreaming."Refik Anadol[17,26] asserted that AI can read and capture our data and decisions. And those data stand for all memory of the humankind. Across the study of empirical automatically improved computer algorithms, upgrade and strengthen machine learning, and regenerate unexpected new media art works.

3.2 AIGC generate basic content and the first draft of new media art model

The new media art studied in this paper is the art form realized by user-centered and user experience design in virtual environment. Additionally, to the relatively basic initial design requirements, the operation demand of large-scale new media art has a longer display cycle and higher requirements for design quality. Therefore, it often involves the construction and rendering of 3D scenes, and often needs to be made into virtual reality scenes. Relative to the basic class design requirements, the demands of large-scale new media art are usually scheduled for longer, the ability of designers demands higher and the production level of technical personnel needs higher. In addition to relying on the designer's individual ability to cope, we can also try to cope with this problem by AI model drawing. AI generates pictures, text, music and other basic content to generate animation, and succeeding reconstitute the content needed for new media art.

There are four steps to generate the content: modeling, mapping, lighting, and rendering. First, provided that we require generating some of image data of lotus and butterflies, as well as relating texture maps and lighting information. These data will be used as input to the AIGC. According to the morphology of lotus and butterfly, artist can use 3D modeling software (e. g. Maya, Blender, etc.)

to create lotus and butterfly models as prompt of AIGC. Next, AIGC uses deep learning technology to train a generative adversarial network (GAN) model that learns the appearance features, texture, and lighting effects of lotus and butterflies. With a large amount of data training, the AIGC can generate highly realistic lotus and butterfly models. Artists can map the generated models of lotus and butterflies, and can use software such as Photoshop to make texture patterns of lotus and butterflies, including the texture of petals, butterfly wings, etc. The texture pattern is then applied to the model to make it more realistic. Set appropriate lights in virtual reality scenes, and point light sources and spotlights can be used to adjust the brightness, color and direction of the lights according to the needs of the scene to create a dreamlike effect. In the training process, the parameters of the model were adjusted and the generating effect was optimized to make the generated lotus and butterfly models more realistic and detailed. Finally, apply rendering, combining modeling, mapping, and lighting effects to generate the final image. Using the trained model, input the relevant information of the scene and the result to be expressed, let the model generate the model of lotus and butterfly. Automatically complete the mapping, lighting and rendering steps to generate the final dreamlike effect image.

Through the above steps, we can get a large number of different styles of material images; Then through further style tonality to do screening. Use the Runway or Pika tool to automatically generate animation effects to meet the design requirements of new media art. Different types of new media art models can be preliminarily obtained to meet different user needs. When obtaining the first draft model to meet the needs, we can use the advanced function of the MidJourney or Pika generation platform to improve the image quality or adjust the animations. After the designer's lightweight adjustment work, such as correcting the details and adding copy writing, using AIGC to assist in the generation of new media art works. It can be seen that its advantage is a short time, large batch generation of the available fashion background map. At the same time, it can meet the demand itself, through the variation of AI model and secondary descriptor editing, to meet our personalized requirements.

With the rapid iteration and upgrading of AI model capabilities, we can believe that in the near future, the general trend for designers to use AI models to open imagination and assist in drawing and animation. But it's not that we need to rely entirely on AI, because design itself is an emotional and romantic work, and random design alone is completely undesirable and unreliable. The opinion is that the designer first defines the rules and the frameworks,starting from user experience design, user data is collected and processed to obtain standard data sets, and rules and frameworks are defined according to user needs. From the hundreds of results provided by the AI model to find the results that best matches our demands, so as to help us achieve our goals faster and better. Generate automated algorithmic models of new media art, motivate artists, and help ordinary businesses develop new media works that they want to achieve through the model.

With the progress of computer science, the use of generative artificial intelligence application technology can accurately and efficiently produce the content for new media art. It takes less time,reduce costs and improve returns, laid the foundation for the popularization of new media art. By adopting channels of intelligent interaction, devices and voice, gestures, images and other interaction technologies, users can naturally communicate and cooperate with multiple roles through

multiple channels. According to the survey, the production cost of large-scale new media art is very high, generally by the media enterprises as a project to do. As mentioned above, the Sanxingdui new media works' cost reached 8 million RMB. If use AIGC instead human production, the production cost and production time maybe be can reduced by more than half by rough estimate.

3.3 Continuous optimization process of the new media art model

Based on the principle of user experience, the above intelligently generated new media art draft model is not enough to meet the individual needs of users, and requires their participation and creation. The needs of all types of users can not be the same, therefore, for different user categories, this study will understand the basic characteristics of users through a questionnaire. Then the system analysis recommends three types of initial models for user experience to train and continuously optimize the model.

For new media art is not just about pictures or scenes for users to browse, it's about letting users participate in it to create a new personalized model. Large-scale new media art is inseparable from mixed reality (MR). Virtual objects can interact with real objects and can perceive and respond to the environment of the real world. Users can view mixed reality content by wearing a head-mounted display or other display device, and interact with virtual objects by using gestures, voice, or controller. We apply MR technology to design the experimental environment by using the ring site and the support of virtual technical provided for the experiment by the company. Based on user data, the system recommends three new media art draft models for training,collects user real-time data and requirements through sensor or natural human-computer interaction technology. Through external data collection and internal data mining to obtain standard data sets for real-time transmission to AIGC to generate or modify the content of new media art model,to provide the user with an experience in real-time. Thus, model training is repeated to continuously optimize the model until the optimal new media art model is obtained, as shown in Figure 8. The design team collects the needs or expectations of the user for designing the desired effects. The basic content is generated by AIGC,accompany new media art model training. The data of optimize or update or adjust is used as the prompt of AIGC to continuously optimize the new media art model.

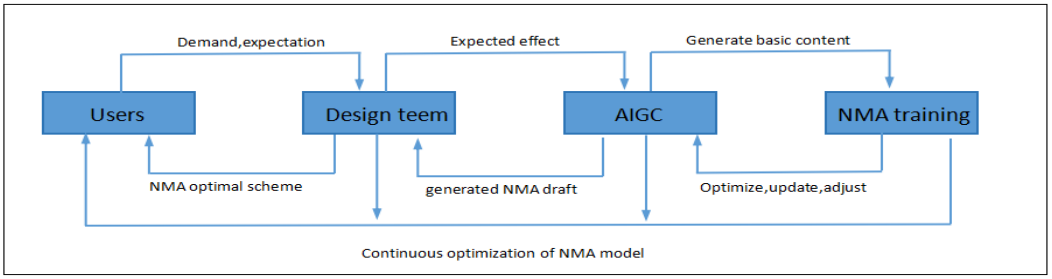


Figure 8. Continuous optimization of the new media art model process.

Based on user experience as the core, real-time response to user needs for the purpose. At the same time, to solve the bottleneck of new media art production. This study produced nine first draft new media art models by AIGC. There are stimulating type,challenge type,dreamlike type,literature and art,learning type,conventional type,horror type,action type and mystery type. We recruit users to train these first drafts for optimization. In this study, male adolescents under 15 years were divided into 3

groups as study subjects training in three days. The result is the most suitable new media art model for users of this age group has obtained and the optimal scheme is also obtained after three days of training.

3.3.1 Standard data-set was obtained using the CART algorithm

Standard data set refers to the effectively sorted data set of user requirements, as the main cue word of AIGC prompt. This is the most critical step in intelligently generating content.

We adopted a decision tree voting algorithm(CART algorithm) based on the collaborative training style. CART algorithm is a dichotomous recursive segmentation technique that divides the current sample into two sub samples. Therefore, the decision tree generated by the CART algorithm is a binary tree with simple structure. Assuming that the set of m samples has m consecutive values, then there will be m-1 split points, and each split point is the mean of two adjacent contiguous values. The division of each attribute is sorted by the amount of impurity that can be reduced, and the amount of impurity is defined as the sum of the ratio before the division. The impurity measurement method is commonly used as the Gini index. Assuming that a sample has a common C class, the Gini impurity of A node can be defined as:

$$\text{Gini}(A) = 1 - \sum_{i=1}^{C} pi^2 \quad (1)$$

Where pi indicates the probability of belonging to class i, when Gini=0, Where pi indicates the probability of belonging to class i. When all classes appear in an equal probability in the node, Gini(A)=C(C-1)/2.

With the above theoretical basis, the actual recursive division process is as follows: If all samples of the current node do not belong to the same class or more than one sample remains, then this node is a non-leaf node. The data collected in experiments and surveys were pre-processed, cleaned and transformed, and the data was converted into a format suitable for processing by the decision tree algorithm. Data normalization was then performed to ensure scale consistency between the different features. The decision tree model was trained using the labeled datasets. The performance and accuracy of the model were evaluated by cross-validation, ensuring the generalization ability of the model. Some data for participants are shown in Table 1.

The sample data field contains the gender, age, age group, personality characteristics, and empiric values of the experiencer. Each record records whether they have participated in similar activities, and fills in the number of times, otherwise "0". That is empiric values.

Data preprocessing, cleaning and transforming the data collected in experiments and surveys, and converting the data into a format suitable for decision tree algorithm processing. Then the data normalization was performed to ensure the scale consistency between the different features. The decision tree model was trained using the labeled datasets. The performance and accuracy of the model were evaluated using methods such as cross-validation, ensuring the generalization ability of the model. Table 1 below is part of the test data, where the personality traits were generated by the MBTI Personality(www.xyzkb.com) test report.

Table 1. Some participant data

Number	sex	age	age group	character	empiric values	System recommend model	Number
DF601001	male	13	0～15	extroversion	0	Literature	DF601001
DF601002	female	9	0～15	sensitive	0	Challenge	DF601002
DF601003	female	10	0～15	extroversion	3	Stimulating	DF601003
DF601004	male	14	0～15	stability	2	Learning	DF601004
DF601005	female	11	0～15	modest	0	Stimulating	DF601005
DF601006	male	19	15～20	introversion	0	Dream	DF601006
DF601007	male	15	0～15	introversion	1	Dream	DF601007
DF601008	male	18	15～20	uncertainty	2	conventional	DF601008
DF601009	male	17	15～20	introversion	0	Learning	DF601009
DF601010	male	12	0～15	extroversion	0	Learning	DF601010

In table 1, there are three attributes, namely gender, personality characteristics and age. Age, in which gender and personality characteristics are discrete values, while age is the value of connection, and the system recommendation model belongs to the result of classification. Empiric values is used to forecast weight.

According to the goals and needs of the user experience design, select the features related to the user experience. Table 2 shows the result of the analysis by the user data is that the age, sex, and character of the users as key features of this sample.

Table 2. Characteristics and target variables

feature1	age	**experience data**	
feature2	sex	**training mode**	System recommendation
feature3	character	**experience evaluation**	Post-user experience evaluation

Assuming that there is the attribute of gender, the Gini index is calculated as follows:

classify	female	male
no	3	4
yes	0	3

$Gini(t_1)=1-(3/3)^2-(0/3)^2=0$
$Gini(t_2)=1-(4/7)^2-(3/7)^2=0.4849$
$Gini=0.3\times0+0.7\times0.4898=0.343$

For personality attributes, there are three kinds of values, and the Gini index calculated after each attribute value is as follows:

classify	others	modest
no	6	1
yes	2	1

$Gini(t_1)=1-(6/8)^2-(2/8)^2=0.375$
$Gini(t_2)=1-(1/2)^2-(1/2)^2=0.5$

classify	others	introversion
no	3	4
yes	3	0

$Gini(t_1)=1-(3/6)^2-(3/6)^2=0.5$
$Gini(t_2)=1-(4/4)^2-(0/4)^2=0$
$Gini=6/10\times0.5+4/10\times0=0.3$

classify	others	extroversion
no	5	2
yes	1	2

$Gini(t_1)=1-(5/6)^2-(1/6)^2=0.2778$
$Gini(t_2)=1-(2/4)^2-(2/4)^2=0.5$
$Gini=6/10\times0.2778+4/10\times0.5=0.366$

Finally, there is a continuous attribute of the value, age, and its value is continuous, so the continuous value is divided by division points. The following Table 3:

Table 3. The GINI coefficient for the age value of DATA.

	10		11		12		13		14		15		16		17		18	
	10		11		12		13		14		15		16		17		18	
	≤	>	≤	>	≤	>	≤	>	≤	>	≤	>	≤	>	≤	>	≤	>
yes	0	3	0	3	0	3	1	2	2	1	3	0	3	0	3	0	3	0
no	1	6	2	5	3	4	3	4	3	4	3	4	4	3	5	2	6	1
Gini	0.400		0.375		0.343		0.417		0.400		0.300		0.343		0.357		0.400	

In the CART algorithm, the Gini impurity represents the likelihood that a randomly selected sample is misclassified in a subset. Starting with the minimum Gini value, and continuing to complete the feature selection and decision tree construction.

Decision tree create. Based on the selected feature assessment criteria, child nodes are generated recursively from top to bottom until the data set is not separable to stop decision tree growth. It is known from the above analysis that the Gini value of sex (0.343) is the smallest, so the earliest decision tree is made by sex.

According to the selected features and Gini value, the age and gender of the experiencer are taken as the characteristic nodes of the first decision tree, and the corresponding weights are added to the leaf nodes of the decision tree. The decision tree CART algorithm is used to build the decision tree model as shown in Figure 9. In this paper, we use the decision tree CART algorithm to solve the classification and regression problem[27].

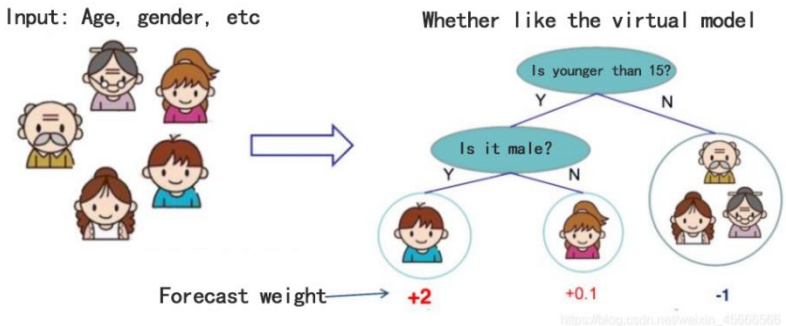
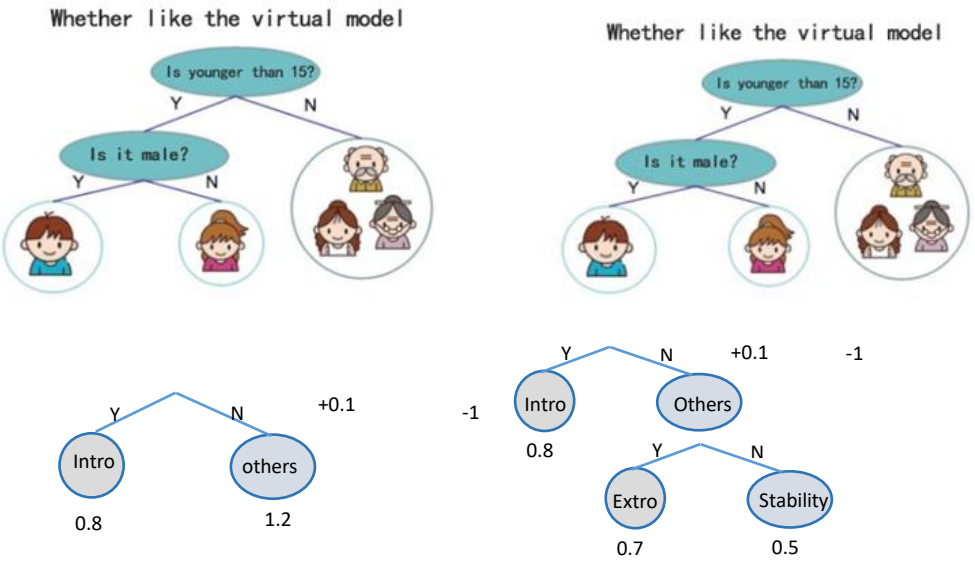


Figure 9. The first decision tree of the CART algorithm.

The male teenagers under 15 years old as the user test group. The weight is evaluated according to the proportion of the number of participants (40%) and the experience value (0.5) and the weight for

men under 15 years is 2. Then, the third data feature is the user's personality traits. Introverted personality has the smallest Gini value according to the GINI system. Therefore, introversion is analyzed separately, and non-content character as another branch is shown in Figure 10(a). Continue to the significant downward leaf nodes, according to GINI, give the complete CART binary tree as shown in Figure 10(b). According to the three characters and weights of introversion, extroversion and stability. The standard data set obtained from the feature data weights is transmitted to the AIGC as a Prompt to generate the 3 first draft models of new media art and recommended to the Male teenagers. Respectively is Stimulus, Challenge and Dreamlike.



(a) **(b)**

Figure 10. The decision trees of the CART algorithm.

In the later model training, this method is also used to obtain the standard data set transmitted to AIGC, so as to generate the content continuous optimization model in real time.

3.3.2 User-experience data is collected in real-time through the sensors

Today, AI looks very advanced, despite its great achievements in language and image recognition,but the solution mainly depends on the learning of big data samples. Also can not have the human self-awareness and subjective creativity. In particular, its artistry, inspiration and subjective feelings are also very obtuse, and it does not have the ability of human cross-field reasoning and abstract analogy. Therefore, it is necessary to model and simulate the real world, collect relevant data, and then generate works of art through artificial intelligence, which is more in line with the user's personality pursuit.

The active identification of complex behaviors of the human body is a dynamic reflection of the state of the human body. Combined with the current identification target, the user physiological-biochemical-behavioral(P-B-B) index data directional collection. Current users' active recognition structures of complex human behavior are mostly targeted, refer to[28,29]. In[4], we

proposed an active identification method of complex human behavior based on multi-wearable sensor data fusion. The autocorrelation coefficient and recurrent neural network are used to extract recognizable feature points, and to classify and identify user behavior by using the fully connected layer and maths function. This study uses this method to collect experience data from the new media art training process for real-time data analysis. Select valid data and eliminate redundant data to obtain the active recognition sequence of user complex behavior. According to the results of the fusion analysis of the collected user index sensing data and user experience demand data, the content as the input of AIGC for the user virtual reality scene.

It is a very complex, biochemical and behavioral task to collect data, which needs to design matching data collection links and processes. A certain number of monitoring nodes can be arranged in the sensor and access system, and the nodes are associated with each other to form a full coverage data recognition structure. Next, the data acquisition process is designed, as shown in Figure 11 below:

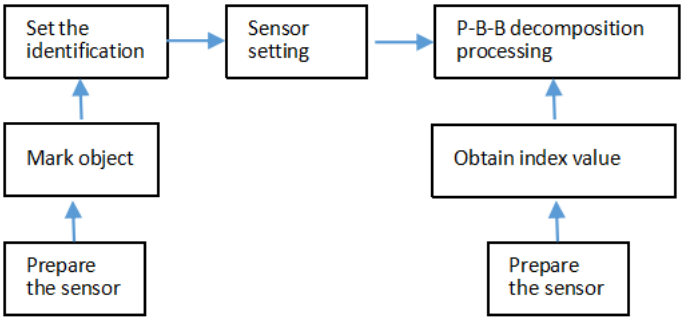


Figure 11. Data acquisition process of user physiological-biochemical-behavioral.

According to Figure 11, the user physiological-biochemical-behavioral index data acquisition is completed through the sensor. Set the number of multiple sensors as n, the raw data collected by the i sensor is $x_i'(t)$. Normize the collected data and obtain the collected physiological-biochemical-behavior index data. The formula is:

$$x_i(t) = \frac{x_i'(t) - x_i'(t)_{\min}}{x_i'(t)_{\max} - x_i'(t)_{\min}} \tag{2}$$

In the formula(2), $x_i'(t)_{\max}$ is the maximum value of the raw data collected by the sensor, $x_i'(t)_{\min}$ is the minimum raw data value. User physiological-biochemical-behavioral indicator data was collected through multiple sensors as the object of subsequent data fusion. The acquisition process is designed according to the user's physiological-biochemical-behavioral indicators. According to the collected data fusion results of the user index sensor data, in the process of experiencing the new media art model, when the user behavior changes, multiple wearable sensor data are fused to obtain the similarity between the user behavior and the predetermined data characteristics. Select valid data and eliminate redundant data to obtain the active recognition sequence of user complex behavior. Use autocorrelation coefficient and recurrent neural network, and classify and identify user behavior through fully connected layers and functions. Thus, the user experience physiological-biochemical-behavioral index data is obtained, combined with the needs and

expectations of the user experience process, the standard data set in the training process is finally obtained, and the content is generated in real time as the AIGC prompt. Then, the art team processes the content and then responds to users for the user experience.

3.3.3 Model training and continuous optimization

In order to evaluate the economy, rationality and effectiveness of the user experience, we simplified the model test, weighted by the ratio of age and gender applicants,all testers need to be recommend three types of initial topic models by system, including training feedback for each test. The training period is based on the following assumptions. Three training sessions per day are morning(9: 00-12: 00),afternoon(14:00-17: 00)and evening(18: 00-21: 00).

The training tester consists of 3 groups,each group of 30 people.For each group within 3 days and cannot repeat the same time period, use the mean model analysis.The model has a total of nine virtual scenes requiring computational experience time,experience the process of the virtual scene appears semi-randomly. The training group shift system and the individual order of each group are shown in Table 1. From the perspective of humanization, it is necessary to consider the differences of different periods. Each group have 3 teams, 10 persons per-team. So design the morning, afternoon and evening three periods, each time for three cycle training, to avoid time conflict and reduce the waiting time.

Table 4. The rotation training system of the three groups

time	day 1 three rounds	day 2 three rounds	day 3 three rounds
morning	A1-A2-A3	B1-B2-B3	C1-C2-C3
afternoon	B2-B3-B1	C2-C3-C1	A2-A3-A1
evening	C3-C1-C2	A3-A1-A2	B3-B1-B2

Group A shows in Table 4, after the team A1 completes one round, team A2 then completes another round, and then team A3 completes the last round, then completing the three rounds on the first day. The other groups alike. 3 groups train in the same space,and the order of individual tests is different for each group every day.

According to the above CART algorithm, the initial model of boys in this age group is pushed by the system according to its characteristics. The models recommended by the system using the information gain algorithm to the group A experiencers are stimulating, challenging and dreamy. The user's stimulation experience evaluation is 8 points (out of 10 points), not more than 9.5 points, and the modification rate is 0.9, indicating that there are still 9 problems to be improved. The model needs to be optimized for test by the same, challenge type and dream type, and also needs to be optimized for test until the optimal model is trained.

Table 5. Participants experience the data for the first time

sex	age	group	character	train model	evaluation (full 10)	Modification rate (10 Items)
male	14	group A	extroversion	M01	7.5	0.9
male	14		introversion	M02	7.0	0.85

male	13		extroversion	M03	7.5	0.82
male	15	group B	extroversion	M03	8.0	0.2
male	15		introversion	M02	7.8	0.3
male	14		stability	M01	7.0	0.6
male	12	group C	extroversion	M02	7.0	0.5
male	13		introversion	M01	7.0	0.8
male	13		introversion	M03	7.5	0.8

* M01: Stimulating type; M02: Challenge type; M03: Dream type

Table 5 shows that the first experience results of boys aged from 0 to 15 did not reach the expected value. We adjusted and improved the training model and design strategies according to the feedback of user experience. User feedback data were collected and the model was iterated and updated according to the feedback results. Based on the selected features, the data set was divided into different subsets and prepare the standard number sets for AIGC intelligent generation basic content. For each group, new members joined the group size was increased by three people each time, and the above steps were repeated until the termination conditions were met, as shown in Table 6.

Table 6. The 3-group model training process

Training model	**number of people**	**modi-rate**	**evaluation (average)**	**traning data rate**
stimulus	3	0.85	7.5	10
	6	0.69	8.0	20
	9	0.68	8.3	30
	12	0.65	8.5	40
	15	0.62	8.8	50
	18	0.5	8.8	60
	21	0.5	8.8	70
	24	0.3	9.0	80
	27	0.15	9.0	90
Training model	**number of people**	**modi-rate**	**evaluation (average)**	**traning data rate**
Challenge	3	0.91	7.0	10
	6	0.85	7.2	20
	9	0.83	7.5	30
	12	0.81	7.5	40
	15	0.72	7.8	50
	18	0.7	8.0	60
	21	0.38	8.5	70
	24	0.3	8.8	80
	27	0.19	9.0	90
Training model	**number of people**	**modi-rate**	**evaluation (average)**	**traning data rate**

Dreamlike	3	0.83	7.5	10
	6	0.81	7.5	20
	9	0.68	8.0	30
	12	0.59	8.0	40
	15	0.54	8.5	50
	18	0.42	9.0	60
	21	0.38	9.4	70
	24	0.2	9.5	80
	27	0.02	9.6	90

If modi-rate below 0.05 and evaluation More than 9.5, the termination condition is satisfied to the. The model will be stopped training. In Figure 12, three new media art models are stimulated, challenge, and dreamy. And the x-axis is the percentage of the training data rate. The way of increase training data during the experience, the dreamlike type has the lowest modification rate and is more stable than the other two indicators. The training results show that the most suitable dreamlike type NMA model is obtained for boys.

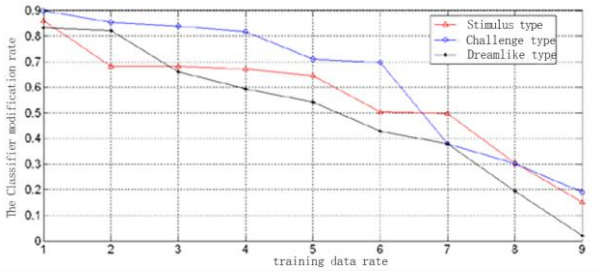


Figure 12. Three error rate metrics for NMA model training.

The optimist model with the lowest modification rate and evaluation more than 9.5 among the three types of subject models is obtained. Moreover, due to training and optimizing the model, the new media art model has met the requirements of user experience.

According to the above-mentioned method, the initial experience model of users can be obtained through mathematical modeling, the collected and analyzed user feedback data can be used as real-time input prompt of AIGC, and content can be generated in real time so as to ensure the realization of personalized needs of different users in the experience process. According to the above data mining algorithm, combined with the information technology applied to the new media art, and using the application technology of generative artificial intelligence, to achieve the goal of continuous optimization of the new media art works. Using these optimized results, the design team can easily create new media art content that suits the needs of different users.

AIGC combines current real-time cloud rendering technology, through an integrated full-stack service architecture and scenario-based industry solutions, combining common technology, ecological content, standardized operations, continuous value art design principles and guidance framework, which support the new stage of development of new media art. Design principles of the new media art based on user experience. Based on the user's needs and expectations, the design team

simulates the expected effect and generates the basic content through AIGC. The aim is to optimize, update and adjust the NMA model. The design team used AIGC and the user training process to continuously optimize the new media art model, and finally got the optimal solution of NMA.

4. Conclusion

Four steps to intelligence generate new media art. According to the data mining algorithm used above, combined with AIGC applied to new media art, it is easy to generate the first draft of new media art works. Apply CART algorithm to get the standard data set as the AI role, requirements, and finally send specific instructions to the AI. New Media art's basic content were generated using the AIGC tools just as MidJuney, StableDiffusion, Runway and Pika. It is easy to produce basic content of new media art that suit different users. Under the premise of data processing and model training, CART algorithm conducts real-time classification data generation, then specifically reorganizes the data, and finally use AIGC generates NMA basic content. The application of AIGC not only solves the problem of traditional production of NMA but also enables it to be presented in real time according to user needs.

DECLARATIONS

Authors' contributions

Conceptualization, C-X.Y. and L-J.X.; methodology, C-X.Y.; software, J.T.; validation, C-X.Y. and L-J.X.; formal analysis, C-X.Y.; investigation, C-X.Y.; resources, J.T.; data curation, J.T.; writing—original draft preparation, C-X.Y.; writing review and editing, C-X.Y. and L-J.X.; visualization, L-J.X.; supervision, J.T.; project administration, C-X.Y.. All authors have read and agreed to the published version of the manuscript.

Availability of data and materials

No new data were created or analyzed in this study. Data sharing is not applicable to this article.

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