Scholar Publishing Group
International Journal of Art Innovation and Development
https://doi.org/10.38007/IJAID.2023.040114
ISSN 2789-7192 Vol. 4, Issue 1: 155-163

Design of AI Interactive Art System Based on Computer Vision

Ruoxin Niu*

Philippine Christian University, Manila, Philippine

Niuxinxi2@163.com

**corresponding author*

Keywords: Computer Vision, Artificial Intelligence, Interactive Art System, Interactive Psychology

Abstract: With the continuous development of artificial intelligence technology, under the support and promotion of big data and cloud computing, with its own sustainable work, extremely fast computing speed and a certain degree of intelligence more and more deep into people's life, in recent years also into the field of design. This paper aims to study the design of AI interactive art systems based on computer vision. This paper on the new media era of interactive art and the development of the database is briefly introduced, to explore the structural similarity of the database and interactive art, then further to the human interactive art is the most important and most important interactive object psychology and emotional analysis, for the database and human similarity theory analysis and the coexistence in human and database emotion and the combination of the creation of interactive art. A brief analysis of artificial intelligence and big data related to databases in a broad sense is conducted, to explore their application in interactive art, the emotional changes brought about by interactive art, and the possibilities and ethical problems of future interactive art based on these technologies and emotions. Artificial intelligence art will become the foundation of the art model in the 21st century. For interactive art creators, human-computer interaction, human interaction and even machine interaction will become a part of the future interactive art. How to truly grasp this technology and correctly transfer emotion is an opportunity for the future interactive art creators and a challenge.

1. Introduction

The application of database in interactive art works is generally used as a data background to provide technical support: in interactive art works applying computer technology, it can be directly

connected to the database to read and write data, or as a channel to collect information, to provide a data theoretical basis for interactive art works. On the other hand, the database structure can be used to isomorphize the interactive art structure: the interactive art works can help the creators to express their emotions to the art participants, but also can feedback their emotions to the creators, and the database as a data collection tool also creates a kind of communication between administrators and users. Not only that, the characteristics of the database itself can also bring inspiration to the emotional research of interactive art and promote the expression of artistic emotion. Art language is through the unique structure form of the emotional experience of art to people's heart, it is art creators through art will own creation technique and creative modeling effective integration of art content, database because of its own unique structure and language became a new art language, and applied to interactive art creation activities, not only can effectively express the emotion of art, but also beyond the traditional art language ability to express emotion. In interactive art, emotion includes not only the emotions of the creator, but also the emotions of the interactive participants [1-2].

In the computer vision of artificial intelligence interactive art system design research, many scholars to its research, and achieve good effect, for example: Zhu Q put forward the interactive art and database technology of technology symbiosis, interactive art of cross-media sensory interactive interaction art information of free mobility, and interactive art technology information security problems [3]. Mcgeorge N M focuses on the representation and processing of object physical properties in virtual environment, develops some hardware in the visual interface in virtual reality, and proposes relevant algorithms and implementation methods [4].

This paper buys paper books, uses papers and journals on CNKI, Google Academic and other academic websites to read, search web pages and videos on the Internet, explore and understand new media and interactive art, collect news and materials of advanced foreign research, and strive to integrate with the world. This paper describes the related technologies of 3 D human-computer interaction based on computer vision, 3 D input / output equipment, human-computer interaction in virtual reality, and human behavior recognition. A three-dimensional human-computer-interaction system based on computer vision is presented and describes the detailed design of the system. The implementation of the system is then described, with the results of the experimental analysis, and the application of the system in the project. Finally, the summary and outlook of the paper, summarized the work of the paper and its shortcomings, and the future work is expected.

2. Design and Research of Artificial Intelligence Interactive Art System Based on Computer Vision

2.1. The Language of Interactive Art

Art language refers to the means and method of the creative subject to use unique material media and make artistic expression in the creative activities of specific types of art, which is the external form and structure of the work. Art language aims to express the content, but also has a unique aesthetic value. Without artistic language, there is no work of art. The language of interactive art comes from his media on the one hand, on the other hand also from its interactive means and technology [5-6].

Media is a person or thing that instructs the creator and the audience to have a relationship. The media itself will not change in the process of establishing a relationship. Media has a strong negative effect on information, knowledge and content. It is positive, active, and has a significant impact on information. It determines the clarity and structure of information. Interactive language brought by interaction is the main artistic language of interactive art. Interactive art mainly interacts with the audience through the stimulation of the five senses, among which it mainly includes vision,

hearing, touch and common sense. Some works pursue the ultimate stimulation of a single sense, while others pursue the overall sensory linkage and synesthesia to produce an immersive experience. In the era of new media, interactive art involves a wide range of fields, most of which use advanced media technology and interactive art integration, among which they are mainly computer digital technology, Internet technology and audio and light image technology [7-8].

2.2. Influence of Science and Technology Development on Interactive Art

The development of the industrial revolution brought many cheap painting pigments and new materials brought a great impact on the art field at that time, many innovative forms and media appeared one after another, the development of science and technology on art can sometimes be subversive. After the war, the political environment of various countries was relatively stable, and the stable political environment vigorously promoted the rapid economic development[9-10]. On the other hand, various countries, in order to innovate and develop, began to vigorously promote the development of education. For all of the above reasons, artists have been able to devote more energy to their artistic creation and obtain better resources and a more broadened vision. At the same time, the third scientific and technological revolution continues to unfold, especially in computer networks, biotechnology, chemical materials and other fields. The development and popularization of these technologies has provided a new and convenient artistic carrier and creation media for the majority of artists[11-12].

2.3. Design of Artificial Intelligence Interactive Art System

The ranking is mainly divided into internal sorting and external sorting. Specifically, there are mainly insertion sorting, exchange sorting, selection sorting, and merge sorting. The specific sorting method is used depends mainly on the nature of the sorting method itself. Direct insertion sorting in the insertion ranking divides the data into two groups. The second group of data is compared with the first group one by one, and finally the ranking of the whole group of data is completed. Bubble sorting in the exchange sorting is that when there is a string of information elements, the bubble sorting algorithm will repeatedly compare two adjacent elements. If the two adjacent elements are in the wrong order (such as from large to small), the two elements will exchange positions, because this method is similar to the data floating name. Direct selection sort in the selection sort first selects the smallest element in the element group and exchanges it with the first element, then looks for the smallest element in the remaining element group for removing the first element and then exchanges it with the first element of the element group, and so on. The merge sorting is to merge the elements step by step, repeated several times to get an orderly group of elements. According to the time complexity, space complexity, stability, the simplicity of the algorithm, attend the sorting data size, the record itself information size and keyword structure and initial state of the seven aspects, generally bubble sorting, direct insertion sorting, direct selection sorting and quick sorting is a more reasonable choice, the bubble sorting and direct insertion sorting is famous for its stability and simplicity [13-14]. The overall structure of the system is shown in Figure 1.

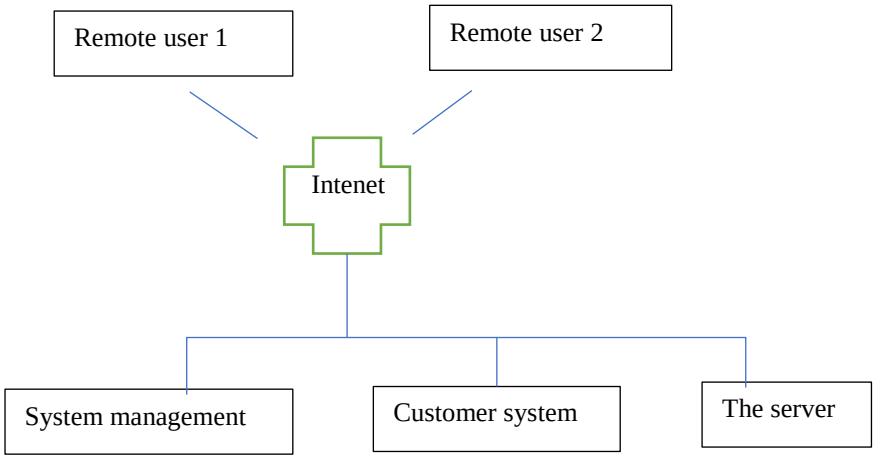

Figure 1. System structure diagram

2.4. Gaussian Smoothing Filter

This is a class of linear smoothing filters that choose values according to the shape of the Gaussian function. One-dimensional zero-mean Gaussian function.

$$g(x)=e^{-\frac{x^2}{2\sigma^2}} \tag{1}$$

Where, aa is the standard deviation. If Gaussian filtering is applied to one-dimensional signal x (t), the input signal is convolved with Gaussian function:

$$y(\tau)=\int_{-\infty}^{+\infty}x(t)g(\tau-t)d\tau \tag{2}$$

We often use the two-dimensional zero-mean discrete Gaussian function as a smoothing filter, the function expression is:

$$g(i,j)=e^{-\frac{(i+j)^2}{2\sigma^2}} \tag{3}$$

The Gaussian smoothing filter is very effective at removing the noise following a normal distribution. The 2-D Gaussian function has a rotational symmetry, with the same smoothness in all aspects, and thus is not biased towards either direction in the subsequent edge detection. Before edge detection, a Gaussian filter is often applied. The Gaussian distribution parameter v determines the width of the Gaussian filter. The larger the mouth, the more the band of the Gaussian filter, and the smoother the band is. Different Gaussian filters can be designed according to the actual needs [15-16].

3. Design, Research, Design and Experiment of Artificial Intelligence Interactive Art System Based on Computer Vision

3.1. Application of the Database

The main role of database is to store and manage data, which is widely used in the big data era of information explosion. The database can store huge data, and due to its nature, it makes the data have a strong continuity, facilitating the execution of addition, deletion and modification operations. Many multimedia data because of its own huge, will choose to use the multimedia database for

storage. Many mobile devices, such as laptops or handheld computers, also choose to use cloud mobile databases to store information, which can not only save local space but also call the required data, anytime, anywhere. The data required by a website or application is also stored by the database. User information stored in the database can not only ensure the security of the data, but also reduce the redundancy of the website. Not only the network background data, some data required by the front desk will also be called from the database through code. ADO.NET can be applied to multi-tier applications. In the multi-tier application architecture, different applications run on different data layers. As shown in Figure 2, its three-layer model, each layer represents different functions.

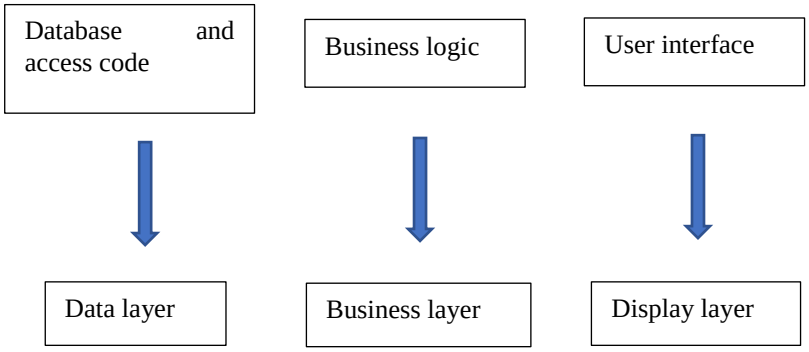

Figure 2. Three-layer model

3.2. Experimental Design

This paper is based on computer vision of artificial intelligence interactive art system design experiment, the first is the study of the network convolutional layer to the algorithm running speed and model size, study different convolution influence, and the second is through the performance of the algorithm and traditional algorithm analysis to judge the superiority of the algorithm.

4. Design, Research and Experimental Analysis of Artificial Intelligence Interactive Art System Based on Computer Vision

4.1. Convolutional Layer

Generally, the more network layers, the slower the network convergence rate, the more complex the network parameter adjustment, and the longer the training and test time-consuming. Therefore, we tried to gradually reduce the number of convolution layers based on the FCN-AlexNet. The effects of different convolutional layers on the algorithm running speed and model size are also studied, and the experimental data are shown in Table 1.

Table 1. Running speed and model size of the FCN of different convolutional layers

	8	7	6	5	4
GPU running speed (milliseconds /frame)	95.2	43.8	53.7	48.2	33.2
CPU running speed (milliseconds / frame)	628.8	293.5	305.1	268.1	219.1
Model size (MB)	218	12.3	13.1	10.8	5.23

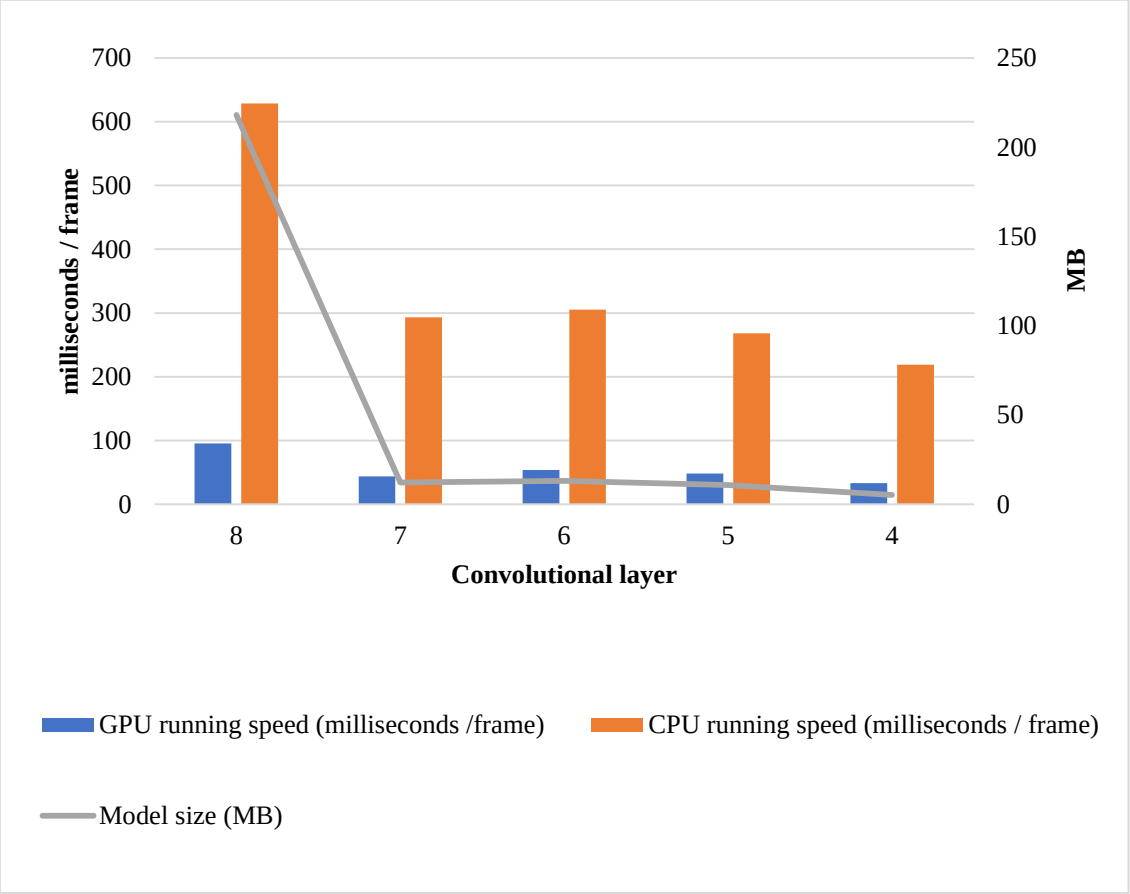

Figure 3. Changes under the different convolution layers

As can be seen from Figure 3, the paper compares the corresponding network structure of the convolution layer of 8 ~4 layers with the model size. As the number of convolution layers decreases, the running speed becomes faster, and the space required by the model becomes smaller. In summary, four convolutional layers were selected in this paper.

4.2. Performance Analysis

In this paper, the performance analysis of the present algorithm and the traditional algorithm is conducted, and the effective processing rate of each module function of the system is compared. The experimental data are shown in Table 2.

Table 2. Performance comparison of the two algorithms

	Discriminate	Interaction	Data Management	DA
Traditional Algorithm	97	92	91	96
The Algorithm In This Paper	99	97	92	98

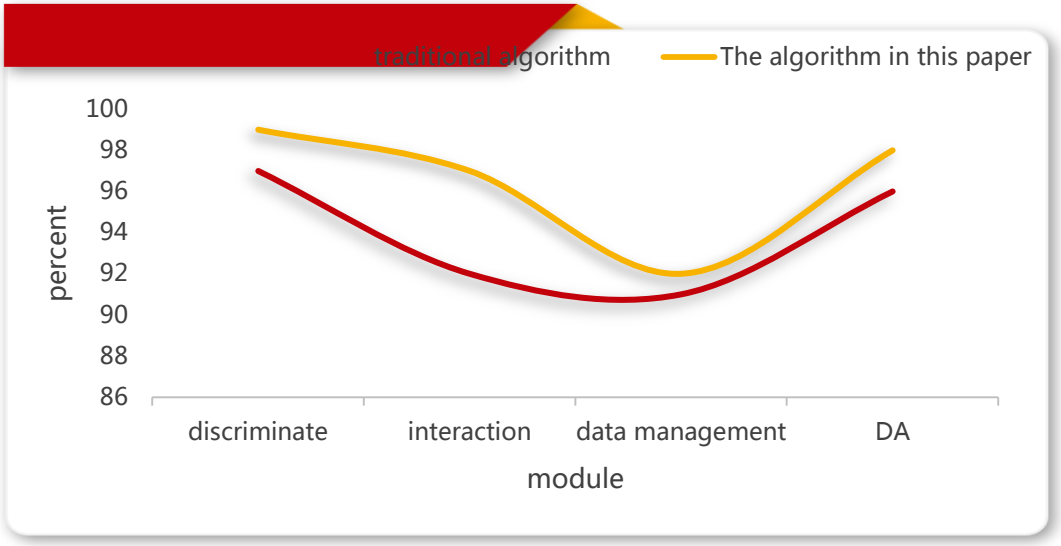

Figure 4. Efficient comparison of each module under the two algorithms

As can be seen from Figure 4, the effective execution rate of both algorithms reaches more than 90%, but in contrast, the effective execution rate of this algorithm is higher, but the performance of both algorithms is poor in data management. It is suggested to further study the data management part of the algorithm.

5. Conclusion

We are in the era of big data, and our behavior creates big data, and big data is reflected in every one of us. With breakthroughs in technologies such as computer vision and cloud computing, the impact of big data begins to fill every corner of our lives. The progress of technology has brought artists more convenient tools for them to convey their artistic emotions more comprehensively. The achievements of big data in many aspects reflect the characteristics of its integration with interactive art. Interaction is an important part of the art participants, no participants, there is no interaction, so interaction art is impossible, so in the creation of interactive art, clear participants 'behavior, study the participants' psychology is very necessary, in the study of participants, big data can play an important role. Due to its own comprehensive and advanced nature, interactive art has a good fit with computer computer vision technology, and they have similar interaction processes in structure. However, the algorithm of computer vision has an important influence on the art emotion of interactive art both in principle and in practical operation. Artificial intelligence based on computer vision and big data are also used more and more widely in today's interactive art. At the same time, due to their own characteristics, they also bring human-computer relationship and personal privacy and other issues into the ethical thinking of interactive art. Basic research of this paper reached the expected effect, the computer vision and interactive psychology, interactive emotion combination and the analysis, affirmed the computer vision technology in interactive art can not only help in technology more interactive emotion, and the future computer vision interaction art outlook and thinking.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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