The Impact of Information Technology on Art Research

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Abstract

Information technology influences all aspects of human society. Art is also influenced by the emergence of information technology, therefore the art research has been affected inevitably. However, the impact of information technology on art research is dynamic and ambiguous. In this paper, we try to investigate the impact of information technology on art research and to infer its future trend. We systematically examined the changes in art media, art form and art research communication caused by information technology. We found that the emergence of new art media and digital arts influenced the interface and scope of art research. The information technology applied in art research decreased the space and time constraints of art research communication.

Keywords: Immaterial; Medium; Digital art; Virtual reality

1. Introduction

Information technology has led the human society in a new information age, and the way of human life also has had a prominent change. Human society has entered a new era of non-materialistic period with the transformation of material industrial society to non-material post-industrial society. Almost all the aspects of human society, not only technology but also economy, politics and art have received a profound impact from this dramatic transformation. Also, art research produced an unprecedented change by the impact and challenge of this dramatic transformation. In the 21st century, information technology and art research are the two main forces that can influence the development art. Information technology, especially virtual reality and the Internet, has become the driving force which makes the object and method of art research become more immaterial in the process of informationalization of human society [1].

The rest of the paper is organized as follows. In section 2 we identify the changes in the art media and its impact. Section 3 investigates some new forms of digital art and section 4 categories the digital arts according to different roles of a computer. Section 5 summarizes the characteristics of digital art and section 6 investigates the change of the communication of art research influenced by information technology. Finally, we conclude with discussions and possible research directions.

2. Changes in art media

Art consists of information and medium. At the early stage of human society, natural materials, such as rock, clay, wood, copper and iron are utilized as the media of art. The emergence of characters and its media as silk, bamboo clip, and paper greatly enriched the expression technique and skill of the art. With the invention of printing technology, it is easier to copy a large number of works of art and accelerate the spread of art. During the industrial revolution, with the rapid development of physical and chemical technology, the plastic, magnetic and other physical techniques widely used in the art and create new media such as film and tape, which make the spread of visual art more physical and the content of art swift from the 2D space into three-dimensional space [2]. The three-dimensional approach to photography and other works increased greatly in the creation of the artists and the spread of works of art expand from a static to dynamic field due to the changes of the media. Now days, the tape and film have been replaced by laser reading technology for their weakness on permanent preservation and loss of quality after modification. Based on the optical technique, laser reading technology can provide high-capacity storage by its multiple read and write ability. Comparing with traditional media, CD-ROM has the distinct advantage of small size, easy to use and high-capacity; these enable it can easily replace other media. The application CD-ROM as a medium makes art
expression swift from the traditional static-type, unidirectional, planar forms to the dynamic, multi-directional and interactive form [3].

The huge changes in the mode of transmission and the presence of art in the media led by information technology make the interface of art research produced a huge change. Some of the massive objects such as palaces, tombs, ruins and other relics of human culture are difficult to recover and show with traditional means, but it is relative easier to make a virtual reconstruction of the computer and let it exists in the virtual space. Using SimXML and the internet, we can reconstruct the Summer Palace and the ancient city of Chang'an, which have already been destroyed [4, 5]. The simulation allows the ancient building in a reverse time and space in which the art research could be more intuitive, efficient and convenient. The change of art media led the change of the interface of art research. Before information society, visitors can only get information through the pieces of various items or articles, pictures, and the corresponding text description that displayed in the museum, and imagine the scene in which the ancient artifacts existed. Now the situation is completely different due to the digital replication technology, visitors can see the 3D models of the artifacts in the virtual museum. Moreover, visitors can change their viewpoint in the virtual environment and check the details of the artifacts.

3. Emergence of digital art

Early pioneers in digital arts can be traced back to the 1950s. Information technology has invaded all areas of the traditional arts and deepened the connotation of art through the historical change of art medium. Moreover, informationalization also led to the new development of art content, especially a series of digital art, such as electronic music, digital prints, and network arts and so on [6,7].

Digital art is a general term to specify a range of artistic works and practices that use information technology as the essential part of art creation and representation. In a broad sense, digital art means the digitization of traditional art disciplines, for example, utilizing information technology as a means of graphic design. In a narrow sense, digital art generally refers to the art-related design, animation or other artistic work in which involves information technology in their art creation processing. Comparing to the traditional art, digital art has many advantages in the dissemination, storage, copying due to its digital medium.

Nowadays, as a creative discipline, digital art includes a vast variety of forms and activities such as interactive media design, digital video art, virtual reality and new media arts. Interactive media design indicates the design that uses interactive media as a medium, such as the World Wide Web as the medium of web design, web game design and mobile phone as the medium of the mobile game. Digital video art includes digital animation, DV film and digital video advertisement. Virtual reality includes the digital museum, digital mall that involves information technology in virtual space design [8].

The most well-known digital art may be digital music which was one of the first suggested applications of information technology and computers. Almost all areas covered by traditional music influenced by information technology. For example, the existing computer technology can reproduce all the existing natural sound and even the sound that does not exist in nature, which break the traditional music knowledge, update the music concepts, and promote the deepening of music research. Information technology also opens up an unprecedented vast music world and offers unlimited music art audio, which greatly expanded the scope of sound performance and artistic appeal. Widely disseminated through the Internet, digital music has been gradually accepted by people and became typical artistic form of the music in the information age.

According to the international consensus, any work and activities of the music produced by a computer or a digital circuit with the CPU are belong to the scope of computer music, general, computer music contains the following main elements:

Digital synthesis

Musical sound includes music, the noise applied in music and the ultrasound exists in harmonics to influence the sound. One aspect of digital synthesis sounds is that all kinds of musical sound can be analyzed based on the prototype of the sound and then synthesized using computer technology. Another aspect of digital sound synthesis is that computers can freely produce natural sound that never exists before.
Digital recording

Digital recording is the application of computer technology in the field of the record. The word digital refers to the representation of a quantity in numerical form and analog refers to a continuous physical quantity. To digitize means to convert an analog physical quantity into a numerical value. In a digital recording system, sound is stored and manipulated as a stream of discrete numbers, each number representing the air pressure at a particular time. Comparing with traditional methods, digital recording has the benefits as follow. Firstly, digital device usually requires less maintenance than analog equipment. Digital systems have few moving parts, and such parts are usually designed so that a little vibration or speed variation is not important. Secondly, digitally encoded information is more durable than analog information. The characteristics of digital recording that is most exciting to the electronic musician is that any numbers can be converted into sound, whether they originated at a microphone or not. This advantage opens up the possibility of creating sounds that have never existed before, and of controlling those sounds with a precision than any other technique.

Internet music

Popularity of the Internet makes user can access to music, such as the concerts, musical shows, MTV and so on, at any time through the Internet. Moreover, one can purchase CD, VCD, DVD and music related books and discuss, review, and chat about music online. The advances in Internet combined with powerful personal computers and operating systems made streaming music practical and affordable for ordinary consumers.

Besides music, other art forms such as dance and drama, also more or less integrated with the information technology, and even television broadcasts also have a virtual host. The digitalizations in these arts greatly change the artistic expression, communication and even the status they have existed. The emergence of the virtual art shows that people have gradually adapted to the impact of information technology and have got used to the immaterial art form that full of information.

Dematerialization of art is the result of the development of information society, which is a service and immaterial product based society. The information society is the result of informationalization of physical and social reality. The immaterial is not material, but immaterial is based on the material, which is detached from the material level. Dematerialization of art form involves a huge challenge when traditional art theory to explain the new art form. The immaterial feature of artistic factors increases immaterial components in art theory, for example, design principles of digital art, principles of computer-aided design and so on.

4. Categorization of digital art practices

Digital art is based on information technology such as computer hardware and software. For many contemporary digital artists, the computer has already become a vital tool in their art creation. The impact of information technology has changed the art activities such as recording, drawing and sculpture; while the new art forms, such as web art, digital installation art, and virtual reality, have become recognized artistic practices [9, 10].

According to the different roles of software played in the digital art creation, digital arts can be categorized into two kinds. One is the simulation based digital art, in which computer is used to simulate the environment and instruments for traditional art. Similar with other new technologies, at first, the information technology tried to find its application in improving the efficiency of the existing technologies. For example, the computer as a new technology was utilized to enhance the skills and domain knowledge they were already familiar with, and to improve the creation efficiency.

Simulation based digital art focus on the recreation of the traditional tools using hardware and software. Information technology provides a significant continuity in the transition from the real environment to a virtual environment. With the variety of hardware and software, the computer can almost emulate all the procedures that can be formally expressed, which give the digital artists an efficiency, flexibility and practicality platform for art creation. In simulation based digital art, the traditional methods and aesthetic values for art creation still play the most important role. The fundamental artistic principles are unchanged, while the creating process is greatly improved.

Another is the programming based digital art. With the help of information technology, digital artists explore new art creation possibilities through programming. The programming ability is the most significant characteristics of the computer technology and digital artists aimed to create artistic
works through programming. By programming, digital artists can use the computer as a tool to explore new creative possibilities and overcome the limitation of the traditional tools. Digital artists can code the idea and implement them by the computer very quickly. In this way, they can obtain much freedom and possibilities than traditional art creation. The computer as a new medium of art practice greatly change artists work habits and ideology. In programming based digital art, the relationship between artists and the computer is more complex than that in simulates based digital art. The artist’s role is not only the art creator but also the programmer.

5. Characteristics of digital art

Digital art refers to the art form created by digital technology and its creation process. For example, the animation rendered by the computer, the digital music and the sculpture designed by computer and so on. Digital art is a new art form that is built on the basis of technology and takes the technology as its core. The impact of digital technology has transformed traditional activities such as painting, drawing and sculpture, while new forms, such as net art, digital installation art, and virtual reality, have become recognized artistic practices. The characteristics of digital art are:

1. The integration of technology and art, or the disappearance of the boundary between technology and art. Technology becomes increasingly important components;
2. The image becomes the information, in the format of 2 binary codes;
3. Interaction played an increasingly important role in digital art;
4. Digital art as a new mode of production and it produces something new, rather than a simple replication.

Digital art includes interactive media design, digital video art, virtual reality design and new media art. As long as the creative process or part of it is using digital technology, the work can be called digital art. Digital art has the common place with traditional art, but they are quiet different in the creative approach, style, communication. To sum up, digital art is prominent with its characteristic of individuality, dynamic nature, interaction, instantaneous dissemination and so on.

Individuality

As digital art works are in digital form, they can be copied freely and transformed easily. Subjective intention can be achieved in a more easy way compared with traditional art. Someone even believes the artists will disappear in the information age. Moreover, traditional arts reflect the publicity and service for the public. After the completion, art works should exist in public places or public media. As to digital art, with more random and personal nature, it contains more the individual felling. A little bit of inspiration or spark of art can be recorded and produced easily in the digital arts.

Dynamic nature

The distinct difference between digital art and traditional art is dynamic nature, more specifically is the content from static to dynamic. Traditional arts, once created, never change. For example, it is difficult to modify the movie after it recorded on the video tapes or film. Digital arts are dynamic arts that always under creation. Both the author and the viewer can review, modify, and then create new works of art at any time.

Interaction

Traditional art is a read-only art, which can only be passively watched from a certain distance. Digital art is a kind of read and write art and the distance shortened the distance between the eyes to the screen. Through computer and the Internet, digital art can interact with visitors and even upgrade in real time. Digital art works can be modified at any time and audience is both the recipient and manufacturer of the information.

Instantaneous dissemination

Comparing with the text carved in stone, bronze tripod or turtle, printing text on paper can be copied much easier. Traditional media cannot be copied, which limit the dissemination of the art. The Large-scale replication technique accelerates the spread speed of art works and information technology enables the art works can be transmitted instantaneously in fiber optic cable. Opposite to its Individuality, the spread of digital arts are more public. The integration of computer technology and
communication technology will greatly enhance the speed and effect of the dissemination of digital art. The spread of digital art is not only fast, but also open to the public with high efficiency dissemination. It should be said that the propagation velocity and range of any traditional arts cannot match the scope of digital art. Traditional arts are slower in speed and much narrower in the scope by many constraining factors. However, the easy-to-copy feature deduces the impact of digital artworks. The original works replaced by copies more and more frequently and the resulting problem is that large-scale machinery copy the works of art lost its unique charm, or at least reduced.

6. Changes in information exchange of art research

In the information society, the way people communicate with each other has a dramatic change. People can choose more and more modes of communication and a way to exchange information is varied. Sometimes various means co-existence: text, Images, 3D Environment and virtual reality. Text and image are the dominating media for a long time, but they have the disadvantage of the explaining dynamic process. People try to solve the problem by using three-dimensional environment, in which a real entity can be utilized to represent the dynamic process of change [11]. However, the three-dimensional form of communication gradually reveals some limitations in the information society. Although its expression is sufficient, it is still hard to transfer information freely and actively due to the space, time, materials, and processing constraints. With the development of information technology, virtual reality technology was used to simulate the real three-dimensional environment in computer [12]. Users can manipulate every object in the system and also have the multimedia features such as hearing, touch, smell. The way used for information exchange is more diversity and initiative. The initiative lies in its real-time graphics rendering, the so-called real-time is a random graphical rendering technique which can generate the real-time graphic according to the user’s input. When the user’s navigator in a virtual three-dimensional scene, he changes his perspective according to his needs and computer can generate corresponding graphics in real-time. The interaction between virtual reality and user is entirely proactive.

Due to the time and space constraints, the traditional information exchange in art research has limitations. For example, the amount of information obtained within a certain time and space is always conditioned by the objective environment. It is hardly to image that someone could attend several seminars at the same time by using traditional methods. Now we can achieve this unbelievable mission combining virtual reality technology and internet, which can provide real-time information to every place in the earth [13]. What we need to do is to open several windows, through which we can easily browse through the Internet and access to relevant seminar information, even more you can choose and store the information in the computer.

Except real-time, interaction is also an important characteristic of virtual reality. The interaction of virtual reality mainly reflected in it could support the individual behavior of the user. In a virtual environment, you can choose your own way to browse and participate in exhibitions and you can give full play to your imagination, according to your own wishes without being influenced by others.

Virtual reality technology change the way of information dissemination, enrich the content and break the shackles of the material world. Art researchers can do their research at home and easily get all the information related to the research, which includes previous studies in digital form. Virtual reality technology is expected to recover the historic places and make people see the glory of the ancient city of Rome or Athens again. In 9 BC, Pompeii was buried by volcanic ash from Mount Vesuvius eruption. Now, with virtual reality technology, some parts of the Pompeii model has been established and realized in the virtual reality program. Experts from the American institute of archaeology and art history department of the University of Pittsburgh reconstructed the buildings of Pompeii's theater and Isis heroin and other buildings in the ancient city. The audience can experience the life and culture of ancient residents of Pompeii through the virtual reality scene. The reproducibility of the theater complex includes the Grand Theatre, the Temple of Hercules and the triangular forum. People can walk into an open-air amphitheater and watch a theatrical performance. Also, the audience can explore the details of Isis heroin with portico walkway, courtyard, building structure, sculpture and color murals. Virtual reality creates a dynamic world for the audience and enables them to understand and feel in it, which are not available in traditional museums.
Researchers at Institute of Precision Engineering of Tokyo University have developed a virtual sculpture system. Using the system, people can use virtual clay to mold the shape they desired. This system has the position measurement device to determine the finger's movement of virtual clay, and express its location continuously. Moreover, it contains motion control system in order to restrict the movement of the fingers and generate the haptic sense of touch. The motion control system also records the press when the fingers touch the clay. In this way, people can knead clay in the virtual world with the same feeling in the real world. With the development of these virtual museums and the construction of virtual systems, it will greatly influence the art research and accelerate its process of dematerialization.

7. Discussion

In this paper, we discussed the influence of the information technology on the art research and systematically examined the changes in art media, new art form and art research communication. Information technology has brought great impact to art research and provided new opportunities for the development of art research. New ideas and ways of thinking inspired by information technology give us more dimensions to consider art research. Moreover information technology leads the art research into the immaterial era, provides a greater variety of artistic possibilities and allows us to get rid of the shackles of the old notion.

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9. References