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Art Design Education in the New Era Featured with the Integration of Arts and Motion Sensing Technology

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ABSTRACT

Art forms change with the development of technology in different times, which constantly challenges art design education in different eras. The purpose of this article is to study how to offer art design education that meets the needs of technology in different times both in contents and philosophy. First, a general integration module is proposed via a deep analysis on the continuously integrating and developing relationship between arts and technology based on an understanding on art concept. Then, the trend of the combination of motion sensing technology to art forms is pointed out with a detailed introduction to motion sensing technology categories and their integration forms. Finally, a new era art design education concept that meets the trend of arts and technology integration as well as new art design education contents under the background of motion sensing technology are concluded.

Keywords: art design education, integration of arts and technology, motion sensing

INTRODUCTION

The purpose of art design education is to cultivate the competence to express art contents. While the mental creation process of art contents at its spiritual level is invisible and requires long-time self-accumulation which mainly relies on unconscious art edification, the cultivation of expressing skills of art forms is realized via teaching and practice. It is obvious that with the advancement of times, art forms that can be used to express art creation contents have become various, thus posing a challenge to art design education in the future.

THE RELATIONSHIP BETWEEN ARTS AND TECHNOLOGY

The definition of arts and its relationship with technology is studied in the following section.

Definition of Arts

Aestheticians have proposed different art definitions, which all focus on a clue of “artists-artworks-audience” and can be summarized as the following. “Meaningful Forms” defines arts according to the nature of artworks. “Arts Equals Imitation” defines it from the relationship between artworks and other objects. According

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State of the literature

- How to develop and realize art design education, especially that related to skills to express art forms in the future? In order to answer this question, the author makes an analysis from the perspective of the relationship between art definition and technology development and comes to the first conclusion on art design education principles. Then, the author studies the general module which integrates arts and technology development and draws the second conclusion.
- Based on the previous study results, the author proposes the idea that motion sensing technology will be the major trend that integrates with arts development in the future. With an analysis on the changes in art forms brought about by these technologies, the author suggests the ways to integrate them into art design education.
- In the end, the author puts forward the framework that represents the motion sensing relationship between audience and art works as well as analyses the corresponding art design education contents, methods, and key points.

Contribution of this paper to the literature

- First, the author creatively puts forward the new idea to understand the relationship between arts and technology, and comes to the following conclusion: the learning of advanced technology should be included in art design education because the spiritual function of arts is expressed via the physical forms created by technology.
- Then, the author proposes a general development module that integrates arts with technology, and comes to the conclusion that with the development of times and technology, it is necessary that artists continuously learn and master new art forms. The life of art design education innovation lies in the discovery and teaching of the most valuable new art forms, that is, the new technologies that can be used to realize the spiritual function of arts.
- The author points out the art design education contents, methods, key points and the trend of integration of art design education and technology education in the new era with the tendency of motion sensing technology development via the study on the developing module of technology advancement and motion sensing technology as well as the construction of the motion sensing framework between the audience and art works.

to Goodman, "Works of art is something that is symbolic in some way". "Arts mean the expression of artists' emotions" is a traditional definition which defines artworks based on the artists who create them. Wolheim's "art" is what we intend to treat as a work of art which is defined according to audience. Beardsley's definition is based on artists and art public-- "Arts is made. The artists' intention is to give it the ability to satisfy the art public's aesthetic interest". Dickie's Art Theory and Dan's Art World Theory give a summary of artworks, artists, and art audience. Levenson's Historical Arts defines it on the basis of arts history (Xu, 2008).

In the history of western aesthetics, the definitions of arts mainly focus on two aspects, that is, the internal features of arts such as aesthetic pleasure, emotion expression, etc. and the distinction between arts and non-arts. However, with the development of society, the appearance of new art forms and contents has kept challenging the traditional definitions. As a result, American aesthetician Morris Weitz first put forward the idea that arts is indefinable which was later defended and developed by Williom E. Kennick.

In fact, all the efforts to define arts are based on the hypothesis that arts have a unique feature that distinguishes it from other objects. However, the development of society leads to the revolution of art forms and contents, thus it is unlikely to find an answer when thinking from the perspective of art contents. In "Arts as Experience", John Dewey (2005) proposed a new perspective, instead of focusing on "what arts is", more attention should be paid to "the meaning of arts", that is, "what can arts bring?" (Li, 2011) From this perspective, the focus is on the relationship between arts and human with works of arts being the carrier of human's experience and emotions. The value is not in its history, materials, or craftsmanship, but in the contents and function it can deliver. It is obvious that artists try to record and express their experience, emotions, thoughts via creating works of art and excellent works of art often help audience appreciate the inner value and have aesthetic experience.

Review of the Relationship between Arts and Technology

Based on previously discussed understanding of arts, arts and technology not only differ from each other but also supplement each other.

On the one hand, the key element of arts is human's subjective emotions and experience regardless of the objective expression forms. On the other hand, technology is human's knowledge and competence acquired via constant exploration of objective matters and theories. The former summarizes human civilization from the perspective of subjective emotions while the latter concludes it from objective knowledge. Human beings are full of intelligence and emotions and have various mental needs which are dependent on certain material basis. In other words, the core of arts is at the spiritual level represented via material matters. Technology is the accumulation of human competence to learn and understand the physical world. This well explains the phenomenon mentioned in the previous paragraph that as a result of the continuous changes in art forms due to the development of society, the form and contents of arts are constantly challenging and reforming the previous definitions.

According to the above analysis, the relationship between arts and technology corresponds to the two contents of art design education. First, the spiritual function in art definition matches with creativity training in art design education. Second, technology forms that deliver art contents match with skill training in art design education. Therefore, it can be concluded that the learning of advanced technology should be included in art design education because the spiritual function of arts is expressed via the physical forms created by technology. Therefore, in the content of comprehensive art design education, it must include the corresponding technology education content at the same time. And design education will become more and more a multidisciplinary system (Pyoung, 2016).

DEVELOPMENT PROCESS AND MODE OF INTEGRATION OF ARTS AND TECHNOLOGY

Changes in Art forms with the Development of Technology

It can be concluded that the development of arts is always with that of technology. The application of new technology often leads to the improvement of art forms and contents. Therefore, the history of arts is also a history of the improvement of art tools and materials.

For example, in ancient times when red earth is the only available painting color, single colored rock painting became the only art form. In the Neolithic Age, colored pottery with beautiful geometrical and animal patterns was developed thanks to pottery manufacture technology. With the development of metallurgical technology, bronze wares came into being, the materials for making metal wares developed from gold and silver to stainless steel and metal. It is possible that the stainless wares we use nowadays will be an art treasure in a few years. What's more, being an important form of art presentation, painting category is also closely related to the development of technology. While classical painting aims at recording images with a focus on reality, the invention of camera puts an end to classical painting and leads to the emergence of various schools such as post-impressionism, abstractionism, and fauvism, etc. It is interesting that the original motivation to the invention of a camera was to create a tool that could save the painting costs (Li & Wen, 2010)..

Therefore, due to the close relationship between arts and technology, it is important to conclude the integration modes and explore the future development.

General Mode of Integrated Development of Arts and Technology

It is true that the presentation forms of arts are developed with technology in order to meet human's spiritual needs. The exploration of arts and technology integration can be divided into two levels. One is the general mode that facilitates the joint advancement of arts and technology, the other is the study into the development and change in art forms with the application of modern technology. [Figure 1](#) illustrates the contents at the first level.

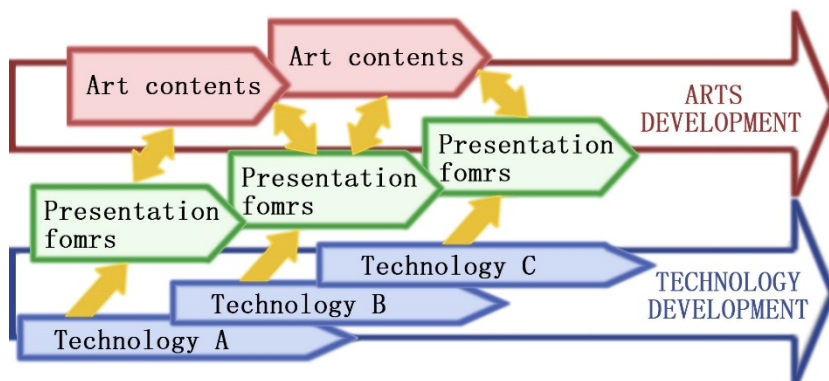


Figure 1. General Mode of Integrated Development Mode of Arts and Technology

According to **Figure 1**, art development mainly includes contents and forms. Various art contents and different forms integrated with different technologies lead to lots of art expression categories. For instance, Painting resulted from integrating arts with coloring technology. Stone carving, wood carving, jade wares, metal wares, glass wares, etc. is the product of integrating arts with material processing technology. Clothes and fabrics came into being by integrating arts with textile technology. Music came from integrating arts with sound technology. Photography, film and television, animation, games, exhibitions, etc. are the result of integrating arts with different display technologies. The development of technology not only brings new art forms but also more colorful art contents based on the new forms.

Therefore, conclusion can be made that with the development of times and technology, it is necessary that artists continuously learn and master new art forms. The life of art design education innovation lies in the discovery and teaching of the most valuable new art forms, that is, the new technologies that can be used to realize the spiritual function of arts. According to the author, motion sensing technology is the most valuable technology that integrated with arts in the near future.

INTEGRATED DEVELOPMENT TREND OF MOTION SENSING TECHNOLOGY AND ARTS

The Relationship between Motion Sensing Technology and Arts

As can be concluded from the previous discussion, the main outcome of the integration of arts and technology is the development and change in art forms. From the perspective of interaction technology development, art developing trend can be studied at the second level previously mentioned -- application of modern technology.

The interaction between human and objects changes with the development of technology. Arts is the most important object that satisfies people's emotional needs. The whole process of art creation and appreciation is the interactive process between human and objects that participate in art activities. Therefore, interaction technology is a major category of technology that mutually develops with arts. The history of interaction can be traced back to "Jing Fang Yi Zhuan" which delivered the meaning of being complementary to each other and being alternative. It is obvious that interaction emphasizes the mutual influence. The concept of interaction design has gradually been attached importance since Bill Mogrange first proposed Interaction Design in the middle of 1980s. The developing trend of modern arts is more focus on the interactive relationship between works and humans. The relationship between the art contents and audience has change from the former single way information delivery to mutual influence, which reflects the essence of interaction. Actually, the rapid development of interaction technology promotes the continuous improvement of interaction design in art creation, which can be demonstrated in **Figure 2**.

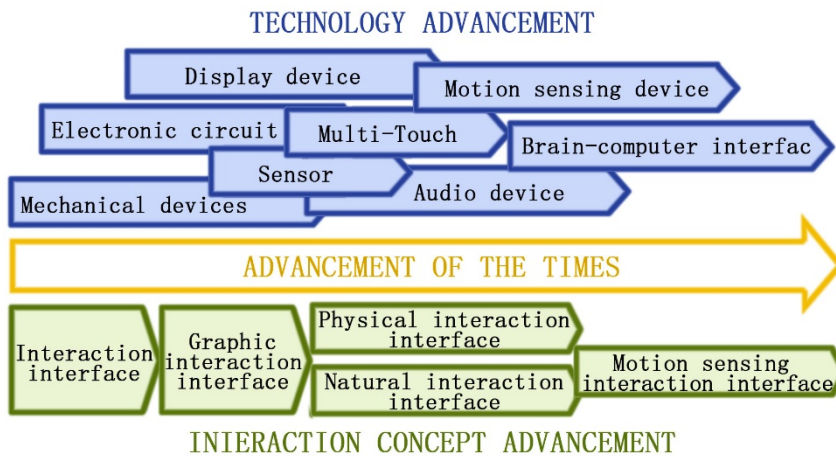


Figure 2. Technology Development and Interaction Concept Development

Motion Sensing Technology – Major Integration Trend

The earliest human interaction with objects directly depends on objects themselves such as sculptures, paintings, works of art, etc. Later, the integration of mechanical objects with electronic sensing control led to audio-visual technology and electronic display devices. The invention of screen transformed the presentation of arts which resulted in art categories like films, animation, etc. The present interactive relationship between human and objects puts forward the concept of the distinction between physical interaction interface and natural interaction interface (Papanek, 2012). In 1997, Prof. Hiroshi Ishii of Massachusetts Institute of Technology, America proposed the concept of physical interaction interface, which makes a distinction between object and non-object interface in the process of human object interaction with the purpose of emphasizing the importance of humanization and intuitive interaction realized via physics basis. As a result, digital divide is reduced. Natural interaction focuses on the humanization, naturalization, and simplification of interaction between human and objects (Cao, 2011), which can be best realized via motion sensing technology.

Motion sensing refers to the direct interaction between body language and objects without any control devices, which enables the audience to interact with art forms more easily, better appreciate them and thus having more real and stronger feelings. The understanding of motion sensing includes two levels, that is, motion and sensing. The former means human body while the latter refers to the mutual information delivery, either the sensing from human to object or vice versa. Nowadays, more and more art categories with the feature of interaction have come into being. The realization of motion sensing means adjusting the art contents according to information gathered from human body (from human to object named controlled information) which affect human feelings via various means (from object to human named display information). In art presentation, if art contents can be designed and created via the mutual information delivery, better effects and deeper immersion experience (Sanabria & Jesús, 2017) can be achieved. In other words, the display information presented can be adjusted to the audience's different control information, thus satisfying the audience's different needs and states and bring better interactive experience (Qin & Yu, 2015).

MOTION SENSING TECHNOLOGY AND ITS INTEGRATION WITH ART DESIGN

Motion sensing technology can be divided into motion sensing control technology and motion sensing display technology. The following is a brief introduction to the present technology and its development. Besides, by analyzing the changes of art forms brought about by these technologies, this paper puts forward how to combine motion sensing technology into the content of art design education in the future.

Motion Sensing Technology and Its Development

Motion sensing technology mainly includes hand gesture recognition, facial recognition, facial expression recognition, eye tracking, motion capture, posture recognition, physical signal monitoring, and brain wave identification, etc.

Among these technologies, hand gesture recognition and motion capture have a relative mature development. The motion technology based on image and video can identify human motion and posture (Shotton et al., 2011), which is very suitable to be applied to various interactive games, films, or virtual reality works. Besides, the analysis of human body's figure, size, clothes, hairstyles, etc. can serve as the judgment standard when designing art contents for different gender, age, identity, etc. The most widely applied recognition technology based on computer vision is the 3D motion sensing camera Kinect developed in November 2011 by Microsoft, which can be used to realize the design for various motion sensing display interface. For example, design application to virtual campus, large touch-screen interaction, etc (Zhai, Zhao & Huang, 2015). What's more, computer vision technology can be used to conduct facial recognition, facial expression recognition, eye tracking, etc. Human face recognition technology can identify human identity via comparing gathered facial characters like size, organs, etc. with the existing face database. In recent years, with the development of face detection and recognition, research focus has moved to more accurate areas such as expression analysis, age evaluation, etc. , all of which can help provide different art information to different identities in the process of motion sensing interactive design.

Physical signal monitoring and brain wave recognition technology now still use sensing elements to touch human body. There has been a wide application of physical signals such as blood pressure, heartbeat, respiratory rate, etc. to medical and nursing fields. The measurement and application of brain wave is now under research. It is sure that with the development of technology, all the above mentioned technologies will be applied to art design in the future.

Motion Sensing Display Technology and Its Development

Motion sensing information display technology has developed with a great variety ever since the introduction to the concept of natural interactive interface. The ones that attract the most attention, enjoy high practical value and frontier developing space include touch-screen technology, computer virtualized reality technology, 3D display and naked eye 3D, etc (Wang & Wang, 2010).

Touch-screen technology has developed into maturity and is increasingly employed in modern display design, such as the application of large touch-screen to public interactive space design. Virtualized reality technology has become the mainstream and widely used in areas such as education (Lin, Wang, Kuo & Luo, 2017). Besides the patent software developed by large companies such as EMC, IBM, Microsoft, etc, there are many OSVR that can be used to display real and vivid information. For instance, Linux's full function virtualization solutions KVM (Kernel-based Virtual Machine).Virtual machine monitor Xen developed by Cambridge University. Operating system level virtualized technology OpenVZ based on Linux kernel. Virtualized project Lguest proposed by the engineer Rusty Russell, etc (Alatalo, 2011). At present, naked eye 3D is familiar and 3D display is developing rapidly. Japan, Korea, and countries in Europe and America started the fundamental research into 3D display in 1980s and developed many technologies and products (Dodgson, 2005). By comparison, although China started relatively late, there are certain research achievements by scientific research institutes and enterprises.

Besides the above-mentioned vision-oriented motion sensing display technology, there are many other motion sensing display modes that can be applied in art design. For example, acoustic audio effects achieved via multi-channel stereo technology. Adjustment of temperature, humidity, wind speed, air volume, and even the smell of the air via air conditioning device, Realization of more exercises, balance or weightlessness via space device. All of these can stimulate audience's various experiences and form an art environment.

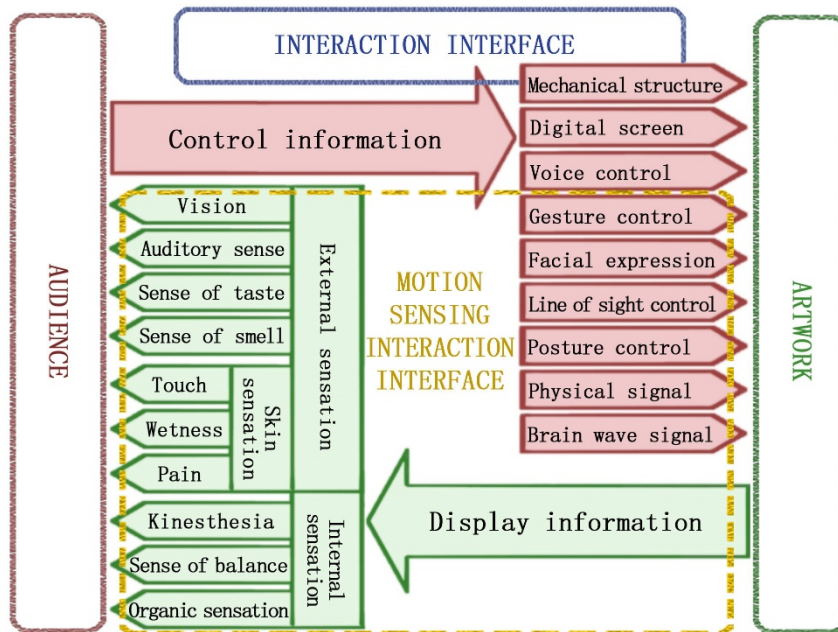


Figure 3. Motion Sensing Relationship between Audience and Art Works

New Art Design Education Contents with the Trend of Motion Sensing Technology

The application of motion sensing technology to the creation of art design works mainly lies in the presentation of more intellectualized, more real, and more informative works of art. The realization of comprehensive information communication and interaction between art design works and audience is the major developing trend in the future. The corresponding art design education contents are the various applications of motion sensing technology to artwork representations. Obviously, this requires educational institutions to provide students who study art design with the principles and applications of motion sensing technology, at the same time, using a variety of interactive technology teaching means (Hao & Xiao, 2017) to cultivate creative thinking and design method of students.

The motion sensing relationship between art work presentation and audience is shown in **Figure 3**. As can be seen from the figure, with the purpose of helping students to master new skills of artwork presentation, the first element to consider in art design education is how to introduce the basic principles and features of various motion sensing control information technology and display information technology, which is similar to material technology introduction in traditional artistic techniques. The only change is in the specific contents of the techniques. Of course, due to the practice-oriented nature in art creativity education, the new materials, techniques and crafts are expected to be combined with artwork analysis and creative practice. The appreciation and creation of modern artworks that make use of motion sensing technology are all experiment-oriented. Therefore, the contents in work analysis and practical creation should be flexibly chosen in the process of teaching. In addition, changes in the perceptive mode and strength of the appreciators' aesthetic experience are affected by changes in interactive modes from the perspective of the spiritual function of artworks, which is an area that should be attached importance to.

What should be emphasized is that the learning of new technology application does not collide with that of classic artworks and techniques in art creation. Just as the summary of the integration of arts and technology, the judgment on the deep integration of artwork presentation with motion sensing technology in the future is based

on the summary on the past arts development history. The innovation of art forms in the new era cannot be separated from the learning and understanding of classical artworks in different historical periods.

CONCLUSION

In conclusion, through the deep analysis on art definition and the history of art presentation forms development, a continuously developing trend of integration between art design contents and various technologies can be found. The former focuses on the realization of aesthetic function, while the latter concentrates on the physical forms that can provide art presentation. The nature of the relationship lies in the continuous supply of new forms and means to present artworks with the help of technology development, which requires art design education contents to keep pace with the development of the times. As a result, instead of excluding the study of advanced technologies, art design education should always seek the new presentation forms resulted from new technologies. Nowadays, the development of motion sensing technology has brought unprecedented aesthetic experience and forms, which not only provides brand new space to art creation, but also serves as a key element in future art design education. The principles and contents should actively follow the tendency of this interactive reform, and more motion sensing technology courses should incorporate in art design education. Only in this way, can the most valuable creative skills and tools be obtained by students.

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