

## *Retraction*

# **Retracted: The Application of VR/AR Technology in Graphic Design Based on zSpace**

### **Wireless Communications and Mobile Computing**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

### **References**

- [1] L. Liu and M. T. Nhung, "The Application of VR/AR Technology in Graphic Design Based on zSpace," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 1668296, 7 pages, 2022.

## Research Article

# The Application of VR/AR Technology in Graphic Design Based on zSpace

Lulu Liu<sup>1</sup> and Minh Tien Nhung<sup>2</sup> 

<sup>1</sup>Media and Communication College, Xi'an Peihua University, Xi'an, Shaanxi 710000, China

<sup>2</sup>Faculty of Social Sciences and Humanities, Ton Duc Thang University, Ho Chi Minh City 700000, Vietnam

Correspondence should be addressed to Minh Tien Nhung; [nhungminhtien@tu.edu.vn](mailto:nhungminhtien@tu.edu.vn)

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The arrival of the information age has promoted the rapid development of information technology, and the birth of VR and AR technology has brought many changes to the emerging technology fields. R&D and progress of VR and AR technology highlight outstanding achievements in the information age. In the future, VR and AR technologies will bring huge economic benefits to related industries, and at the same time, they will lead the future of related industries. Virtual reality technology has evolved for decades since its birth. As a new technology, VR has greatly changed people's daily life. No matter in the field of graphic design or interior design, it can be used as a special technical means to effectively penetrate between abstract thinking and entity, thus promoting the change of people's design thinking. Therefore, VR technology has been paid more and more attention in recent years, so it is widely used. With the strengthening of China's national strength, VR/AR technology based on zSpace has been more and more applied to the field of graphic design. Therefore, this paper takes VR/AR technology based on zSpace as the research object, analyzes the application of VR/AR technology in graphic design in detail, sorts out the advantages and existing problems of VR/AR technology in graphic design field, and discusses the role of emerging technologies in graphic design field, hoping to provide reference and help for the improvement of virtual reality technology in graphic design field.

## 1. Introduction

As a new virtual reality educational equipment in recent years, zSpace has developed rapidly. zSpace is also increasingly supported by teachers and students because of its natural interaction, freedom of movement, visualization of content, virtual environment, easy control, and real experience [1–3].

In the process of technological progress, VR and AR technologies are constantly improving. In the field of games and daily life, both VR and AR will lead the development of new trends of the times. This is the result of the combination of electronic information technology, high technology, and the times [4, 5]. Therefore, China must actively support the development of new industries such as virtual technology [6]. Therefore, the scale of VR and AR in the market has increased

dramatically. In the process of technological progress and industrial development, it is necessary to adopt strategic planning methods to further develop VR and AR industries, so that VR and AR technologies can push the electronic information industry to a more rapid development era [7–9].

While the development and popularization of Internet VR/AR technology have brought great changes to human life, these technologies are also being widely used in modern graphic design. Virtual reality (VR) technology includes simulation technology, computer plane technology, man-machine interface technology, multimedia technology, sensing technology, network technology, and other technologies [10–12]. It will generate a simulation environment through the above technologies and conduct a systematic simulation. The system simulates multi-information fusion, interactive

3D dynamic vision, and entity behavior, and users can immerse themselves in the virtual environment, which is the uniqueness of VR technology [13, 14].

## 2. zSpace and VR/AR Technology

**2.1. zSpace Interactive Mixed Reality Technology.** The Chinese name of Z is interactive mixed reality technology, which can provide the ultimate learning experience such as digital learning, which can stimulate people's curiosity and enhance their understanding [15, 16]. zSpace consists of two parts, hardware and software.

Its hardware products have the following characteristics, such as head tracking will keep the stereo effect with high fidelity. By changing the position of the glasses in the tracking area, the image can be automatically adjusted while maintaining the reliability of the image, which is helpful for the user's visual experience and highlights the humanization of the product [17]. Tracking system helps 3D applications to provide a real immersive experience. Just as moving glasses will change the actual field of vision, the application will also adjust the viewing angle. And the tracking camera can ensure that the light pen interacts with the virtual object in the tracking area [18, 19].

However, the software part of zSpace includes Franklin Lab, Virtual Science, Leupold (art software), visualized human body, Marie Curie elements, and Euclid model, and it also requires hand tracking technology, tactile feedback, stereo, network transmission, and audio input/output technology [20, 21].

**2.2. Virtual Reality (VR) Technology.** Virtual reality (VR) technology refers to the establishment of virtual space environment by computer and real-time simulation interaction by visual, tactile, and other perceptual methods. Virtual environment refers to the use of computer plane system and various interface devices to display and control the interactive three-dimensional environment generated on the computer.

VR technology is an important direction of simulation technology, simulation technology and computer graphics, man-machine interface technology, multimedia technology, sensor technology and network technology, and other cutting-edge technology, and the combination of as a cross-technology and VR technology has certain difficulty; at the same time, VR technology is a very challenging frontier discipline and research area.

In the past two years, benefiting from the residential economy, the global VR industry has experienced explosive growth, with shipments reaching 6.7 million units in 2020, a year-on-year increase of 70.4%. It is expected to approach 15 million units in 2022. The forecast of global VR shipments from 2018 to 2022 is shown in Figure 1.

China's VR shipments will be 1.9 million units in 2020, and it is expected to reach 5 million units in 2020. The forecast of global VR shipments from 2018 to 2022 is shown in Figure 2.

In September, 2021, the top ten patent applications in the global virtual reality industry were Tencent Technology

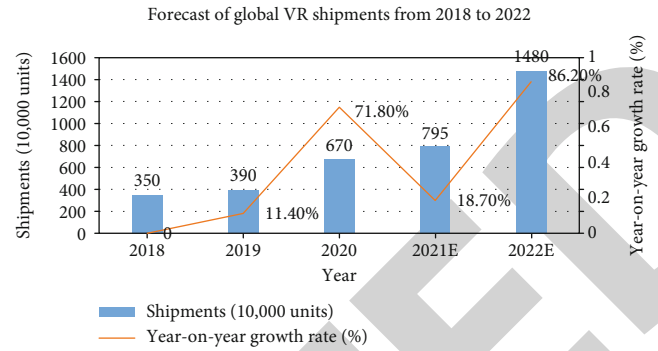


FIGURE 1: Forecast of global VR shipments from 2018 to 2022.

Co., Ltd.; LG Electronics Co., Ltd.; Goer Optical Technology Co., Ltd.; Samsung Electronics Co., Ltd.; BOE Technology Group Co., Ltd.; State Grid Corporation; Microsoft Technology Licensing Co., Ltd.; Facebook Technology Co., Ltd.; and Google Co., Ltd. Among them, Tencent Technology Co., Ltd., has the largest number of virtual reality patent applications, with 709 applications. LG Electronics Co., Ltd., ranked second, with 526 virtual reality patent applications. Statistics on the number of patent applications in the global virtual reality industry in September 2021 are shown in Figure 3.

**2.3. Augmented Reality (AR) Technology.** Augmented reality (AR) is a new technology that integrates the world in the real environment with virtual information. Through computer synthesis technology, virtual information is loaded into the real image world, and information is received by human senses, and the real-time environment and virtual information are imported into the image screen in real time, so as to realize the feeling and experience beyond reality. Therefore, AR technology is a new technology that integrates the real environment world and virtual information. It will load virtual information into the real image world through computer synthesis technology and load the picture in real time through the real environment and virtual information.

Augmented reality goes beyond the simulation and simulation of reality to enhance participants' perception of the real world, that is, things that are not perceivable or inconvenient to perceive. For example, when a user goes to an auto show and takes the relevant equipment to look at the car, all kinds of information of the car will be displayed on the equipment, so that the user does not have to ask or query information. Augmented reality is the goal and final form of VR technology development but is limited by the development of related technologies.

Augmented reality (AR) has been developed for decades, so AR technology is becoming more and more mature. In some movies and animations, the appearance of AR makes us see fantastic technological scenes that we never felt before. In real life, AR technology has also been applied in mechanical, medical, construction, automobile, graphic design, and other fields, and its scale is increasing year by year.

For example, Apple released in 2017: let more people really feel the charm of AR through iPhone. For this reason, the data of AR-related products in the entire App Store from

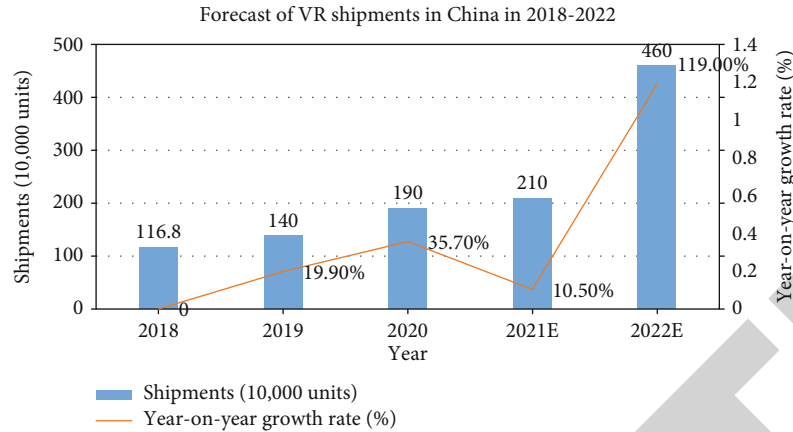


FIGURE 2: Forecast of VR shipments in China from 2018 to 2022.

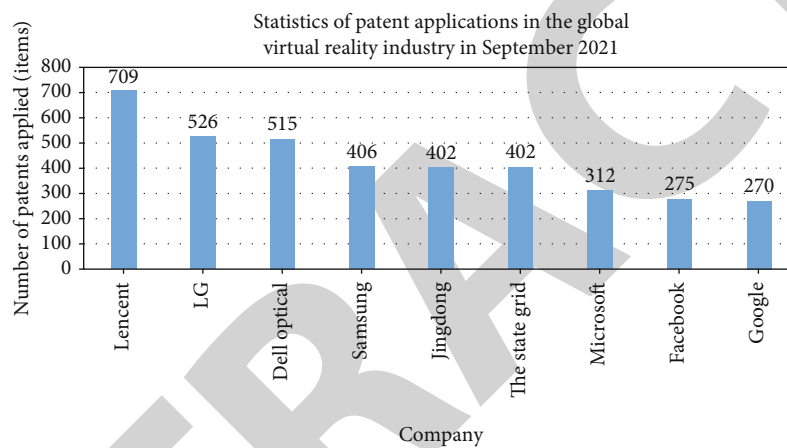


FIGURE 3: Statistics on the number of patent applications in global virtual reality industry in September 2021.

2009 to 2019 are counted. Among them, 2018 is the year with the highest number of new AR products, with 4,154 new products in. The changes of AR-related products online in App Store over the years are shown in Figure 4.

### 3. Development of VR and AR

**3.1. Development Status of VR/AR Technology in China.** China's VR/AR technology is still insufficient in promotion and publicity, which leads to many people having no idea about VR and AR technology, let alone contact with it. According to relevant institutions, China hopes to promote VR and AR technologies quickly in the short term. At the same time, in order to improve product quality, it is necessary to pay more attention to choosing appropriate means to promote the concept of VR to consumers.

Many hardware devices and application software related to VR have been listed, because VR is relatively low in technical difficulty compared with AR, so its industry threshold is relatively low. Therefore, among them, AR is more versatile, and it can play an important role in industry, medical treatment, graphic design, retail, games, and other application fields. Therefore, in the long run, the value and market

competitiveness of AR technology are superior to VR technology.

At present, VR display terminals are in the early stage of development in China, and major domestic operators are developing different types and ways of VR interactive solutions based on their own advantages. Therefore, there are various VR display terminals with interactive modes on the market at present, such as remote control, touchpad installation, binding handle, and some products with gesture recognition function. The coexistence of these various forms of interaction VR products has contributed to the great situation of VR technology, equipment, and interaction modes.

However, the current situation of domestic AR market is still in its infancy, so it is necessary to effectively integrate various industrial resources. In fact, this also shows that the VR/AR market has greater possibility and development space. Therefore, if you want to enjoy the benefits and benefits generated by the industry, you need the participation and joint efforts of everyone from all walks of life.

**3.2. Market Size Forecast of VR/AR Industry in China.** Published by China Industrial Information Research Network Research Report on China's VR/AR Industry Market Depth Analysis and Investment Prospect Forecast from 2017 to

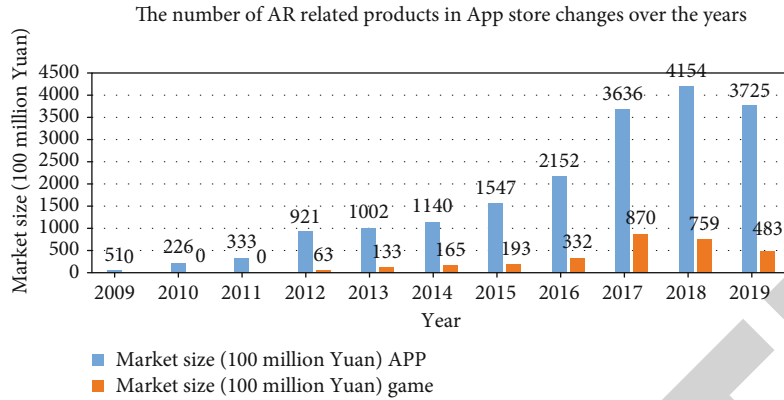


FIGURE 4: Changes in the number of AR-related products online in App Store over the years.

2022, according to the data, from 2018 to 2022, the AR market will surpass the VR market and reach 326.93 billion yuan in 2022, three times the size of the VR market. It is expected that the VR industry will continue to grow in the next few years, but the growth rate will slow down. At present, AR/VR technology is under further research and development, such as 3D tracking, reconstruction, and gesture recognition. These technologies will bring new experiences in different application fields. The analysis of China's VR/AR market size from 2017 to 2022 is shown in Figure 5.

Therefore, the current domestic AR market is still in its early stage, and it still needs the efficient integration of various industrial resources and the mutual integration of soft and hard cloud data. This mismatch in development also indicates that the VR/AR market has huge potential and space for development, which requires the participation and joint efforts of the industry to share the benefits and profits of the outbreak of the industry.

**3.3. Global VR/AR Investment and Financing Status.** 2016 is called the first year of VR. According to VR gyro data, in 2016, the amount and quantity of global VR/AR investment reached a small peak, reaching 26.18 billion yuan and 203 cases, respectively. However, the VR/AR technology has not achieved a revolutionary breakthrough, and the pain points of vertigo and delayed experience still exist. Therefore, the capital is becoming more rational, and the investment enthusiasm has declined. In 2021, home isolation drove the end users' demand for immersive experience in the real world to rise and then superimposed the "overnight explosion" of the metauniverse concept. VR/AR became a hot spot for investment. There were 340 investment events throughout the year, with an investment amount as high as 55.6 billion yuan, a year-on-year increase of 128%. The global VR/AR investment amount and number of events from 2015 to 2021 are shown in Figure 6.

**3.4. Application of VR/AR in Graphic Design.** Graphic design, also known as visual communication design, uses "vision" as a means of communication and expression, creating and combining words, symbols, and pictures in various ways to create visual expressions used to convey ideas and information. Graphic design occupies a mature position in

today's design market. Its services include advertising posters, packaging design, book cover design, and other design requirements. Therefore, graphic designers can design new works by combining their professional skills with VR/AR.

In the current VR technology, the creation of virtual scenes and data will certainly support modeling software, such as Maya, 3Dmax, and other commonly used modeling software. In the practical application of VR technology, users must wear VR devices for immersive browsing. In order to build a virtual reality model, that is, the unit engine of VR browsing function, the designer must incorporate the built model into the unit engine of the development platform. At this time, it is enough to just change the model data. The camera recognition technology in VR and AR can project virtual information into the actual environment. At present, VR technology and AR technology used to identify information mainly include two-dimensional code recognition, image recognition, geometric recognition, specific object recognition in actual environment, terrain recognition, and position coordinate recognition. The following is the application of VR technology in graphic design based on the above information identification method.

**3.5. Application of VR Technology in Advertising Poster Design.** The core of poster design is the communication of content, and the traditional forms of expression are mainly poster pasting and advertising space placement. When VR technology is used in advertising poster design, on the surface, advanced technology is used to provide users with a new way of communication, that is, a new experience, but the core of advertising poster design will not change. Therefore, designers must use specific logical concepts, modeling ability, and story ability, as well as scene layout in the design process, guide users according to the designer's thinking, and make users try their best to understand the core of the work.

**3.6. The Application of AR Technology in Book Design.** Book design includes design elements, such as front cover, back cover, spine, and waist cover. The main visual elements are the front cover and the back cover, usually consisting of digital graphic design and illustrations. Using AR technology, the virtual model can be integrated into the actual environment, and the book cover can be identified by image



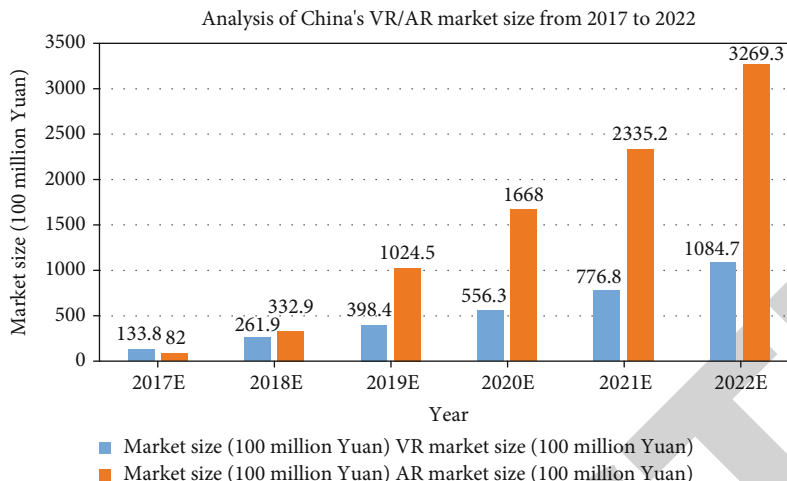


FIGURE 5: Analysis of China's VR/AR market size from 2017 to 2022.

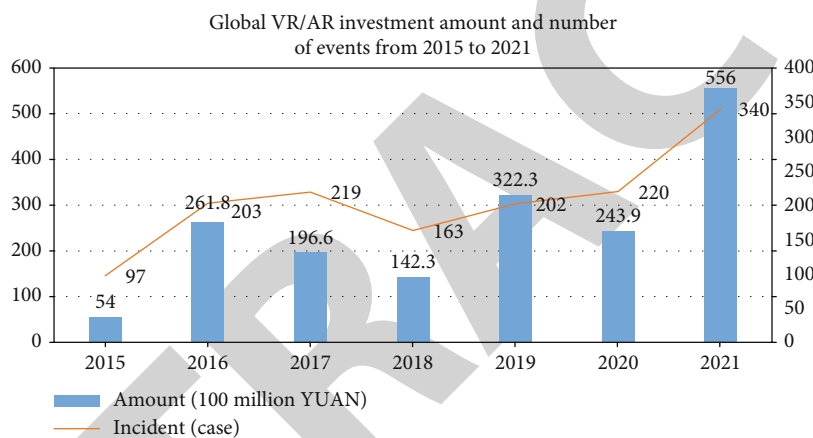


FIGURE 6: Global VR/AR investment amount and number of events from 2015 to 2021.

recognition and QR code recognition, so that more virtual information can be obtained to strengthen the book design. For example, if you scan the QR code on the back cover with a camera, the release time, version number, publisher, and other information of the book will be displayed on the device.

In order to have a better visual experience or interaction and to make books show excellent visual interaction effects, we must consider the design of two-dimensional plane and three-dimensional space. The realization of VR technology is closely related to the material of 3D modeling. At present, the main trend of graphic design is to use modeling software such as C4D to create models and export images for the next design, but graphic design and traditional graphic design are still the mainstream. Therefore, when the designed two-dimensional works need to be converted into three-dimensional works, designers need to understand their own designs more reasonably and clearly and add space elements into the design when carrying out graphic design. That is, imagine a two-dimensional plane as a three-dimensional space, and determine the spatial position, occlusion relationship, and other elements of the object. In the actual design work, the screen elements can be layered

according to the design concept, and the plane elements of each layer can be processed according to the requirements of Unity engine.

*3.7. Application of VR/AR in Packaging Design.* Packaging mostly exists in the real environment in the form of solid geometry, but at present, innovative applications of product packaging design are reflected in product packaging shape and appearance design. Using VR technology and AR technology to identify specific objects in the real environment and the characteristics that users can interact with virtual information can achieve a further breakthrough in product packaging design.

Take the peach product packaging box as an example; the previous work can be carried out according to the previous product packaging design process. After the finished product of the packaging box is made, the packaging box can be imported into Unity engine and identified and logged in, so that virtual information can be added according to the requirements. For example, after identifying the packaging box, you can see the interactive interface around the packaging box with the number of products in the box, the expiration date of the products, and the production date of the

products, so that users can selectively obtain the required information. Or when the product packaging is recognized and the mascot of the brand will pop up, interact with the mascot and get the corresponding information. Take the health care products or medicines that need to be taken regularly as an example, attach a component with positioning function to the medicine package, identify it in Unity engine, choose positioning identification method to generate virtual information in the real environment, and finally link with the application of intelligent mobile device, which will send out a reminder when the scheduled time for taking medicine arrives, and open the application to enter the camera shooting interface, so that virtual information can appear near the actual products on the device. On the one hand, it realizes the reminding function; on the other hand, it also realizes the product searching function.

From the comprehensive analysis of virtual reality technology and the basic characteristics of virtual reality technology, we can intuitively understand that virtual reality technology can be used to create a perceptive and immersive, interactive, and autonomous virtual scene, and designers can directly experience the impact of the scene to the audience through head-worn devices and then targeted to the composition of the scene, lighting, and other factors for adjustment. The well-known game "Pokémon GO" just uses this technology, so that players can participate in the game in the natural environment. However, it should be noted that designers should pay attention to the style unity of product packaging design and interactive interface design in the design process, because the change of environment and the application of new technologies make users feel detached easily, so they cannot associate virtual information with real information. The unity of design style can make users visually weaken this sense of detachment.

*3.8. Application of VR/AR Technology in Graphic Design Teaching.* Due to the need to cultivate active and imaginative design thinking in graphic design education, virtual reality technology has formed a virtual environment with realistic effects by constructing software and hardware platforms. This will help to strengthen students' sensory feelings in graphic design course and make them more immersive.

Modern graphic design education will pay more attention to the overall quality of graphic design education and the design level of students. Lecturers will also have a deeper understanding of students' thinking and give timely feedback and corrections. The combination of graphic design teaching process with VR and AR technology will stimulate students' interest in learning and enable them to learn graphic design in a brand new way.

Students can use VR technology to deeply participate in teaching and use virtual reality technology to maximize their imagination. This can not only better cultivate students' design thinking but also improve their innovative ability. VR and AR technology can also greatly save the model expenditure of the original graphic design teaching process, save the cost and space of graphic design teaching, and improve the economic effect of graphic design teaching. Students can change and optimize the design at any time, and

comprehensive quality improvement becomes realistic and feasible.

For graphic design education, deep cooperation and communication are of great significance in design teaching. Students can complete the practice of graphic design teaching in different forms, participate in multidimensional design space in various forms, and find out the advantages and disadvantages of each other's thoughts. In virtual reality technology, lecturers can also take part in it as students and cooperate closely with them, so as to improve students' initiative and form a harmonious teaching environment, and achieve a high degree of cooperation and unity between students and lecturers.

#### 4. Conclusion

With the rapid development of science and technology, more and more high technology has broken through the inherent thinking boundaries of human beings and is also replacing the traditional work content, impacting the design industry. However, the rapid technological development and software update still cannot replace the human brain. Under the background of this era of rapid technological development, contemporary designers should constantly think about the development direction of the industry and open up more thinking space.

As mentioned in this paper, virtual reality technology and augmented reality technology based on zSpace are important trends of people's scientific and technological progress and development. They can effectively improve the efficiency of graphic design and contribute to the continuous progress and development of graphic design industry in China. ZSpace, based on the field of graphic design, can develop designers' design thinking and cultivate their critical thinking and spatial imagination. It is believed that virtual reality technology will have more and more applications in the field of graphic design in the future.

There may be many problems in the application of virtual reality technology in the field of graphic design, so it needs the efforts of people from all walks of life and support for graphic design. Whether we are leaders, promoters, or recipients of technological innovation, what we have to do is to be inclusive and positive. In the future, we will see more possibilities for the application of VR/AR technology based on zSpace in graphic design.

#### Data Availability

The figures used to support the findings of this study are included in the article.

#### Conflicts of Interest

The authors declare that they have no conflicts of interest.

#### Acknowledgments

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