

Exploration of Technical Motivation and Aesthetic Pursuit of Virtual Film Production

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Abstract: As a revolutionary technology in the field of film production, virtual film production has gradually changed the way of film production and aesthetic pursuit with the wide application of digital virtual images since the 1990s. This paper deeply discusses the technical motivation of virtual production, including the integrated application of digital technology, the innovation of the production process, and the creation of a real-time visual environment. At the same time, this paper also analyzes the dual dimensions of the aesthetic pursuit of virtual production — creating visual wonders and pursuing image authenticity. In specific cases such as Avatar and Mandalorian, the profound influence of virtual production on the development of the film industry is revealed, and the embodiment of digital technology aesthetics in virtual production is discussed, as well as its contribution to the ontology of film, the expansion of theme and the exploration of time and space.

Keywords: Virtual filmmaking; Technical motivation; Aesthetic pursuit

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1. Introduction

Virtual production, as a brand new way of film production, not only changes the traditional production process but also profoundly influences the aesthetic pursuit of films. This paper aims to explore the technical motivation and aesthetic pursuit of virtual production, to provide a useful reference for the future development of the film industry, and to provide film creators with more abundant creative means and broad creative space. Even if the audience has a high demand for the film, the film will meet it. In the pursuit of visual wonders, the film production will also pay more attention to the authenticity and delicacy of the image, which will let the audience have the feeling of being in the scene, thus promoting the development of the film industry to a higher level.

2. A new era of technological innovation and aesthetic exploration

Since the 1990s, digital virtual images have been widely used. This marks a new development direction of film

production, and the way of film production and shooting has undergone great changes. As film director James Cameron has said, “There is a revolution underway in the art and technology of visual motion picture production that is bringing about such profound changes in the way we make films and other visual media that we can only describe the emergence of a digital Renaissance.” In this revolution, the integration of digital virtual images brings a double aesthetic experience to the film: first, to create a variety of breathtaking visual experiences, fully stimulate the audience’s exploration desire and curiosity; Second, to maximize the pursuit of the truth in the details of the film, to meet the requirements of some detail-controlled audience. Although digital virtual images have a century-long history in movies, it is the 2009 film *Avatar* directed by James Cameron that really attracted the attention of the world. It brought a whole new way of filmmaking and the concept of “virtual film production” into the film industry. The next decade brought even greater breakthroughs in filmmaking. In 2019, at SIGGRAPH, the top annual conference of computer graphics of the Association for Computing Machinery, a demonstration video integrating “virtual LED set” and “in-camera special effects” made an amazing appearance, showing a new production process that was completed simultaneously in shooting and post-production, marking the arrival of the era of “completely virtual production.” The first season of the American TV series *Mandalorian* using virtual production technology was also born this year, which aroused the attention and hot discussion of the film industry around the world, which will also see the influence of virtual production in real image production. Nowadays, virtual production has been integrated into film production, as it not only has a profound impact on the direction and mode of film production but also become an important force to promote the development of the film industry.

3. The challenge of virtual production

First, to build a fully functional virtual production environment, the film studios not only need to be equipped with high-performance computer software to deal with massive data, complex scene rendering, character animation, real-time synthesis, and other work but also need to use rich creative options and fine control means so that creators can freely exert their creativity in the virtual environment. It is also necessary to establish a complex and stable network connection system so that the data can be transmitted and processed in a high-speed environment, and at the same time, it can meet the requirements of collaborative creation. All of these require high investment, but this is just the beginning because, with the continuous progress of technology and the increasing demand for film production, the studios also need to regularly upgrade and maintain the virtual production environment to ensure that it can always maintain the leading technical level and excellent performance.

Second, the use of virtual film production requires creators to deeply understand the principles and methods of computer science. To effectively use computers to build and render, they need to be able to convert 3D models into realistic 2D images, which requires users to understand some knowledge of graphics and have rich experience in events. Film art is a discipline that integrates literature, drama, music, and other art categories, which needs its strong innovation ability and can give profound connotation to the transformation of virtual scenes and characters.

Third, when creating very realistic scenes and characters, virtual film production often faces the major challenge of how to maintain coherence and realism in dynamic interaction, especially in the field of character animation, how to make the actions and expressions of virtual characters natural and smooth and achieve the realm of consistency with the performance of real actors is the main problem to be considered. Moreover, this highly realistic virtual environment also brings new problems to the audience’s perception: on the one hand, it will make the audience confused between the immersive experience and the real, and it is difficult to clearly distinguish the

virtual and the real; On the other hand, if the virtual element and the real element are not properly integrated, it will produce visual disharmony and awkwardness, and then make the audience have a bad viewing experience ^[1].

4. The new realm of aesthetics driven by real-time and interactivity

The emergence of virtual production technology has not only reshaped the process of film creation but also profoundly affected the aesthetic pursuit of film art. Because, the core of virtual production lies in its technical motivation — real-time and interactive, which together build the technical driving force of pursuing the sense of presence shooting, and promote the innovation and leap of film production technology.

4.1. Real-time: Capture every wonderful moment

One of the highlights of real-time virtual production technology, it allows the film production team to instantly preview the virtual scene and special effects on the scene, mainly reflected in the capture of action and scene rendering can shorten the time of post-production, and improve the efficiency of production. Take the Avengers movie series as an example, in the process of shooting this movie series, the actors wear motion capture suits and perform in the virtual studio ^[2]. With the help of virtual production technology, the film team accurately recorded the actors' movements and expressions through real-time motion capture and rendered them into the virtual scene in real time. In this way, the director and production team can watch the effects of the virtual scenes and special effects on the scene, so that the shooting plan can be adjusted in time to capture every wonderful moment. Real-time performance will not only improve the efficiency of production but also allow the film production team to capture the best shots on the set, shooting many shocking battle scenes and special effects shots.

4.2. Interactivity: Building an immersive creation environment

Virtual production technology also has the feature of interactivity, which allows film production teams to freely create and modify in a virtual environment, thus breaking the boundary between pre-shooting and post-production in traditional film production. Take Ready Player One as an example, during the production of this film, the director required the film team to adjust the scene layout, character modeling, and special effects at any time according to the needs of the plot, to achieve the interactive construction of virtual production technology, so that the audience can be placed in a fantasy game world, become the protagonist of the film, and experience thrilling adventures and challenges with the characters. With the help of virtual production technology, the film production team can be more free to create and modify the work, showing a more shocking and imaginative visual effect ^[3].

5. Technical motivation and non-linear production process and virtual aesthetic leapfrog

5.1. Technical motivation: From linear to parallel production process

From original film photography to today's digital virtual production, film technology has been advancing and pushing cinematic art forward. The technological impetus for virtual filmmaking stems from the desire for more efficient and flexible production processes. In traditional filmmaking simulations, pre-shooting and post-production are two distinct stages, with a distinct divide. However, in today's era of virtual production, this boundary has been completely broken, because it is based on an unreal engine and LED background wall of virtual production, which will make the whole process of the non-linear characteristics, blurring the boundaries

of pre-shooting and post-production. Take *Interstellar* as an example, director Christopher Nolan uses LED background walls and virtual photography technology to preview virtual scenes and special effects on the spot in real time, improve production efficiency and shorten the time of post-production, so that the director can present perfect visual effects in the process of shooting. Virtual production technology will not only change the production process but also have a subversive impact on the production mode of traditional visual effects films, making film production more flexible and efficient ^[4].

5.2. Aesthetic pursuit: Aesthetic leap from reality to virtual

In traditional film production, the pursuit is often a realistic aesthetic, focusing on restoring the scene and atmosphere in real life. Compared with the virtual production era, people will find that it pursues the leap from reality to virtual. Take “*Avatar*” as an example. In the world of this film, the audience can feel unprecedented visual impact and aesthetic experience, because they create many fantastic scenes and characters, which break the restrictions in the real world and open a new aesthetic dimension. Because of virtual production, the pursuit is the relationship between the virtual and the real and lets the audience get a better experience.

6. Explore the reality of image: the trajectory of the aesthetic pursuit and technological evolution of film

Take *Interstellar* as an example, although the “film space-time interweaving technology” it uses is slightly abstract when showing the vast universe and multi-dimensional space, Christopher Nolan’s team skillfully guides the audience’s attention from the sense of abstraction to the wonder of the mystery of the universe with its unique visual narration, such as the visual wonder of wormhole crossing and the time warping effect at the edge of the black hole. *Life of Pi* goes a step further, with most of the film’s scenes and Pi’s maritime adventure partner, Richard Parker, a Bengal tiger, created by computer-generated imagery (CGI) with a level of detail that makes the audience feel as if they have personally experienced a thrilling ocean journey ^[5]. These masterpieces demonstrate the relentless exploration of cinematic aesthetics in the pursuit of photorealism. Photorealism is not only reflected in the fine carving of CGI elements but also in the digital simulation of natural phenomena and emotional depth that are difficult to capture in real shooting. In traditional film aesthetics, the integration of virtual and live-action elements often faces challenges, and it is difficult to accurately convey the delicate emotion and dynamic beauty of live-action shooting. However, modern film technologies, such as motion capture and expression capture, enable the animal characters in *Zootopia* to show rich facial expressions and smooth movements, as if the characters have real vitality, and the audience can feel profound emotional resonance. These innovations not only show the ability of virtual production technology to obtain realistic images but also reflect the profound pursuit of film authenticity. From the perspective of aesthetics, there are two concurrent aspects of film aesthetics — digital technology aesthetics and documentary aesthetics. Although virtual film technology seems to challenge traditional aesthetics, in fact, it is a new form of reflecting life or reproducing real life scenes. Digital technology aesthetics and documentary aesthetics not only expand the aesthetic form of film together but also open up a new aesthetic road for the creation of images in the digital age. In the restoration and presentation of images, because of the collision between the nature of spectacle and the nature of reality, the aesthetic meaning of virtual production technology constantly pursues the sense of reality of images that “imaginary objects” are generated. This makes the whole world a beautiful scene so that people’s needs are more and more satisfied. The film world also constructs a series

of beautiful scenes that gradually meet the audience's growing diversified needs, and then promote the virtual production technology in the technical innovation and aesthetic concept of double progress and development.

7. Cross-cultural communication and integration

The popularization and standardization of virtual production technology will inject a strong cross-cultural communication and cooperation ability into global film and television. This can break the regional restrictions so that different countries and regions of the production team can carry out deep cultural exchanges and integration, to promote the diversified development of film art. Take the Sino-US co-production of the film *Megalodon* as an example. The Chinese team and the US team participated in the planning, shooting, and post-production of the film, and virtual production technology was an important bridge between the two sides. The technology was used to create a virtual deep-sea environment, and computer simulations of *Megalodon* and other Marine creatures were also made. This allows artists from China and the United States to give full play to their creativity and expertise, and create film images that meet international aesthetic standards and have distinct cultural characteristics. The design of *Megalodon*, for example, combines Chinese cultural elements with American science fiction ideas; The setting of the plot and the shaping of the characters also integrate the cultural elements and values of China and the United States. Production teams from the two countries have also worked together to develop an efficient virtual production process. Cross-cultural cooperation and communication between film production teams can enable them to have a deeper understanding of the cultural characteristics and market needs of different countries and regions, to create film works that are more in line with the tastes of international audiences. These works can not only obtain higher box office revenue and word-of-mouth evaluation worldwide, but they can also convey the unique charm and values of different cultures in the process of cultural exchanges, and enhance the understanding and friendship between people of different countries.

8. Concluding remarks

In the exploration of the motivation of virtual production technology and aesthetic pursuit, the author found that every leap in technology is opening up a new world for film art. Virtual production not only subverts the traditional production mode but also leads film creators to cross the familiar creative boundary and step into a new creative era. From virtual production to visual virtual production, it is not only the continuous innovation of technology but also the realization of real-time interaction between creators and actors, so that "what you see is what you get" has become the new normal of film production. In the entanglement between the virtual and the real, the form of the film and the real demand play games with each other, and jointly deduce a new aesthetic form, so that the virtual image blooms wonderful charm in the extreme reality. However, the prosperity of technology should not cover up the pursuit of a sense of reality. As a unique audio-visual art, the film should seek the true meaning of beauty in the pursuit of truth, touch people's hearts with realistic image narration, and convey profound thinking. This is the future way for virtual production to lead film creation.

Disclosure statement

The author declares no conflict of interest.

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