

On the Path of VR Technology in Film and Television: Postprint Author: Zhang San Affiliation: Beijing Film Academy Abstract: This paper explores the application and development path of Virtual Reality (VR) technology in film and television production. By analyzing the creative practices and techn...

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Abstract

VR (Virtual Reality), as a revolutionary technology in visual science and technology, has currently been widely applied in multiple fields including film and television arts. Along with increasing industrialization and popularization, it has exhibited new characteristics in aspects such as technological advancement, artistic experimentation, and market layout. However, due to its relatively short development history and intense competition, there remain obvious deficiencies in technological progress, audio-visual performance, profit models, and other aspects, and it is still undergoing active exploration. It is believed that with the further development of VR (Virtual Reality) technology and the emergence of scale effects, it will undoubtedly have even broader prospects for development.

Full Text

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Abstract: VR (Virtual Reality), as a revolutionary technology in visual science and technology, has already found extensive application across multiple fields including film and television art. Along with increasing industrialization and popularization, it has demonstrated new characteristics in terms of technical advancement, artistic experimentation, and market deployment. However, due to its relatively short development history and intense competition, significant

deficiencies remain in technological progress, audio-visual expression, and profit models, with active exploration still ongoing. It is believed that with further development of VR (Virtual Reality) technology and the emergence of scale effects, it will undoubtedly possess even broader prospects for development.

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As a revolutionary technology in visual science and technology, VR (Virtual Reality) has become a hot topic in culture, gaming, and technology in recent years, and even more so a favorite pursuit of capital and industry. The Ministry of Industry and Information Technology released the “2016 White Paper on Virtual Reality Industry Development,” which states that “China’s virtual reality technology industry has tremendous potential, but still faces many challenges in application. The VR industry is on the eve of an explosion and is about to enter a window period of sustained rapid development.” According to the “China Virtual Reality (VR) Industry Research Report” released by iResearch, China’s VR market scale will reach 79.02 billion yuan in 2017.

In terms of production, major manufacturers have provided corresponding solutions for modified 3D+VR systems, developing stitching software to generate complete VR videos. They have also added features to address common issues in VR shooting such as exposure mismatching and visible crew members, forming a post-production workflow suitable for VR video processing and the integration of live-action with CG.

1. VR Technology Marketization Path

Enterprise-level VR content refers to VR content for enterprise applications, including VR applications in education, healthcare, and other industries. In August 2016, Alvin Wang Graylin, President of HTC Vive China, appeared on CCTV’s “Dialogue” program and specifically mentioned VR education, stating that “some people may learn through vision, hearing, or touch, and VR can precisely allow individuals to experience this process immersively—something that previous traditional media devices could not achieve.” Google Maps’ attempts have also validated this viewpoint. Leveraging VR’s unique sense of immersion and interactivity, the VR version of Google Maps allows users to browse global scenic spots and historical sites without leaving home, with an intuitiveness far exceeding traditional geography classroom teaching.

Consumer VR content is more widespread, encompassing VR games, VR live streaming, VR film and television, and other cross-cutting fields. Among these categories, VR games have shown the most vigorous development momentum. Whether adopting a first-person perspective or real-time rendering characteris-

tics, the integration of games and VR appears seamless. Currently, VR games already occupy 35% of the market share. VR live streaming, relying on hundreds of live platforms and hundreds of millions of users, has also achieved rapid development.

2. Exploration Path of VR Film and Television

The development of technology and the arrival of the VR era cannot be separated from strong support and continuous exploration in three aspects: technology, art, and market.

2.1 Technical Drive The ideal equipment for shooting VR film and television should be a “3D+360-degree panoramic” camera, as videos shot with native 3D cameras possess more profound depth. These can be divided into two major categories: one involves modifying internationally common cameras into 3D+VR systems, with corresponding solutions based on different shooting costs; the other is integrated virtual cameras capable of real-time 360-degree omnidirectional audio and holographic image capture. Audio collection has also evolved from mono and stereo to panoramic sound capture. From early GOPRO combined VR devices to today’s integrated automatic stitching equipment, VR film and television has made considerable progress in image quality, sound, and portability.

Regarding playback devices, VR headset technology has transformed from concept to reality. Current mainstream designs fall into three categories: PC-tethered headsets, mobile phone enclosures, and all-in-one devices. Although each has its own advantages and disadvantages in terms of performance and cost-effectiveness, they have already extended VR video playback from homes and offices to more scenarios.

2.2 Artistic Attempts As VR technology continues to mature, VR works have begun to emerge in large numbers. Typical early pioneering works include *Harvest of Change* launched by The Des Moines Register and Gannett in Iowa in 2013. In November 2015, *The New York Times* released its first VR documentary, *The Displaced*. This documentary utilizes virtual reality technology to deliver heart-wrenching news content, showing three children living displaced lives in war-torn areas. The unique immersion brought by VR can provide audiences with a stronger sense of presence and participation, thereby further experiencing the power of reality.

At the 2016 Venice Film Festival, the world’s first feature-length VR film was screened—*Jesus VR – The Story of Christ* with a duration of 90 minutes. Audiences could watch the film on rotating 360-degree chairs while wearing Samsung Gear VR headsets in the festival’s VR cinema.

2.3 Market Layout Market deployment is mainly reflected in three aspects: smart mobile terminals, VR experience centers, and VR cinemas.

In terms of smart mobile terminals, according to data from market research company Newzoo, the number of global smartphone users reached 2.6 billion in 2017. For this world's largest multi-screen terminal market, major manufacturers have corresponding mobile solutions. Whether video portal websites, VR hardware manufacturers, or VR professional technology companies have all made strategic mobile APP deployments for VR content, striving to leverage the huge base of smartphone users, combine VR content as a playback platform, and bring massive traffic import through VR film and television content.

The emergence of VR cinemas: Traditional film industry giant IMAX built the first VR cinema—IMAX VR—in Los Angeles in 2016. Although still somewhat similar in nature to VR experience centers, IMAX VR has already signed agreements with Google and multiple Hollywood film companies, and films suitable for IMAX VR cinema playback will appear in large numbers in the near future.

3. Dilemmas in VR Development Path

3.1 Technical Defects Still Exist On July 12, 2017, the Jiangsu Provincial Consumer Association held a press conference on VR headset consumption survey results, revealing that 48.76% of consumers were not satisfied with current VR experiences, and 49.45% believed that domestic VR headset technology was not mature enough and had low configuration.

In terms of current technology, whether external tethered headsets, mobile headsets, or VR all-in-one devices, certain technical problems still exist. First, most products have insufficient resolution. Apple, relying on Retina Display technology, can achieve over 400 PPI (pixels per inch), claiming to have reached a level where the human eye cannot distinguish individual pixels. However, to achieve enclosure, the viewing distance of VR headset displays worn by consumers far exceeds that of mobile phones, requiring PPI to reach over 800 for good visual experience. Among current mainstream market devices, few can meet this standard except for a small number of 4K+VR devices.

Second, the field of view is too narrow. The human eye's field of view is wide horizontally and narrow vertically, with a maximum horizontal viewing angle of 156 degrees for a single eye and 188 degrees for both eyes. The limit of human vision is approximately 150 degrees vertically and 230 degrees horizontally. To provide users with an immersive feeling, screens need to fill the above range. Currently, existing devices still struggle to meet this requirement, and VR display devices match images by tracking head movement dynamics, yet cannot achieve mature eye-tracking technology, which does not conform to human viewing habits.

3.2 Traditional Audio-Visual Language System Fails Under VR film and television technology, due to the full-view nature of the image, the complexity of composition increases geometrically. In the frame, all crew members have nowhere to hide. While the director can retreat outside the environment,

where should the cinematographer, sound engineer, and lighting technician go? Lighting, art direction, and set design can no longer be conducted as before. This poses enormous challenges to the director's coordination, post-production editing, rendering, and special effects.

The language and grammar of traditional film and television art are completed on the basis of montage, while the multi-dimensional, parallel spacetime, exhaustive display of VR film and television constitutes a complete subversion of traditional montage techniques, posing enormous challenges and disruptions to both shooting and editing. More importantly, traditional cinema provides audiences with a viewing area, allowing them to passively receive information conveyed by creators, with the content, timing, and method of reception entirely determined by the creators. However, in VR film and television, audiences become free, able to transcend the creator's defined scope, which greatly reduces the effectiveness of information transmission. At the 2016 Cannes Film Festival, American director Steven Spielberg expressed skepticism about VR film and television, stating that VR could even be "dangerous" because it allows audiences to "forget the story itself." Ed Catmull, co-founder of Pixar, also stated: "The point of VR is not to tell stories. For 40 years, people have been trying to tell stories using VR. None have succeeded."

3.3 Unclear Profit Model A truly market-oriented VR film and television industry should be a mature industry that forms a cash revenue model among end consumers. However, with continuous capital investment, neither smart mobile terminals, VR experience centers, nor VR cinemas have formed stable revenue models. This is manifested in: the registered user numbers of various APPs on mobile terminals are generally less than 1 million, and excluding 引流 users from hardware pre-installation, truly active installations are less than half, with scale effects not yet prominent.

The famous Rogers' diffusion effect has been verified in many fields such as mobile Internet: when a product's penetration rate exceeds 15%, it will usher in the first wave of exponential growth. For the VR industry, it has just crossed the "innovator adopter" stage. In the foreseeable future, with the growth of VR consumer groups and the popularization of consumption behavior, it is expected that when VR users exceed 40 million, it will drive the blowout development of the VR industry, thereby promoting the emergence of mature product content and solutions to the aforementioned problems.

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