# The Creation and Application of VR Technology in Documentary Production (Post-print)

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## Abstract

Virtual Reality (VR) technology offers novel methods and pathways for documentary filming and presentation, enabling interactive and immersive audience experiences. By leveraging three-dimensional stereoscopic imaging technology, it constructs realistic three-dimensional environments that provide viewers with authentic viewing experiences. This paper proposes the utilization of Virtual Reality (VR) technology for scriptwriting in documentary production, employing multi-layered filming methodologies that incorporate both fixed and aerial cinematography, establishing appropriate shot transition frequencies, optimizing documentary presentation modalities, configuring optimal parameters for documentary filming, and refining post-production workflows. Through case study analysis of the documentaries "Most Beautiful China" and "Kindergarten in the Mountain Village" , this work examines VR documentary production efficacy, offering reference recommendations for contemporary documentary production practices.

## Full Text

## Abstract

Virtual Reality (VR) technology offers novel approaches for documentary filming and presentation, delivering interactive and immersive experiences to audiences. By employing three-dimensional imaging techniques, VR creates realistic environments that provide viewers with authentic viewing experiences. This paper proposes the integration of VR technology throughout documentary production, from scriptwriting and multi-perspective filming techniques to optimized presentation methods. Specifically, we recommend using fixed and aerial shots with appropriate transition frequencies, establishing optimal shooting parameters, and refining post-production workflows. The effectiveness of these methods is analyzed through case studies of *The Most Beautiful China* and *Kindergarten in*

*the Mountain Village*, providing practical insights for contemporary documentary production.

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VR technology has fundamentally transformed the landscape of contemporary film and television production. Its application in documentary filming offers distinct advantages, with many large-scale productions now incorporating VR to deliver unprecedented experiences that capture audience attention and stimulate reflection, thereby achieving powerful documentary impact.

## 1. VR Technology

VR (Virtual Reality) technology represents a significant breakthrough in visual experience for film and television, revolutionizing traditional presentation methods through immersive environments. By leveraging computer systems, VR constructs a virtual parallel world and three-dimensional space that simultaneously provides viewers with tactile interaction and audio-visual experiences, also known as "spiritual environment" or "phantom environment" technology. VR experiences are unconstrained by time or location, offering audiences a genuine sense of presence. Head-mounted displays (HMDs) are common viewing devices that adjust perspectives based on viewer movement [1]. VR technology is also characterized as immersive virtual reality, delivering significant interactive experiences where users can engage with virtual environments in real-time through specialized instruments and receive haptic feedback—for instance, perceiving object weight through grasping interactions.

## 2.1 VR-Enhanced Scriptwriting

Documentary creation encompasses script design, subject selection, and location scouting—processes that are traditionally time-consuming and labor-intensive. VR technology optimizes these creative workflows, though its primary challenge lies in experience design. During development, scripts must be condensed to accommodate shorter documentary durations, with narrative structure and content tailored to the final presentation length [2]. In VR documentary production, the scene—not the shot—becomes the fundamental unit, representing a departure from conventional filmmaking. This approach enables 360-degree scene presentation, immersing viewers within the environment and intensifying their engagement.

## 2.2 Multi-Perspective Filming Techniques

VR production employs multi-angle and multi-camera configurations that fundamentally differ from and complement traditional filming methods. While capable of capturing entire spatial environments, this approach makes it difficult to emphasize specific scenes or details, as all elements remain equally visible. Consequently, new techniques are required to create visual emphasis—unlike conventional documentaries that use focal length changes to highlight subjects [3]. For instance, during the production of *Red Memory*, a precision-graded pan-tilt head was used with a Sony A7S2 camera equipped with a Canon 8-15mm fisheye lens, capturing six directional angles at 90-degree horizontal intervals while recording sky and ground views separately. The footage was then stitched using panoramic software such as Auto Video Pro and Auto Pano Video through processes of alignment, adjustment, and seamless integration. The Sony A7S2' s advanced color profiles effectively manage shadow and highlight details while delivering 4K resolution. Independent lens processing also allows for customized lighting configurations per shot. Alternatively, the Insta360 Pro panoramic camera integrates six lenses in a single unit that operate simultaneously, automatically grouping footage into folders for one-click stitching via Insta360' s proprietary software [4].

[Figure 1: see original paper] Pan-tilt head scale markings
[Figure 2: see original paper] Insta360 panoramic camera

## 2.3 Fixed Shot Configuration

VR documentary filming represents a reconstruction of reality that demands active viewer participation. Shot composition must therefore provide audiences with sufficient imaginative space to stimulate reflection. Current domestic VR documentaries primarily focus on landscapes, geography, and cultural history. For scenic subjects, aerial shots using high-altitude perspectives effectively capture terrain and human activity, as exemplified by *Aerial China*, where drone footage comprises over 90% of the film, supplemented primarily by narration rather than dialogue or monologue [5]. Fixed shots are better suited for character-driven narratives, aligning with conventional viewing habits and reducing viewer disorientation while facilitating environmental familiarity. In *Red Memory*, fixed shots were used extensively for revolutionary site documentation, with host gestures guiding viewer attention and providing audience agency in exploring scenes. To enrich visual presentation, ground-level tracking and aerial shots were intercut to introduce dynamic elements to the environment.

## 2.4 Optimized Transition Frequency

Transition frequency significantly impacts VR viewing experiences. Common methods include dissolve, fade-to-black, and hard cuts. However, VR' s inherent limitations restrict rapid editing, making it difficult to establish connections between events and potentially obscuring visual information. VR documentary

production can adapt traditional transitions like fades and dissolves, combining them with fade-in/fade-out techniques to enhance viewing comfort while maintaining documentary authenticity [6].

## 2.5 Enhanced Presentation Methods

As VR technology becomes widespread, documentary presentation has diversified across cinematic screens, televisions, computers, and mobile devices. Given their panoramic nature, VR documentaries are frequently distributed through mobile apps, with major platforms developing dedicated VR players such as iQiyi VR, Uto VR, Youku VR, and Orange VR. Viewing devices significantly impact the experience, with options including all-in-one VR headsets, VR helmets, and VR glasses. VR glasses represent the most affordable option, requiring only a gyroscope-equipped smartphone and a VR player app that leverages gravity sensing for multi-angle viewing. All-in-one headsets operate independently without requiring a phone, while high-end VR helmets connect to computers for superior clarity [7].

Leveraging VR' s open-ended presentation characteristics, filmmakers can employ audio cues, camera movements, and actor blocking to direct viewer attention during initial presentation phases. Appropriate interaction design—whether through gaze-based or audio-triggered interactions—should be selected based on audience needs and documentary genre to strengthen immersion and satisfy curiosity.

For example, *Eye for an Eye: A Séance in Virtual Reality*, created by VR consultant Seine Abs, digital supervisor Devin Emil, and director Elias Petridis, utilized a specialized VR scriptwriting method. The frame was divided into six color-coded quadrants (front, back, left, right, top, bottom) using black, blue, green, red, orange, and purple. Crew members could interpret these colors to execute corresponding shots while mentally visualizing the composed scenes [8].

## 2.6 Optimal Shooting Parameters

Current VR video equipment typically employs GoPro array rigs with multiple camera units. The GoPro 4 Black, the latest model at the time, captures 4K resolution footage with the following recommended settings: Resolution of 1920$×$1440P (4:3), Wide field-of-view (Fov), Low sharpness, Native white balance, Frame rate of 59.94 FPS or higher (Minimum), Low light mode disabled, Flat color profile, ProTune enabled. ISO values should be adjusted by environment: 1600 for low-light conditions, 800 for indoor settings, and 400 for outdoor scenes.

## 2.7 Post-Production Optimization

VR documentary production generates substantial footage requiring stitching-based post-processing. With diverse shooting equipment available, final output

quality depends heavily on multi-camera stitching. Common software includes Kolor Autopano Video Pro and Splice VREditor for video, and Auto Pano Giga for still images. Adobe Premiere Pro CC also offers basic VR stitching capabilities. Compatible VR video formats must be created for player compatibility [9].

The post-production workflow involves: importing footage, synchronizing audio and video signals, stitching single-scene videos, performing preliminary color correction using analysis software, and outputting the final video. Color discrepancies and noise variations between lenses are addressed through detailed grading and denoising using NUKE CARA VR. Audio design guides narrative focus by attenuating non-essential channels, preventing information overload and leveraging instinctive audience responses to follow character psychology and plot development, thereby facilitating rapid narrative immersion.

[Figure 3: see original paper] Panoramic video stitching effect using Autopano

## 3. Case Studies

### 3.1 *The Most Beautiful China*

VR episodes of *The Most Beautiful China* typically run 3–5 minutes, never exceeding 10 minutes. In the segment featuring the Xilingol League' s Aobao Festival, narrative efficiency was prioritized by condensing secondary details while preserving story integrity. This approach allows viewers to authentically experience Mongolian herders' lives through scenes of flocks and grasslands, delivering an immersive Aobao Festival experience. The first season comprised 22 episodes combining fixed shots with extensive aerial cinematography that captured China' s landscapes, customs, and architecture from multiple angles, enhancing viewing experiences [10].

### 3.2 *Kindergarten in the Mountain Village*

Left-behind children represent both an educational concern and pressing social issue. *Kindergarten in the Mountain Village* aims to deepen public understanding of these children and stimulate societal action. The documentary addresses the phenomenon of rural parents migrating for work while leaving children with grandparents, exploring how unaddressed parental longing creates developmental challenges requiring urgent attention from families and society.

The 9-minute-38-second film contains 36 shots with limited narrative complexity, focusing instead on presenting authentic living conditions. Children residing with grandparents in a rudimentary mountain kindergarten express profound longing for their parents. With only one teacher for the entire village, the documentary fosters emotional resonance by immersing viewers in the children' s reality. VR technology enhances this immersive experience through multi-layered audio recording—capturing bird calls, wind, water flow, and distant conversations—that merges with visuals to create authentic sensory experiences. Fixed

shots position viewers as observers, leading them through the children' s lives and psychological experiences with powerful emotional impact, demonstrating VR' s distinctive strengths.

[Figure 4: see original paper] *The Most Beautiful China*
[Figure 5: see original paper] *Kindergarten in the Mountain Village*

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*Note: Figure translations are in progress. See original paper for figures.*