The Application and Characteristics of VR Technology in Disaster Event News

Hongru Shan*

Electrical and Computer Engineering, Rutgers University,1069 BPO way, Piscataway, NJ, The United States

*Corresponding author: hs762@scarletmail.rutgers.edu

Abstract. With the development of technology, an increasing number of new report formats are being applied in the field of journalism. The immersive nature of VR technology makes it particularly valuable in news reporting, especially in disaster news. Currently, a considerable number of VR news reports have been published across various domains. This paper has analyzed the application of VR news reporting in disaster events, drawing from specific case analyses of three distinctive events: pandemics, fires, and earthquakes. It summarizes the characteristics of VR disaster news in terms of scene construction, information dissemination, storytelling, and more. By comparing VR technology with traditional news reporting on the same topic, it has examined the strengths and weaknesses of VR technology in the realm of disaster news. The paper also provides insights into the hotspots and prospects of this research topic.

Keywords: VR technology, disaster news, immersive experience, 360° video.

1. Introduction

In recent years, our society has witnessed a surge in disaster events, including fires, earthquakes, conflicts, and the globally impactful COVID-19 pandemic. Responding to these events necessitates the dissemination of vast amounts of information and emotional expressions. However, traditional media primarily involves one-way communication, with users receiving information passively [1]. With advances in hardware technology and the growing popularity of the metaverse concept, Virtual Reality (VR) technology is becoming a new way to convey information. In 2022, 8.8 million AR/VR headsets were shipped worldwide [2], and it's expected that the use of extended reality technology, including AR/VR/MR tools, will increase by 40% by 2027 [2]. It's foreseeable that VR technology will play an increasingly important role in news dissemination.

Unlike traditional news media, VR offers immersion, interactivity, and imagination [3]. Users can not only receive information but also interact with it. The imaginative aspect allows users to become creators in the second of information dissemination. With these new features, VR technology enhances the connection between individuals and environmental and emotional information, which is crucial in disaster news. In an experiment by Dr. Jiyoung Lee on VR disaster news, different levels of enhanced VR experiences improved users' presence, empathy (both cognitive and emotional), and fear, leading to increased audience engagement [4]. While VR technology has the potential to enhance emotional engagement with disaster news, it may also have some negative consequences. Research by Adrien Verhulst suggests that fake VR news tends to attract more viewership and trust compared to traditional fake news [5]. Therefore, it's vital to research the application and characteristics of VR technology in disaster news.

This paper will conduct a comparative analysis of case studies on the use of VR technology in disaster news. It will examine its characteristics and provide recommendations for its future and improved use in disaster news reporting.

2. VR technology in disaster news

In the evaluation of disaster news, various aspects such as factual transmission, narrative quality, humanization, storytelling, and impact are commonly considered. However, Virtual Reality (VR) news possesses distinctive characteristics. In comparison, VR news has the capacity to elicit stronger

emotional resonance and scene perception among users through the faithful reproduction of environments and the use of immersive sound descriptions. The following will expound upon the application characteristics of VR technology in various scenarios, such as COVID-19 VR news and fire-related VR news. It will analyze how VR technology provides different information delivery experiences to the audience in different case scenarios. Additionally, it will summarize the application patterns and characteristics of VR technology in news presentations.

2.1. COVID-19 VR news

The listed two VR stories which are published for COVID-19 will be analyzed as examples in the following section (Table 1).

Table 1. Listed VR COVID-19 news for study [6]

Title	Year	Length	Feature	Publisher/Producer
Visualizing the COVID-19 Tragedy – 360 [7]	2020	3:14mins	Multi-Scene, Multi-Perspective	National Geographic
Suspected COVID-19 patient requires intubation in the ED [8]	2020	10:44 mins	Near-First-Person Perspective, Dynamic Scene Storytelling	Dr. Glenn Posner

In the Visualizing the COVID-19 Tragedy – 360, Artist Suzanne Brennan Firstenberg designed an installation in Washington DC that used tiny white flags to represent American deaths so far from COVID-19 (Fig.1). In the news, only three text segments added through VR technology appeared, and these texts were only present at the beginning of the video, providing a brief introduction to the author and the installation. Besides, there is a background explanation to help audience understand the whole installation. Its mode of information delivery primarily consists of 360-degree videos. In terms of freedom, users are restricted from moving. They can only adjust their viewpoint vertically and horizontally which is not an ideal approach in a VR experience. But it can help the audience focus on the surrounding environment so that the key point of the news to be conveyed more effectively. For the scenarios, this VR news piece switched scenes a total of 10 times, capturing various angles including ground level, aerial shots, the front of the installation, the middle of the installation, and more. In some scenarios, the audience is surrounded by several moving people which enhances the sense of presence. Furthermore, the top three most liked comments in the review all expressed regret and sadness for the deceased and indicated that through VR news, they could feel like they were there in person. Compared to that, the same topic video was published on April 19, 2022, in which comments are more likely to delve into the underlying causes of the event beyond feeling sadness [9].



Fig. 1 Screenshot of Visualizing the COVID-19 Tragedy – 360 [7]

In another video Suspected COVID-19 patient requires intubation in the ED which shows the process from triage through to intubation for the critically ill COVID-19 patient through 360 videos (Fig.2) [8]. Though it still used the first-person perspective, there were no changes in perspective or scenes. Throughout the entire VR video news, aside from the background voiceover narration, no manually added VR subtitles or captions were present. For the user freedom, they are only able to rotate their perspective up, down, left, and right which is limited. That means users should be more focused on what is happening around them rather than just watching the environment. Last but not least, for the audience feedback, comments are mostly sharing their own personal relative experiences which represent a deeper emotional connection and identification.

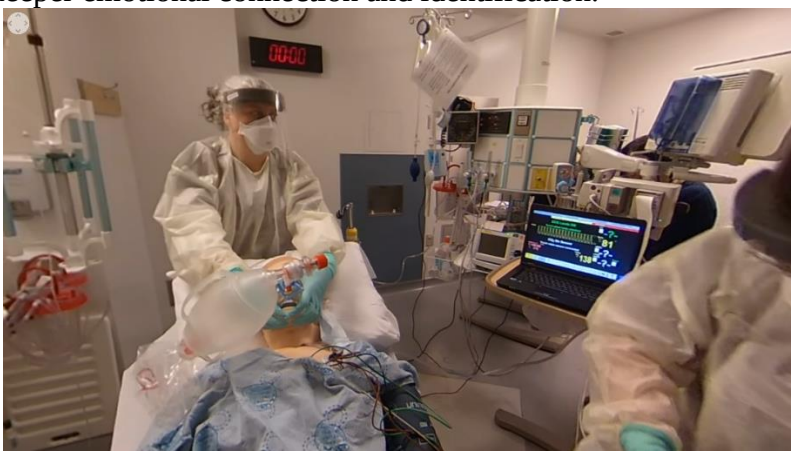


Fig. 2 Screenshot of Suspected COVID-19 patient requires intubation in the ED [8]

In the application of VR COVID-19 news, we have observed that the use of VR technology tends to reduce textual descriptions and instead relies on audio or video to recreate the events themselves. In terms of freedom of movement, they avoid excessive exploration of scenes by restricting users to fixed positions. They ensure an ample supply of content through the switching of multiple scenes or perspectives. In cases where a single scene is employed, they enrich the content by introducing dynamic stories surrounding and pseudo-interactivity, which means there is no actual physical interaction but rather passive video or sound interaction.

2.2. Fire disaster VR news

The listed two VR news which are published for fire rescue will be analyzed as examples in the following section (Table 2).

Table 2. Fire rescue VR news for study

Title	Year	Length	Feature	Publisher/Producer
Fire Rescue (360 Video) [10]	2016	5:50mins	Increasing Sound Effects, Reducing Visual Information	BBC News
Devastation in Paradise after Camp Fire [11]	2018	0:53mins	Single Scene, Host-Guided	ABC News

The 360-degree video "Fire Rescue," produced and released by the BBC, presents a completely different mode of storytelling (Fig.3). This news story reconstructs and simulates a real-life event where two London firefighters rescue six children from a house fire. Like previous examples, this news does not include additional embedded text narration beyond essential character introductions. Instead, it is accompanied by background narration that allows the audience to immerse themselves in the scene. In terms of freedom, the design still follows a fixed position with a 360-degree viewing angle rotation. Regarding scene design, it primarily consists of indoor and outdoor settings. Outdoors,

there is the main street and fire truck, with limited presentation time and information. The main content of the news is concentrated in indoor scenes, which can be divided into three parts: amidst the flames, amidst the smoke, and during the rescue. In these three parts, there isn't an excessive amount of visual information presented. Instead, the oppressive and tense atmosphere of the fire scene is conveyed primarily through sound. This includes sounds such as breathing, crackling flames, and breaking objects, which effectively immerse the audience in the environment, providing a sense of tension and fear.



Fig. 3 Screenshot of Fire Rescue (360 Video) [10]

The VR news report titled "Devastation in Paradise after Camp Fire" presents to the audience the huge destruction caused by the Camp Fire. The entire video only consists of a single scene. The movement of viewer's perspective is guided by the reporter present in the scene. It is noteworthy that this VR news report is grounded in a real-world location rather than being a reconstructed or virtual environment. The similar theme news – "The Camp Fire has destroyed more than 6,700 buildings in Northern California" [12] which is a traditional video report also created by ABC, tends to provide a macro-level overview of the entire scene. Even when reporters are present, the focus in traditional news is often on the reporter's narrative rather than the scene itself. In VR news, however, environmental details take center stage, while the commentary serves to enhance the audience's immersive experience of being present at the scene. As for the audience's feedback, most comments of the VR news report "Devastation in Paradise after Camp Fire" express surprise and appreciation for VR technology, with a minority of viewers expressing dissatisfaction with aspects such as image quality (Fig.4).



Fig. 4 360 Video: Devastation in Paradise after Camp Fire [12]

In the case of one of the most representative natural disasters, fires, VR technology is mainly employed for scene reconstruction. It is characterized by fewer scene transitions and a focus on presenting various environmental atmospheres. Specifically, the chosen scenes tend to be small and relatively enclosed, particularly in news related to fire rescue. These scenes do not present an excess

of visual details but instead rely on sound, certain visual effects, and smoke simulations to create a tense atmosphere. In comparison to traditional video news, VR disaster news places a stronger emphasis on conveying emotions.

2.3. Earthquake VR news

The listed two news reports which are published for earthquake will be analyzed as examples in the following section (Table 3).

Table 3. Listed Earthquake VR news for study

Title	Year	Length	Feature	Publisher/Producer
Nepal: After the Earthquake | ABC News #360Video [13]	March, 2016	3:04mins	Real-World Scenes	ABC News
Nepal: Rebuilding lives after 'Great Quake' BBC News [14]	May, 2015	10:37mins	Traditional Video News	BBC News

"Nepal: After the Earthquake" is a 360 VR video news produced by ABC. It primarily focuses on the damage to landmarks in Nepal after the earthquake, as well as the reconstruction efforts. The entire news segment is based on real-life footage. Throughout the narrative, there are six scene transitions. In terms of user freedom, there is no significant difference compared to other 360-degree video news. A similar traditional news report, "Nepal: Rebuilding lives after 'Great Quake'," also discusses the impact and recovery of landmark buildings in Nepal. It's noteworthy that both reports mentioned the Monkey Temple. However, apart from the ability of VR technology itself to provide a 360-degree perspective, VR news does not convey significantly more information to the audience.

3. Discussion

Based on the above case analyses, it is evident that VR technology has been widely employed in various disaster news contexts. These applications share several key characteristics:

(1) Presentation Format: VR news often takes the form of 360-degree video scenes, providing a more immersive and vivid way of conveying information.

(2) Content Delivery: VR news relies on background narration to explain the context rather than extensive textual descriptions, helping readers recognize the knowledge of news.

(3) Degree of Freedom: Most VR news applications limit user mobility, typically allowing them to observe the environment by rotating their viewpoint. This design decision may help guide users' focus toward critical aspects of the news, reducing the distractions from exploration environment.

(4) User Feedback: User comments and content analysis suggest that VR disaster news is more likely to evoke empathy compared to traditional media reports. Readers not only pay attention to surface-level information but also engage in more reflective thinking and emotional sharing related to the news.

(5) Interactivity: While VR news does not introduce an abundance of interactive elements, it catches readers' attention through engaging storytelling and pseudo-interactivity. This strategy helps maintain reader engagement and encourages them to become more deeply involved in the news story.

(6) Authenticity: VR disaster news can be either on-site field reporting or presented through scene reconstruction and even virtual environments. When using non-real scenes, some special effects or other human-made elements could be added which may affect the emotion expression of the news.

(7) Scene selection: VR disaster news is more likely to use enclosed and confined settings rather than open environments. The scene tends to create an atmosphere for emotional transmission rather than conveying specific visual or data-related information.

Based on the previous case analyses, VR disaster news also has several limitations.

Firstly, it does not possess a distinct advantage in conveying specific data information.

Secondly, information delivery lacks real-time capabilities because the production of 3D videos takes considerable time, especially during disasters. It is hard to promptly create VR news content on-site, resulting in delayed information delivery compared to traditional media.

Thirdly, image quality still needs improvement. Last but not least, VR news is not suitable for all topics of news, because immersive news is not different from video, text, images, and sound, which are four forms of content that are more widely applicable [15]. Like the VR news in the Nepal earthquake, it does not inherently convey additional information than traditional ones.

4. Conclusion

In conclusion, VR technology's application in disaster news reporting has made significant strides. This paper has elucidated the current application of VR technology in the domain of disaster news through the analysis of real-world VR news reporting cases in the context of pandemics, fires, and earthquakes. Applying a comparative methodology, it was observed that VR disaster news tends to focus on smaller scenes with rich details, prioritize emotional expression over information dissemination, and employ more voiceovers than textual explanations. In terms of scene construction, VR disaster news utilizes both real-world footage and reconstructed scenes. In the latter approach, creators and producers could incorporate more subjective expressions through post-production effects and other techniques. Then, this paper has also highlighted some of the existing issues and shortcomings, particularly related to video quality and news in specific scenes.

In the field of future disaster news reporting, improving video quality through high-resolution cameras can significantly enhance user immersion. Furthermore, media outlets should carefully select their expression of news information, particularly in the context of VR disaster news, where the focus should lean more towards conveying emotional and atmospheric information. It is suggested to minimize the presentation of specific numerical data so that the advantages of VR technology can be fully applied, and it will also provide the audience with a more immersive experience.

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