Virtual Reality Film Development: Immersive, Cinematographic, and Duration

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Abstract

The film industry is growing rapidly. Nowadays, there are movies with 360 video format or also called virtual reality movies. This type of film provides a new experience for the audience, because it can provide a sense of immersion. Immersion is the emotional feeling of being "in" in an experience. An immersive experience makes the audience feel as if they are involved in the story or image that is being displayed. It's no longer just watching it. Unfortunately immersion in VR films also has a weakness, which can cause the audience to lose focus on the storyline. Using VR media for too long can cause health problems. Therefore, this study aims to determine the immersive experience, duration, and cinematographic aspects that are effectively applied to VR films. The point is that the story shown can be conveyed properly to the audience, and the audience feels comfortable. The method used in this research is a qualitative method with a literature study approach. There are 8 articles used as reference in this study. The findings from this study are that the immersion of VR films can be increased by using the right media, namely HMD. 20 minutes is the maximum duration for viewers to enjoy VR films without worrying about health risks. The focus of the audience can be directed by cinematographic aspects such as composition, light, point of view and continuity.

Keywords: cinematographic, duration, effective, immersive, virtual reality film

I. INTRODUCTION

Technological developments encourage innovation in various fields. One of them is the field of film. Film formats are increasingly diverse, ranging from films with conventional video formats, 3D, 4D, up to 360°. Films can no longer only be enjoyed with the naked eye, but also with various renewable media, such as VR glasses. Various kinds of VR glasses or head mounted displays (HMDs), among others, are Oculus Rift, HTC Vive, Samsung Gear VR, Google Cardboard, and PlayStation VR[3]. VR glasses are a medium used to enjoy VR movies. Virtual reality is a technology system that provides virtual worlds experiences for viewers[4]. Film is a mass communication medium that contains audio and visual combinations [5]. Films are used as a means of

entertainment that presents stories, events, music, drama, humor, and the like to the general public[5]. It can be concluded that virtual reality films are entertainment in the form of stories whose presentation provides a virtual world experience for the audience.

Virtual reality films have certain characteristics, namely using video in a 360˚ format, a linear storyline, and a low level of immersion [6]. The immersive experience in VR films can reduce the audience's focus on the storyline [1]. Losing focus can cause confusion for the audience, and not convey the message or story to the audience. Using VR glasses for too long can also cause motion sickness, such as nausea and dizziness[2]. Therefore, researchers aim to determine the immersive experience, cinematography, and duration that are effectively used in VR films. The research questions in this study, namely:
1. How is the immersive experience on VR movies?
2. How effective is the cinematography and duration used in VR films?
The use of updated scientific articles is expected to provide more up-to-date knowledge and information for practitioners in the field of film and for academics regarding VR films.

II. Literature Review

Virtual Reality is a visual image that appears in a three-dimensional form made by means of a computer so that it looks real with the help of certain equipment, which allows users to feel and be directly physically involved in that environment [1].

One medium that is quite appropriate to use virtual reality technology is film media. Film is an activity to influence the audience so that the message to be conveyed through the film can be conveyed as expected. Conventional films are related to story aspects and cinematographic aspects in packaging and building visual images in a film. An immersive experience that can be felt through films with the help of VR technology can reduce the audience's focus on story content, but instead focus more on the perceived visual experience.

III. Research Method

This study uses the narrative review method [7]. The sequence of the process of carrying out the narrative review of this research starts from:

A. Collection of Library Resources
The process of searching for library sources from various sources that are considered credible. The search was carried out online by collecting literature sources from reputable national and international journals, and e-proceedings of international seminars. Like IEEE, Elsivier, Springer, and SAGEpub.

The keywords used during the search process are virtual reality and film. Film has a synonym for film. Search process based on title and abstract. Search is limited to journals that use English and Indonesian. The number of scientific articles that can be collected at this stage is 48.

B. Selection of Library Sources
The selection process is carried out to sort out various library sources that can be used or not. Screening was carried out using inclusion and exclusion criteria. This process is done by reading abstracts from the journals that have been collected. The selection process resulted in 8 articles which were then used as literature review material.

TABLE I
INCLUSION AND EXCLUTION CRITERIA

Inclusion Criteria	Eksklusion Criteria
• Published in the last 10 years • Journal or proceedings format • Open access • Journals in English and Indonesian	• Not discussing VR technology systems in depth.

	• Focus on implementing and using VR in films	

C. *Reviewing Library Resources*

This stage is used to explore the findings and methods that have been used in previous studies related to the topic of this research. The following is a summary of the results of a literature review related to VR films. The summary contains the title, author, purpose, method and findings of each previous journal article that are relevant to this research topic.

TABLE II

PENELITIAN TERDAHULU, METODE, DAN HASIL TEMUANNYA

No	Title and Author	Purpose	Method	Results
1.	Apllication Research of Virtual Reality Technology in Film and Television Technology Zhang, Zhu, & Tian. (2017).	Knowing the characteristics of the aesthetic experience when using VR in films	Literatur review	VR is giving a new aesthetic to the world of film. In the form of real interactions, and the images presented by VR provide a different experience for the audience.
2.	An Exploratory Study for Designing Social Experience of Watching VR Movies Based on Audience's Voice Comments Yan, Jiang, Xiong, & Shen. (2020)	Knowing the effect of the audience's voice comments on vr movies and identifying their influence on the audience's experience when watching VR movies.	Mixed methods, qualitative and quantitative.	Audience voice comments influence participant involvement, provide an understanding of the film that is memorable, and its use provides a more immersive experience for the audience.
3.	Towards understanding Scene Transition Techniques in Immersive 360 Movies and Cinematic Experiences. Moghadam, & Ragan, 2017.	Design and evaluate three scene transition techniques in two different situations. Gather information regarding sickness, spatial orientation, and preferences.	Experiment	Gamers prefer fast transition techniques and gradual or slow transitions are preferred by beginners or minimal experience in 3D and VR games.
4.	VR Fact Sheet 2019 – An Overview of VR Movies & Games. Jank, et al, 2019.	To find out the latest developments related to VR	Literatur review	VR games are easier to classify and easier to find products than VR movies. At this time, there are still many people who are not interested in using VR technology because it is expensive and causes motion

No	Title and Author	Purpose	Method	Results
				sickness. So there is a need for intensive development so that VR can reach all groups.
5.	The Effect Immersion on Emotional Responses to Film Viewing in a Virtual Enviroment Kim, et al, 2018.	To analyze the effectiveness of using VR on film as a medium and examine the relationship between immersion and emotion.	Experiment with two different treatments, using HMD and no-HMD technology.	The use of HMD technology makes the audience feel more immersive and get more intense emotional feelings than no-HMD. There is a link between immersiveness and emotional response.
6.	Technical Immersion Analysis on Virtual Reality-based Animated Film "Crow The Legend" Wibowo, 2023.	Analyzing the use of cinematographic aspects in visual storytelling in a virtual reality-based animated film entitled Crow: The Legend.	Descriptive Qualitative Method Data analysis uses the theory of cinematographic aspects and immersive aspects (Technical Immersion Theory). The author compares Cara Wimba in the conventional film format vs the virtual reality film format. The author compares the Outer Expression Procedure (TUL) in the conventional film format Vs the virtual reality film format. The author analyzes the Cinematographic Aspect which consists of point of view, continuity, cutting, composition, lighting, and sound. The writer analyzes Technical Immersion Visual Cues which consist of audio cues and orientation & disorientation cues.	Cinematographic aspects (which consist of point of view, continuity, cutting, composition, lighting, and sound) that are adapted to technical immersion specifications can be adapted for use in VR films. In the VR format, the animated film Crow: The Legend uses a lot of POV points of view, in which the audience seems to act as an observer who is in the same area as the characters. Sometimes even the audience can interact with the characters. The author found that some of the transitions that occur in the VR format look less smooth and this allows the audience to lose focus when watching the film. Losing the audience's focus even for a moment can affect the integrity of the story and disrupt the audience's immersive level.
7.	Computer-Aided Graphic Design for Virtual Reality-	Conducting analytical studies related to graphic design in 3D animation scenes.	Build libraries related to animation material ontologies.	The animation material composition category defines the basic characteristics of the material and scene material

No	Title and Author	Purpose	Method	Results
	Oriented 3D Animation Scenes

Zhao 2022 | This research produces an ontology library that describes the nature of animated material for the first time, which consists of animation material composition and animation scene material sphere. | Design and implement a qualitative plan from animation scene materials.

The author analyzes computer-based graphic design on VR-based animated 3D film scenes.

The author uses 8.62 billion training datasets to train the designed deep convolutional neural network model. This process takes 52 hours to convert the value of the loss function to 2.5e-4. Then the author uses principal component analysis to reduce the size (for example, 4.96 billion datasets are used to conduct training). The result obtained is that the time needed to reach the same level of convergence accuracy is only 30.5 hours. In addition, the max-error and mean-error values were found to be almost the same even though they used different datasets. | styles (starting from type, base material, color, texture, image, and scene style).

The author states that virtual reality in the animation industry is still not much developed (still in its early stages). The animation industry will produce more perfect VR-based animations with the support of technological innovations and improvements in narrative design practices by creators. So that later the resulting animation will provide an emotional experience and more natural interaction with the audience. |
| 8. | Virtual Reality Cinema: A Study

Zarka 2016 | Describes the Virtual Reality Cinema (VRC) method. The VRC concept combines cinema concepts and virtual reality concepts that can amaze film lovers. | The author describes the development of Virtual Reality supporting devices on the market. The author also compares the advantages of each VR device mentioned in the journal. | The Virtual Reality devices discussed in this research are the Oculus Rift and Samsung Gear VR.

The VR device known as The Sensorama was developed in 1950 to provide a virtual reality experience. Sensorama is the beginning of the development of VR devices.

Virtual Reality Cinema (VRC) has started to be introduced in |

No	Title and Author	Purpose	Method	Results
				theaters in the Netherlands and Germany. The introduction of VRC was a success, but this does not mean that VRC is ready to be implemented in all cinemas.
				VR devices like the Oculus Rift provide users with stunning visuals and immersive virtual worlds with a wide field of view. This is known as the Virtual Human Eye (VHE). Users will experience a real-life feel by moving their heads to look at different points of view, not just limited to looking ahead. What is displayed on the VR device gives the user an open world experience from the surrounding environment.

D. *Discussion of Research Results and Conclusions*

This stage is used to discuss the findings from previous research, only then can conclusions be drawn to strengthen existing theories.

IV. RESULTS AND DISCUSSION

A. *VR Film Immersive Experience*

VR films provide a different experience for the audience [8]. In terms of the images displayed, the interaction or immersive level presented, and the media used. VR films have a unique way of telling stories to the audience. The audience can determine for themselves what they want to see (a certain picture or part of the whole picture presented). VR makes it easy for viewers to enjoy virtual reality environments by simply moving their heads and bodies. VR presents a real virtual environment, resembling the real situation. High immersion can provide a memorable experience, leave an impression on the minds of the audience, and be easy to remember [9]. VR films with HMD (head-mounted display) technology such as the oculus rift, can increase the immersiveness of the audience [10]. Oculus Rift technology gives users a stunning virtual environment view and a wide field of view, compared to other technologies such as Google Cardboard. This technology is also known as Virtual Human Eye (VHE)[11]. VR goggles or is the most popular form of VR headset used, then VR Helmets which must be connected to a PC[8].

B. *VR Film Cinematography*

Cinematography in VR films is different from conventional films. Cinematography in VR films focuses more on its influence on the direction of the viewer's view, because VR gives the freedom to explore the virtual environment space. The director has an important role, to be able to direct and influence the audience's point of view. The director must understand the cognitive feelings, emotions, and physical experiences of the audience in the VR world. The direction of the viewer's point of view can be influenced in various ways, such as taking the right point of view, continuity, composition, and light [1]. In VR films, taking a point of view must pay attention to the audience's comfort, habits when using VR media, and the audience's immersive level. The level of immersion is high when the audience "enters" in the virtual world that is being built. To get this, it is better to take a point of view using an eye level [1]. Thus the audience will feel as a character who plays a role in the story, because it has a height that is parallel to the character's view. Interactions that occur in the virtual

environment should also use an eye level perspective. So that the audience feels that the characters in the virtual environment are interacting with themselves. The plot in VR films should use a forward-moving plot. Don't skip the flow, because it can confuse the audience.

Continuity can be presented with one-take shots to get the effect of continuity from the story and run smoothly. Video transitions in VR films can affect the integrity of the story and the delivery of story content. Fast transitions are loved by game lovers. In contrast to people who are using VR for the first time, prefer slow transitions [3]. Such a fast transition has a negative effect, because it can trigger motion sickness for the audience. Transitions that are not smooth or still rough, can cause the audience to lose focus while watching. The audience will be distracted and have difficulty capturing the contents of the story. Focus can be established by showing the right composition and lighting. Effective composition in VR films is by highlighting one important element. Setting the right light can also guide the viewer's view so they can follow the storyline. A center light can be placed on any of the elements that can guide the storyline.

C. Duration VR Film

The duration of films generally ranges from 60-100 minutes, but some are longer, up to 180 minutes. There are also films that are less than 60 minutes long or also called short films. Determining the duration of VR films is something important. Because too long someone uses VR will cause motion sickness. The duration of VR films should be no more than 20 minutes, so that the audience does not feel dizzy and sick[2].

V. Conclusion

Making VR films, various aspects must be considered, so that the story can be conveyed properly, the audience gets a memorable experience, a high level of immersion and comfort. Important aspects to pay attention to are the selection of media used to enjoy VR films, duration, and the cinematographic aspects presented. Media that really supports immersiveness in VR movies is the use of HMD technology [10]. Cinematographic aspects that are effectively used in VR films are point of view, composition, continuity, and light [1]. 20 minutes is the most convenient duration for VR movies, so it doesn't cause motion sickness[2]. The findings that have been summarized in this study, hopefully in the future can be used as a reference in making VR films and useful for academics as reference material for further research.

REFERENCES

[1]   E. C. K. Wibowo and B. Grahita, "Analisis Technical Immersion pada Film Animasi Berbasis Virtual Reality 'Crow The Legend'.," *ANDHARUPA: Jurnal Desain Komunikasi Visual & Multimedia*, vol. 09, no. 01, pp. 29–44, Mar. 2023.

[2]   F. Tian, R. Hu, S. Dai, and Z. Zhang, "Evaluation of VR Movies on Rhythm, Montage and Saliency," *ICALIP*, pp. 292–297, Apr. 2018.

[3]   K. rahimi Moghadam and E. D. Ragan, "Towards Understanding Scene Transition Techniques in Immersive 360 Movies and Cinematic Experiences," *IEEE Virtual Reality*, pp. 18–22, Mar. 2017.

[4]   J. Zhao and X. Zhao, "Computer-Aided Graphic Design for Virtual Reality-Oriented 3D Animation Scenes," *Comput Aided Des Appl*, vol. 19, no. S5, pp. 65–76, 2022.

[5]   handi Oktavianus, "Penerimaan Penonton Terhadap Praktek Eksorsis di dalam Film Conjuring," *Jurnal E-Komunikasi*, vol. 3, no. 2, pp. 2–12, 2015.

[6]   A. Jank, F. Kozich, F. Frohlich, and K. Erenli, "VR fact Sheet 2019-An Overview of VR Movies & Games," *IEEE Games*, 2019.

[7]   H.-F. Hsieh and S. E. Shannon, "Three Approaches to Qualitative Content Analysis," *Qual Health Res*, vol. 15, no. 9, pp. 1277–1288, Nov. 2005.

[8]   M. Zhang, Z. Zhu, and Y. Tian, "Application Research of Virtual Reality Technology in Film and Television Technology," *IEEE Access*, pp. 1–1, Sep. 2020, doi: 10.1109/access.2020.3022499.

[9]   S. Yan, W. Jiang, M. Xiong, and X. Shen, "An Exploratory Study for Designing Social Experience of Watching VR Movies Based on Audience's Voice Comments," in *Adjunct Proceedings of the 2020 IEEE International Symposium on Mixed and Augmented Reality, ISMAR-Adjunct 2020*, Institute of Electrical and Electronics Engineers Inc., Nov. 2020, pp. 147–152. doi: 10.1109/ISMAR-Adjunct51615.2020.00049.

[10] A. Kim, M. Chang, Y. Choi, S. Jeon, and K. Lee, "The Effect of Immersion on Emotional Responses to Film Viewing in a Virtual Environment," in *IEEE Conference on Virtual Reality and 3D User Interfaces*, Reutlingen: IEEE, Mar. 2018, pp. 601–602.

[11] O. M. Zarka and Z. J. Shah, "Virtual Reality Cinema: A Study," *IJRAR- International Journal of Research and Analytical Reviews*, vol. 3, no. 2, pp. 62–66, May 2016.