Cyberella – Design Issues for Interactive 360 Degree Film

Susanne Haake(✉) and Wolfgang Müller

University of Education, Kirchplatz 2, 88250 Weingarten, Germany
{haake,mueller}@md-phw.de

Abstract. The idea of 360 degree is not a new phenomenon in arts and media. It has its origins in the arts of the early 18th century and later the panoramic view in the field of photography and also in film was adapted. Groundbreaking technological progress has allowed for a new hype in 360 degree videos in recent years, including new possibilities of interaction. In this paper we will describe the current status of the ongoing project Cyberella which focuses on exploring filmmaking and narrating techniques for interactive 360 degree films. Our approach is divided into two steps. Firstly, existing interactive 360 degree videos are examined for their specific film language. A catalogue will summarize important results of the analysis, including research questions, as a basis for our film project. Our second step will comprise of our film project Cyberella, which is testing a variety of film styles to find new ways of filmmaking and defining design guidelines. In summary, this paper aims to contribute to the discussion of how storytelling in relation to traditional film language can or should be adapted in 360 degree interactive video context to formulate first design-issues for practical use.

Keywords: Interactive 360 degree video · Virtual reality · Film language
Design guideline

1 Introduction

The idea of 360 degree in arts and media is not a new phenomenon. In the early 18th century first 360 degree paintings occurred in Great Britain [1]. In this context cycloramas were developed, in which the spectator stands in the middle of a panoramic cylinder. The intended effect is to make spectators feel as if they are standing inside the presented landscapes. Later, the 360 degree idea was adapted in the field of photography and film. In 1897, Raoul Grimoin-Sanson invented the Cinéorama, a panoramic film projection system using ten synchronized projectors [2].

Groundbreaking technological improvements allowed for a new hype in 360 degree videos in the last years. An important achievement was the emergence of virtual reality technologies (VR), for example VR glasses. New interactive video content formats have revolutionized the communication and marketing world in a very short period of time [3]. As a highly immersive visual concept, they are a powerful format to engage with people. This comes along with a changing role of the spectator, especially since interactive 360 degree movies allow spectators to influence narrative plotlines. Due to

A. L. Brooks et al. (Eds.): ArtsIT 2018/DLI 2018, LNICST 265, pp. 152–162, 2019.
https://doi.org/10.1007/978-3-030-06134-0_16

this, spectators can be part of the experience and renarrate a story [4]. Further, 360 degree films influenced the film language decisively. Filmmakers have started to experiment with this new medium, particularly in the form of storytelling and an aesthetical point of view. Well known rules such as how to make a film, have to be discussed and redefined in this new context [5].

This is the origin of this project. Our research focuses on how traditional storytelling can or should be adapted in a 360 degree interactive video context to formulate design-issues for practical use. The project is titled Cyberella and transfers the well-known story pattern of Cinderella into 360 degree video format using interactive elements to manipulate the plot line of the film.

The remainder of this paper is structured as follows: At first, the related work according to our research context is presented, focusing on the field of film and new media studies as well as a brief examination of Interactive Digital Storytelling (IDS). In the following chapter, our approach, concept and lessons learned are described. Finally the summary, including our future work will be presented.

2 Related Work

Our approach mainly relates to not only the field of film studies, but also the application of concepts and methods from the field of new media studies and Interactive Digital Storytelling (IDS).

2.1 Film Language in Virtual Reality Context

There exist several standard works on film language yet. For example, the well-known work of James Monaco is often cited in the context of film language and history [6]. "How to read a film" is a good example of the fact that film studies have been opened up to audiovisual forms outside of cinema and television a long time ago. It contains a separate chapter that deals with film language in multimedia. The works of Elsässer and Stam are also part of this research context [7, 8]. There is not only an adaption of film study theories to the new media field, but also the new media field to film study theories. New media studies also increasingly investigate filmic narration [9, 10]. Thus, it becomes clear that an expanding interdisciplinary research field has emerged in the last 15 years.

For our approach, references between film studies and new media studies in the context of virtual reality are particularly important. There are also basic studies in this field [11]. The particular challenge of narration in the field of virtual reality is also being investigated, for example in "The virtual life of film" [12]. Another example is "Towards a narrative theory of virtual reality" [13]. In particularly, the effects of cinematic narratives in the VR context receive greater attention [14]. A basic work, however, is still missing in this context.

2.2 360 Degree Videos and Virtual Reality

360 degree cameras, or the so called "omnidirectional cameras", record a view in every direction at the same time [15]. For this reason, the spectator can change the viewing direction while watching a 360 degree video through a mouse click or other forms of interaction. A high immersion is guaranteed by wearing a headset to increase the feeling to be inside the recorded panoramic shots [16–18]. Virtual Reality and 360 degree video are often used in the same context and are therefore interconnected, for example in the case of using a head-mounted system for the reception. Here, the viewer is completely immersed into the virtual environment - while watching a 360 degree video the outside world is not perceived. In contrast however, we usually term a computer-animated world a Virtual Reality world, particularly in the context of computer games. Of course there also exist numerous 360 degree animation films.

2.3 Interactive Storytelling in 360 Degree Videos

Interactive Storytelling relates to a field of research concerned with the conceptualization, development and evaluation of methods and technologies linked with nonlinear narratives and corresponding mechanisms for user interaction to influence the paths and the outcomes of stories [18, 19]. Corresponding approaches have being investigated in the last years, and lately quite a few of those are being used in the field of interactive entertainment products and computer games, specifically within a sub-genre emphasizing narrative against high degrees of interactivity.

While the number of examples of 360 degree videos is actually high, the lack of interactive storytelling in the market reveals deficits of these approaches. They may not only be linked to technological aspects but also to deficits in finding the right form of how to develop dramaturgical lines in interactive 360 degree films [20]. In addition, while different interaction paradigms have been explored, unfortunately they did not adapt successfully in the 360 degree context.

Accordingly, interactive storytelling with 360 degree videos is still at the early stages and common rules of film language need to be formulated. In the following paragraph the approach and concept of our research project Cyberella, including first results about design-issues, are presented.

3 Approach and Concept

Our project Cyberella focuses on how traditional storytelling can or should be adapted in 360 degree interactive video context to formulate design-issues for practical use.

In our first project phase, existing interactive 360 degree videos were examined for their specific film language. Underlying examination criteria were: Image composition, using of sound, editing and dramaturgical aspects like increasing suspense or establishing plot points. In addition, the analysis of the interaction possibilities played an important role. The results have been collected and tabulated. This catalogue of criteria formed basis for our own 360 degree video project.

Our second project phase includes our practical film project Cyberella that involves testing a variety of film styles in accordance to the catalogue in order to find new ways of film making and gain initial experience. We want to put focus on aspects that have not yet been tried out in this form or that have not been analyzed in detail. Early and regular screenings of sequences in front of test audiences with discussion panels helped to define first design guidelines. Both steps are explained below in more detail.

3.1 Step 1: Examination of 360 Degree Videos

In the following section we will discuss important characteristics of the medium 360 degree video and the corresponding film language. The presented best practice films demonstrate their application. Compared to conventional film, the way of making films is different in a 360 degree context. In traditional video, for example, the user is locked to the angle where the camera is pointing to during the capture of the video. With 360 degree video recording, these boundaries no longer exist. This new freedom of spectators has a significant influence on film language. A film maker cannot limit the details presented to spectators, they choose it them themselves [21]. Pre-defining shots and image composition get difficult to establish, except for the first shot of the film before the user interacts the first time. However, this also means that it must be ensured that the viewer does not miss anything important. Furthermore, usually the camera has a fixed position without moving around. Things or persons cannot be zoomed in well unless they are moving towards the camera on their own. A 360 degree scene is usually told from one setting size. Changing the setting size has to be done through editing the film material which in turn can often lead to new challenges [22].

Cuts are rare in the 360 degree genre and usually mark a change of location. In the field of animated film you can find more experiments with this editing technique. A good example represents PEARL [23]. The short musical from 2017 was created as 360 degree video and can be seen in browser or with virtual reality glasses via Google Spotlight Stories [24]. According to the road movie genre the story is set inside a car, reflecting the relationship between a father and his daughter sharing their love to music. The narrow display window allows close setting sizes and creates a feeling of closeness to the figures. It results in an animated look that is simple and flat, reminding us of the first computer games. This reduced look combined with almost no voice support stresses the music side of the film. Storytelling becomes particularly interesting, using time-leaps forward and backward to narrate. This is realized by the match cutting technique showing the young girl growing up. Besides looking around no further interaction is supported but this technique is used well. Looking back and forth inside the car to the daughter and father lets the audience actively get to know their relationship.

The following 360 degree film uses the technique of film editing in a different way: WELCOME TO ALEPPO represents an example of 360 degree video reporting from 2015 [25, 26]. It combines 360 degree with non-360 degree film material telling the story of the incredible destruction of the city and the numerous victims of the war. A collage of film sequences shows the time before the war and its gruesome consequences. During the film, 360 degree sequences are included, in which the camera is located without any movement in the middle of the ruined city. The viewer now has the

opportunity to look around and empathize with the destroyed war scenery, expecting for something to happen.

In many cases the interactivity in 360 degree videos can be reduced in changing the viewing perspective while watching 360 degree videos. Maybe because many platforms, (such as facebook and youTube), do not support further interactivity by default. Google Spotlight Stories offers a solution to integrate interactivity into 360 degree films, particularly for the Google Cardboard. Interactive videos extend boundaries even further allowing to explore the video and to navigate to related information [20]. They are well known in a non-360 degree context. But recently, new forms of interactivity has been recognized in our context. GONE [27] and VR NOIR [28] present two examples that include interactive elements into 360 degree videos to influence the plot line. The mystery thriller series GONE tells the story of Meredith Clover, a mother searching for her missing daughter [29]. Throughout the series the spectator has the ability to use certain hotspots in the scene. These hotspots represent clues and are only available for a limited time. If the user taps on one of these hotspot scenes, the colour saturation will change and a sound will be played. In the meantime, the main scene will not be interrupted. Throughout the series you will also find false hints, a well-used storytelling technique. VR NOIR created by the Australian studio Start VR, builds on the storytelling techniques of GONE, but includes the spectator as a main character by giving him/her freedom to influence the narrative [30]. For example, the user can ask a client further questions or get control of a spy camera as you stake out a mark on a rooftop. The analysis of these films has shown that the 360 degree film language is in a transitional stage.

The following table summarizes important results of the examination of best practices in the field of 360 degree film. Further research questions has also been added as a basis for the second step of our project.

3.2 Step 2: Our Project Cyberella

In the next step, the Cyberella project tests new ways of filming 360 degree videos corresponding to the research questions in the table above. It was important to leave established paths of 360 degree storytelling and to explicitly use new forms of expression.

The story of Cyberella is about a student who moves away from home for the first time and lands in a flat with exploitative roommates. The title “Cyberella” already indicates the adaption of a fairy tale theme, constituting the words cyber and Cinderella. The story includes familiar narrative patterns from the fairy tale Cinderella and applies them to the context of today. This comprises not only figures and objects, but also the setting and the sound. Magical special effects complete the adaptation of the fairy tale theme. The following illustration shows a still from the film CYBERELLA (see Fig. 1).

The non-linear plot line contains interactive elements to manipulate the narration of the film. Once we have installed as many branches as possible, our story tree was gradually reduced during the course of the project.

Fig. 1. Still from the 360 degree film Cyberella

The following graph illustrates the current plot line (see Fig. 2):

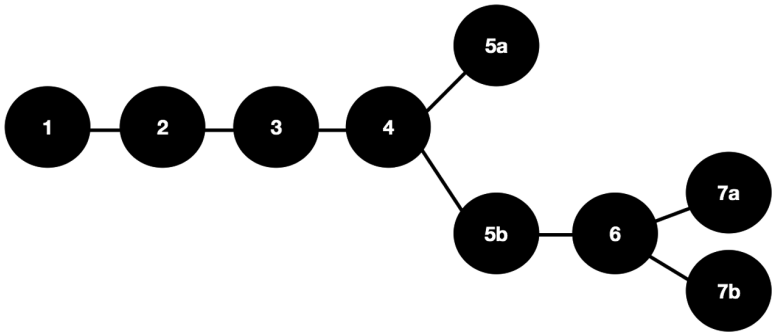

Fig. 2. Branched plot line of Cyberella

The film starts with a linear plot line (step 1 to 4). The character of Cindy, who must work as a servant of her terrible roommates, is introduced. She gets an invitation to a party where she meets a very nice barkeeper. Branching is then used to increase the tension. The protagonist is already there on the way back from a party. Here, the viewer is involved in the course of the story. He/She decides, by using hotspots, what the main character should do and his/her decisions influence the further course of the story. Should the main character go back to the party or go home? In any case, the suspense continues to increase. The first turning point is set up during a chase scene (step 5a and 5b). The second turning point of decision is installed just before the story is triggered (step 7a and 7b).

To integrate the hotspots we experiment with the technique of the frozen image, that is, the image for interaction stands still and the film does not continue until a choice

is made. A mix of 360 degree video material and 360 degree photography is generated by this form of editing. The effect of this interruption on the reception of the film has not been clarified yet. For this, it is precisely the form of integration of interactions that is not yet fully completed in our ongoing project.

4 Lessons Learned

The following chapter contains a discussion about design-issues for interactive 360 degree films. Overall, using 360 degree videos should not be used for their own sake and must have a significance for the story through supporting aesthetic issues. The following four main challenges demonstrate our lessons learned in practical use.

4.1 Challenge 1: Storyboard and Image Composition

The storyboard has to be adapted to the special features of 360 degree videos. We used storyboards in the field of virtual reality and game design as a role model. On the one hand, the circular field shows the position of people and objects relative to the camera, which is placed in the middle, represented by a yellow star (see Fig. 3). On the other hand, the panoramic view shows the composition of the persons and objects in the viewfinder of the camera. While creating the storyboard, we combined this technique with that of making a stop motion film: figures and objects were drawn on cards and placed in different order until the best possible sequence of events was achieved. The best sequences possible were photographed and served as the basis for the storyboard.

Fig. 3. Storyboard shots of Cyberella

The following figure shows two examples of the variation of a circle to create the storyboard:

4.2 Challenge 2: Image Composition and User's Attention

360 degree panoramic views can increase the credibility of the feature especially in documentary films because the audience sees the entire picture and is not limited in

his/her field of view through the picture frame. In practical work, however, this also means that the entire area has to be observed by the film maker. Passers-by must be explained that there is no area behind the camera, so they are always in the picture. For the camera operator him/herself, this means that he/she cannot stand in the set to control the shot directly at the camera. Furthermore, if you like, the 360 degree image is always shot from the perspective of the viewer, who automatically feels part of it.

A big challenge is directing the viewer's attention to places where important things were happening to the story, according to the formulated research question in Table 1. Our research has opened different possibilities, clear references and more subtle variations. For example, on the sound level: The character can on the one hand directly ask that one should turn around. On the other hand, a sound that comes from an area that is not focused on at this moment can catch the viewer's attention and encourage him to turn around. Another possibility arises from the fact that the viewer tends to follow movements. If a figure walks by the camera, he/she turns to see where the figure is going. Furthermore, the lighting can also be a good means to direct the viewer's gaze. Brightly lit areas of the setting increase interest. This is a good example of how traditional film language can be used in 360 degree video. The deliberate use of light and shadow, spotlights on striking objects and people are an important element for film drama.

Table 1. First results of the analysis of best practices.

Aspect	Description	Research question
Image composition and sound design:	360 degree videos capture the perspective of the viewer within a panorama shot, which can be freely chosen. It is not possible to install a fixed image composition	How can we direct the viewer's attention? And how can we arrange the composition of a 360 degree setting? Which role is played by sound design?
Editing/dramaturgical aspects:	There are cuts in 360 degree video, but these are rarely used. Their potential remains untapped	How can we cut 360 degree videos without confusing the viewer? How can we create a suspense line using cuts?
Editing/Mixed film formats:	Usually 360 degree films are only cut from 360 degree film material. There are examples that mix 360 degree material with non 360 degree material	How far does it make sense to mix different film formats?
Interactivity:	Interactions are already being used in 360 degree filming, but to a lesser extent in the context of interactive narrative storytelling	How can interactions support the story?

4.3 Challenge 3: Creating Suspense by Editing (Mixed Film Formats)

Usually, many scenes of 360 degree videos resemble those of a theater stage [31]. Cuts are normally implemented by changing a scene, i.e. the change of location. However, montage is an important means of creating dramaturgy in traditional film even within the scene. This refers to our research questions: How can we cut 360 degree videos without confusing the viewer? And how can we create a suspense line using cuts? We are convinced that this is possible in 360 videos too, when you take some rules into consideration. No cuts in sequences with a lot of dialogue. Here, the imagery must be subordinate because the focus is on the dialogue. In visual scenes, however, cuts are easily possible and are mostly accompanied by music. Furthermore, it is a good opportunity to combine a cut with the movement of a camera. These jump cuts as a bridging of space and time are recognized by the viewer deliberately. When connecting different clips, attention must be paid to coherent connections, especially in the area of the 360 degree videos.

Another challenge lies within editing results from the combination of mixed film material according to our research question of how far it makes sense to mix different film formats. This not only applies to the combination of 360 degree and non - 360 degree material, but also 360 degree film material joined by 360 degree static picture material. Irritations occur when the viewer does not notice the change or does not understand the meaning behind it. This can be solved by special effects, for example playing a certain sound when the 360 degree film image freezes. The distinction can also be identified on the visual level without triggering the film's coherent relationship. One possibility is the use of distinct color filters or the differentiation between colorful and black & white pictures. This should be applied in accordance with what is shown in the picture.

4.4 Challenge 4: Interactivity

In addition to just looking around, hotspots embedded in the 360 degree film material are a great way to enhance interactivity. The inclusion of interactivity has a significant impact on the storyline. According to our research question, how interactions can support the story, the usage of hotspots can help branching of the story. An important challenge here is to keep the dramaturgical suspense line, because branching is a challenge in the 360 degree film. Here it is important not to reduce the choices of the story to yes or no decisions. The choices should have a significant impact on the story. An example of this from our 360 degree film CYBERELLA is: The protagonist is being traced by a stranger who is coming closer and closer. Now she is faced with the decision of either to go back to get her lost cell phone to call for help or to find a hideout inside her house. Brave viewers may choose the first variation and then find that the pursuer has no bad intentions, but instead returns the forgotten cell phone to her. This example shows how dramaturgical turning points can be integrated through interaction.

Furthermore, through hotspots, further information that is important for the story can be distributed in the room. Here, the viewer becomes the discoverer of the story.

His understanding of the course of the plot line is revealed through his interaction. Especially in this area we see enormous potential for future enhancements.

5 Summary and Future Work

In this paper we described the current state of our ongoing project Cyberella on exploring narrating techniques for interactive 360 degree films. Making 360 degree videos opens up innovative possibilities as well as challenges for film language and aesthetics. The viewer is granted with more opportunities to discover the cinematic space and becomes a co-narrator of the story. However, this greater freedom also opens up the problem of maintaining the coherent connection of the plot line and telling an exciting story. Not all techniques of conventional film making can be transferred 1:1 to the 360 degree video. This we have briefly described in our challenges in Chap. 4.

In summary, using 360 degree videos should not be used for their own sake and must have a value for the story. Our lessons learned showed first design-issues for interactive 360 degree videos and stressed challenges in the field of making a good storyboard, using new forms of image composition and sound design to direct user's attention, editing sequences and also adding interactivity. Our next steps are the completion of the film and non-public test screenings. At this stage, the research questions described above in Table 1 will be reevaluated. The focus is especially on the interaction with the 360 degree video.

Acknowledgments. We are thankful for the great support of the student project group that was significantly involved in the implementation of Cyberella: Lea Sophie Drees, Simone Koch and Tamara Tromsdorf.

References

1. Oettermann, S., Schneider, D.L.: The Panorama: History of a Mass Medium, vol. 2, pp. 22–33. Zone Books, New York (1997)
2. Nedelcu, M.: Expanded image spaces. From panoramic image to virtual reality, through cinema. Close Up: Film Media Stud. **44** (2013)
3. Alive Film. https://www.alive-film.com/interaktiver-360-grad-film-mit-hotspots/. Accessed 28 July 2018
4. Dolan, D., Parets, M.: Redefining the axiom of story: the VR and 360 video complex. Tech Crunch (2016)
5. Passmore, P.J., Glancy, M., Philpot, A., Fields, B.: 360 cinematic literacy: a case study. International Broadcasting Convention (2017)
6. Monaco, J., Lindroth, D.: How to Read a Film: The World of Movies, Media, and Multimedia: Language, History, Theory. Oxford University Press, Cary (2000)
7. Elsaesser, T., Hagener, M.: Film Theory: An Introduction Through the Senses. Routledge, Abingdon (2015)
8. Stam, R.: Film Theory: An Introduction. Wiley, Hoboken (2017)
9. Manovich, L.: The Language of New Media. MIT Press, Cambridge (2001)

10. Alexander, B.: The New Digital Storytelling: Creating Narratives with New Media–Revised and Updated Edition. ABC-CLIO (2017)
11. Sherman, W.R., Craig, A.B.: Understanding Virtual Reality: Interface, Application, and Design. Elsevier, Amsterdam (2002)
12. Rodowick, D.N., Rodowick, D.N.: The Virtual Life of Film. Harvard University Press, Cambridge (2009)
13. Aylett, R., Louchart, S.: Towards a narrative theory of virtual reality. Virtual Reality **7**(1), 2–9 (2003)
14. Shafer, D.M., Carbonara, C.P., Korpi, M.F.: Exploring enjoyment of cinematic narratives in virtual reality: a comparison study. Int. J. Virtual Reality **18**(1) (2018)
15. IFI. http://rpg.ifi.uzh.ch/docs/omnidirectional_camera.pdf. Accessed 28 July 2018
16. Neumann, U., Pintaric, T., Rizzo, A.: Immersive panoramic video. In: Proceedings of the Eighth ACM International Conference on Multimedia, pp. 493–494. ACM (2000)
17. Argyriou, L., Economou, D., Bouki, V., Doumanis, I.: Engaging immersive video consumers: challenges regarding 360-degree gamified video applications. In: International Conference on Ubiquitous Computing and Communications and 2016 International Symposium on Cyberspace and Security (IUCC-CSS), pp. 145–152. IEEE (2016)
18. Ryan, M.L.: Narrative as Virtual Reality 2: Revisiting Immersion and Interactivity in Literature and Electronic Media. JHU Press, Baltimore (2015)
19. Crawford, C.: Chris Crawford on Interactive Storytelling. New Riders, San Francisco (2012)
20. Chambel, T., Chhaganlal, M.N., Neng, L.A.: Towards immersive interactive video through 360 hypervideo. In: Proceedings of the 8th International Conference on Advances in Computer Entertainment Technology, p. 78. ACM (2011)
21. Passmore, P.J., Glancy, M., Philpot, A., Fields, B.: 360 cinematic literacy: a case study. In: International Broadcasting Convention, September 2017
22. Berliner, T., Cohen, D.J.: The illusion of continuity: active perception and the classical editing system. J. Film Video **63**(1), 44–63 (2011)
23. PEARL, USA (2017)
24. Curtis, C., Eisenmann, D., El Guerrab, R., Stafford, S.: The making of pearl, a 360 degree Google spotlight story. In: ACM SIGGRAPH 2016 Apply Hour, p. 8. ACM (2016)
25. WELCOME TO ALEPPO, USA (2015)
26. Van der Haak, B., Parks, M., Castells, M.: The future of journalism: networked journalism. Int. J. Commun. **6**, 16 (2012)
27. GONE, USA (2015)
28. VR NOIR, USA/Australia (2016)
29. Skybound. https://www.skybound.com/tv-film/our-vr-project-gone-is-here/. Accessed 28 July 2018
30. Upload VR. https://uploadvr.com/vr-noir-great-example-virtual-reality-will-change-television/. Accessed 28 July 2018
31. Pope, V.C., Dawes, R., Schweiger, F., Sheikh, A.: The geometry of storytelling: theatrical use of space for 360-degree videos and virtual reality. In: Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems, pp. 4468–4478. ACM (2017)