

Interactive Cinema

A mini guide for understanding and producing a 360° interactive movie.

Colophon

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I

Interactive Cinema is a cinematic experience that has game dynamics integrated into it. This gives the viewer the option to influence the storyline to some degree. In a regular cinematic experience, the viewer lacks the option to alter events unfolding within the film. In video games, the player is given the freedom to interact with the game and alter the storyline.

Interactive Cinema is a concept that has been around since the 1990's and has remained in the background because of the lack of success and hardware development. With new technologies on the rise, the concept is resurfacing and seems to be making a comeback.

The goal of this guide is to point out the possibilities and problems that occur within real life VR. It is about finding a balance between giving the viewer the possibility to alter the story, whilst still enjoying it.

Within the domain of Interactive Cinema, several issues have been discussed regarding narration, interface, immersion and the technical aspect. The issues will be discussed in this guide and possible solutions will be provided.

This guide will provide the scriptwriters and producers with information in order to understand the concept of a 360° movie experience, the important key factors and it provides additional information regarding how to start planning and producing your own experience.

Virtual Reality

VR is an interactive and immersive experience in a computer-simulated environment. It has been around since the '90s and had some trouble fulfilling the promises it made, such as transporting the viewer anywhere they wanted to go, by simply putting on a VR headset.

The VR headsets presented in the '90s were big, heavy and would cause nausea. This meant it would be inaccessible in an arcade or a home environment. NASA and the military however saw potential in the concept and attempted to develop flight and combat simulations. To their dismay this led to simulator sickness, which at one point even traumatized the people it was designed for. (Heffernan, 2014)

Most believe simulation sickness is the result of a conflict going on among sensory inputs. The eyes and ears inform the brain of what they perceive while the deeper systems, the proprioceptors which register stress, balance and others, contradict this. (Heffernan, 2014)

Besides the use of VR headsets for simulation purposes for the military and NASA, they have been used in the medical field to help people with their mental illness, such as PTSD, anxiety and phobias.

VR has come a long way since the 90s and has regenerated the hype it had back then while being able to produce results. The current headsets have caused less nausea than previous models, are more affordable and accessible to the public.

There are several VR equipment one can keep in mind, some more accessible than others, it is a matter of preference and finances.

Headsets

One of the basic equipments used to present VR and enhance the immersion of the viewer is a VR headset. It immerses the user by adding to the visual input and gives them the feeling of stepping into a different world by giving the viewer the ability to look all around him. By giving the viewer the freedom to look around wherever they want, they are made the directors of their own story.

There are several options regarding VR headsets you can choose from, and some factors you have to keep in mind when developing for those headsets. Some of these headsets have small displays integrated in them, while other utilize the viewers' smartphone. One of the cheaper models that the viewer can put together themselves is the Google Cardboard. Not only is it cheap, it is also accessible by (almost) everyone with a cellphone.

Another choice is the Oculus Rift, which was purchased by Facebook back in March 2014. This is a bit more pricey when it comes to market value, however it's more sturdy and immerses the user more by blocking them off from distractions happening around them. There is no consumer version of the Oculus Rift at the moment, but developer kits are being sold to whomever is interested.

In addition to these two, there are other options you can look into, such as the Gear VR, Carl Zeiss VR, Project Morpheus, Archos VR and several others.

Storytelling

There are several ways to approach a storyline in a virtual environment, it all depends on how much freedom and how many options you want to give your user. You have to keep in mind which role you want the viewer to fulfill.

You can involve your viewer by giving them the position of one of the characters in the experience. The viewer will have to make his or her own choices based on their personal feelings and storyline.

Depending on your choice, the narrative control integrated in your story is of major relevance, because this determines how much freedom and power you are going to give your viewer. If you provide too many interaction points, the experience tends to be more like a game, but if there is hardly any interactivity, your movie experience will turn into a static story.

Story Structures

In order to know what kind of story you are aiming for, you need to have a some knowledge about the structures. The structures are important, because you can determine your interaction points in the storyline and depending on the interaction points, you determine the size of your plot.

String of pearls

This story structure is mainly used in games. It gives the player the opportunity to explore a world (one pearl) and only after performing a certain task, the user will be able to advance to the next world. (Fig. 1.)

Though it's a way of integrating atmospheric storytelling and interaction within the world, the plot is still linear. (Verdugo, Nussbaum, & Corro, 2011)



Fig. 1. String of pearls

Branching structure

In the branching structure, the model is based on turning points within the script. It branches the game/film into multiple different stories, based on the viewers choice (Fig.2.). This allows them to have an effect over the plot and provides a diverging storyline and true interactivity. For producers, however, it is quite complex creating content for this kind of structure. The more choices you give a viewer, the more alternative possibilities need to be provided for, which becomes a problem when you would have to produce such a film. (Verdugo, Nussbaum, & Corro, 2011)

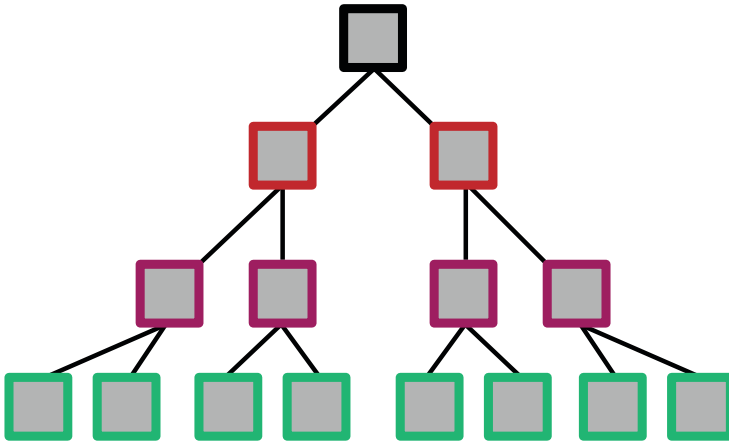


Fig. 2. Branching narratives

Detour structure

In this model there is a good mix between narrative and interactive elements, providing the balance between the feeling of agency* and storyline (Fig. 3.) (Verdugo, Nussbaum, & Corro, 2011). This could be an ideal solution regarding interactive cinema. But although the viewer has the feeling he is in control and has the opportunity to view the consequences of the choices he makes, he is in fact still tied to the main storyline, which might result in a feeling of “fake” agency.

Whether or not you decide to use these narrative structure, is up to you, however you don't have to follow these structures fully. It is possible to modify and combine these structures to your liking, as long as you have a good overview of where the interaction points are and how the storyline flows.

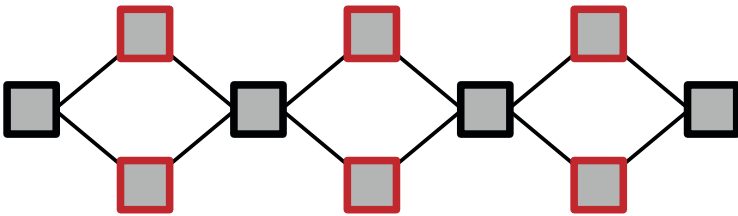


Fig. 3. Detour narratives

* *agency*: the feeling of control

Combined narrative model

The combined narrative model is an example of how story structures can be used to benefit the story (Fig. 4.).

By adding interactivity and highlighting where these take place in the timeline, you are able to structure the foundation of your story.

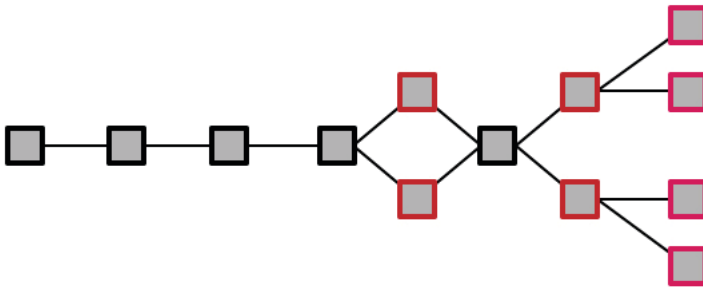


Fig. 4. Combined narrative model

Narration and Focalization

Before you start writing the story, the perspective and focalization have to be considered. Focalization, a term coined by Gérard Genette, a french literary theorist, refers to the perspective through which a narrative is presented. Perspective refers to the point of view.

It is important to decide which perspective and focalization you want to use, because it also defines the way you address your viewer and the way your viewer interprets the story.

When reading books, you come across several perspectives. The all-knowing perspective; omniscient, and the first, second and third person perspectives.

In focalization you have the zero, internal and external focalization. Though point of views show similarities to focalization, there is a conceptual difference between the terms.

Internal focalization

Narrator = Character

This focalization type suggests that the narrator only says and knows what the focal character knows and feels. What other characters feel and think, is unknown. This provides for a “point of view” narrative, where events are mediated through the point of view of the focalizer. (Genette, 1980)

External focalization

Narrator < Character

The narrator is outside of the characters' consciousness, thus knowing less about the character and acting like a camera lens, following the protagonists' actions and gestures from the outside. This provides for an "objective/behaviorist" narrative, allowing the viewer to interpret the actions of the characters as they wish, without influence of the narrator. Many movies are told through the use of this focalization. (Genette, 1980)

Zero focalization

This focalization type resembles the omniscient point of view, where the narrator knows more than the character/viewer, including facts about all of the protagonists, as well as thoughts and gestures. (Genette, 1980)

To guide your viewer, you can choose to have an inner monologue narrating the thought process the viewer should/could have. This would happen through the use of internal focalization.

However, if you would want to let everything happening in the scene up to the user's interpretation, then you would have to use an external focalization and not narrate what the viewer is supposed to be feeling or thinking.

During a user test carried out by the Interactive Cinema team (at the Amsterdam University of Applied Sciences), the results showed that the viewers would identify with the second-person narrative faster than the third- and third person narrative.

Three versions were used for this test, one using an inner focalization and another using an external focalization.

The respondents stated that using a third person narrative felt more like listening to an audiobook in which they had to sit back and listen. This perspective didn't engage them to look around or be active while in the VR.

The first person narrative on the other hand, they had a harder time identifying with, though at some point they were able to. This meant that with time they would be able to relate to the voice narrating.

The second person narrative gave them a stronger feeling of presence and triggered them more to look around and find the hotspots. Hotspots are areas in the scene/movie that allow for or trigger an interaction

Interactivity

One of the key elements of interactive cinema, is the use of interactive elements that influence the storyline to decide how the storyline should progress. To implement this factor into a movie, one must understand what it is and how it influences the storyline.

Within the context of Interactive Cinema, interactivity is the real time reaction viewers get when they make choices within the story. By giving the viewer a possibility to interact with the movie, and receiving feedback on the choices they make, you give them the feeling they are in control of the storyline; the feeling of agency.

A method used by the Interactive Cinema group, for a viewer to interact with the story, is by looking at an object or person to trigger an action, dialogue or effect. This method of interactivity can be implemented by adding hotspots into the scenes.

The hotspots are important because they determine where activity happens in the scene. They can be programmed to trigger after the viewer has looked at it for a certain amount of time and can also be programmed to be as big or as small as you wish. You can, for instance, decide whether you want the hotspot to trigger when the user looks at the entire wall, or when he's nearing a certain portrait on the wall.

A few example of hotspot triggers are:

- A telephone which will stop ringing once the viewer looks at it.
- A door that opens after the viewer has looked at it.
- A DJ starting to play music after the viewer looks his way.
- An actor starts a dialogue with the viewer, after the viewer looks at him/her.
- Looking at the sky could change the weather, such as having it rain.

From past experiments, the Interactive Cinema group noticed that people testing the experience, would often not notice the interactivity in the story, nor the hotspots integrated to trigger them. Hotspot feedback is another element one can add into the interactive movie. The viewer will know they have triggered a hotspot, when they are given some form of feedback about it. This can be implemented through sound or through a visual feedback. The viewer could hear a “ping” sound when they have triggered a hotspot, or they could have a dot in the middle of their screen that changes color as soon as you are on top of an hotspot and/or have activated it.

The thing about feedback is, it ensures the viewer that they have indeed activated a hotspot. By receiving instant feedback, the sense of flow increases (Csikszentmihalyi, 1998).

Flow is a mental state in which the viewer is fully absorbed in an activity. They are so concentrated, they tend to lose track of time while being focused on their tasks.

To achieve this state of mind, the viewer has to be immersed in the movie. Immersion is the degree of involvement a viewer has with the movie experience.

Brown and Cairns (2004) have defined 3 levels of immersion and the *barriers* gamers have to cross in order to unlock/gain the next level of immersion. This was based on an experiment done by them in order to understand the concept of immersion more.

Access;

The players' preferences, his opinion of the game controls and the feedback the game provides him with.

Investment;

The player has to invest his attention, time and effort into the game.

Once these two barriers are crossed, the player will start to feel engaged and will want to continue playing the game.

First level of immersion; Engagement

Game construction;

Having a well constructed game, for example having aesthetically pleasing visuals, intriguing challenges and a well written plot, can have an effect on the players' emotions, which will promote him into the next level of involvement(i.e. engrossment).

Second level of immersion; Engrossment

Atmosphere;

The player, at this point, starts being less aware of his/her environment and their self-awareness has declined as well. If the game is constructed in such a manner that the in-game actions and regions are relevant to the playthrough, it will give the player the opportunity to become fully immersed in the game, considering they now need to devote more of their time to the created atmosphere.

Empathy;

Although it is not necessary for the player to sympathise with the in-game situation, the players can feel a certain degree of personal attachment to the in-game character(s).

Third level of immersion; Total immersion

When the player reaches total immersion, they reach presence. Brown and Cairns (2004) reported that with this final level of immersion, gamers would reach a stage in which they feel like they are cut off from reality, with the computer being all that mattered.

A player while being totally immersed, plays with three elements of his or her attention: the visual, auditory and mental element.

Presence is the feeling of being “there”. Working with a VR headset in a 360° movie will enhance this feeling. The feeling of presence can also be enhanced by acknowledging the viewer in the VR scene. This would mean that actors would have to break the fourth wall. Breaking the fourth wall (Bell, 2008) is a concept in which the actors directly address the

viewer.

The sense of presence can also be enhanced by adding a virtual body into the VR scene. If the virtual body corresponds to the physical body, the mind will be tricked into thinking that the virtual world is more real than the physical one.

Besides adding a virtual body and confusing the viewers mind, there is also a possibility to increase the immersion in the VR scene. This happens when implementation of tactile feedback are applied in the physical world, whilst having it correspond to what is happening in the VR scene.

For example: The viewer walks into a virtual room and opens the balcony doors, and as soon as they do, they hear the environment, but also feel a breeze on their face.

II

Now that the basics regarding an interactive movie are covered , we will start focusing on the production and its process.

There are several points you have to focus on and arrange before starting the production:

- *How much interactivity do you want to add to your movie?*
- *How long do you want your movie to be?*
- *How big is your budget?*
- *How much time are you willing to invest?*
- *Are there people helping you out in this production?*
- *Are you going to rent a camera, hire a company or look for a different solution?*

By deciding on these points, you give yourself an impression of how big the production is going to be and you can take into account the physical, emotional and financial investment you are putting in this movie.

Since this is a newer cinematic format, there will be a lot of confusion on set regarding the camera, the storyboards, script and several other fronts that have to be dealt with.

The key to having a successful production is patience. Not everyone has experienced the world of VR. If you let them experience what an interactive movie is, not only will it boost motivation, but gives them a clearer view of what they have to deliver and how they have to deliver it.

Script Writing

You have to start thinking about your concept and your story. What genre is your movie going to be? What's the general idea behind the story? You also have to think of what role you are going to assign the viewer.

There are several elements you have to keep in mind while writing a script for an interactive movie. You have to integrate interactive moments into it, decide what the viewer should do and if you decide whether or not to branch the storyline out.

The more branches the story has, the more work goes into the movie and each individual branch. Nevertheless, having different endings each time the choices alter, will give the viewer a sense of control. This is often used in games, hardly ever in a filmed environment. It becomes more time consuming, but not impossible.

The detour narrative is also an option, but users watching the movie more than once, will realise that their choices have no influence on the main storyline, and will lose the feeling of agency along the way.

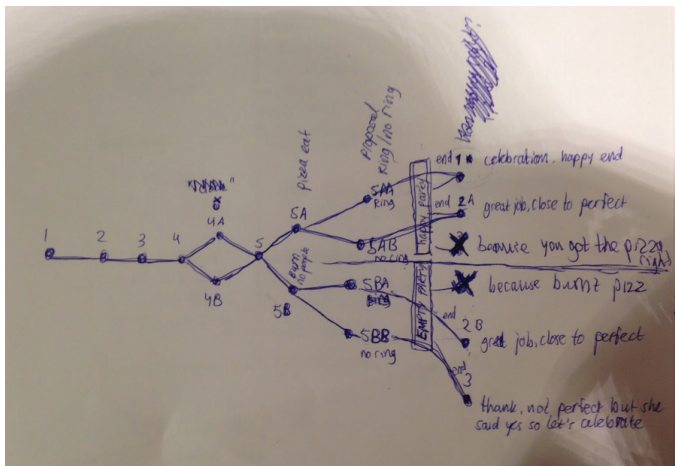
Shooting a 5 to 7 minute experience takes approximately 2 full shooting days. Since you can only review the footage after it has been shot, it might be a good idea to reshoot the scenes several times, just to be sure you got it right.

If you decide to add more interactive and variations to the movie, it will give the viewer extra material to see if they decide to replay the experience.

Since viewers still experience simulation sickness with the current technology, having a shorter experience to reduce that factor is more pleasurable.

When starting to write for an interactive movie, you can choose to have each scene marked in a timeline and have scenes that influences the storyline, branch away from the main one.

Having a timeline to indicate where the interaction points are, helps shape the movie. It also helps others to understand the interaction in the movie and the storyline more.



Script timeline including interactive points and branches

Storyboarding

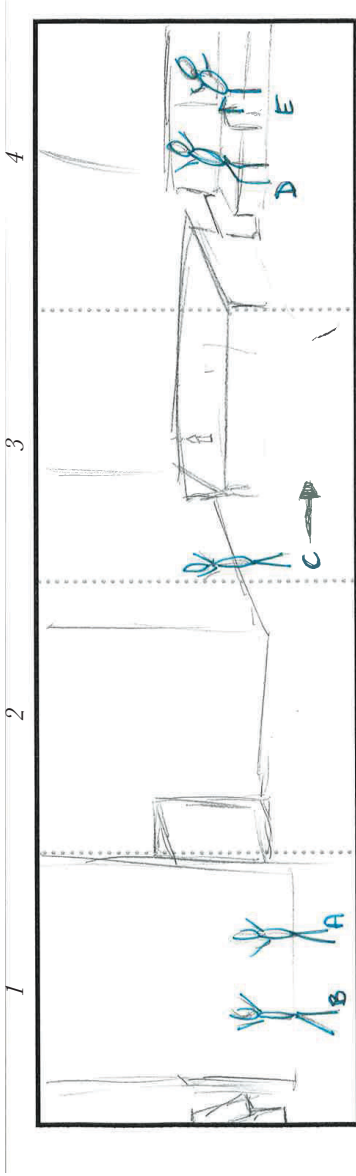
For a regular movie, storyboarding is conventional and widely used in the industry. The storyboard indicates what should be shown on the screen and helps guide the actors and cameramen in understanding the writers' and directors' thoughts.

It is different for a 360° movie. For a storyboard to work in a 360° environment, each shot needs to be split up in four different pieces, showing the scene in a 90° environment. This is necessary because of the camera *stitch lines** and the angles.

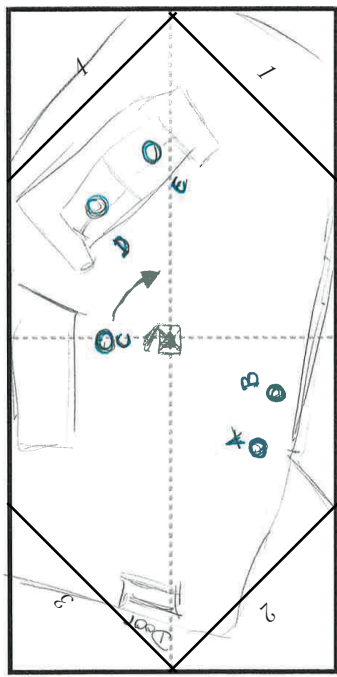
This resulted in the Interactive Cinema team coming up with a storyboard that could be used when working on a 360° movie. The storyboard has four panels next to each other, indicating the panorama the movie will be displaying and where the stitch lines will be.

Since the panels would not be able to give the exact position or depth perception, the top down view was added to the panorama panel. This results into actors and extras on set knowing where they should stand, are supposed to go and what is expected of them.

* *stitch line: the place where the images of two camera lenses overlap.*



Top-down View



SCENE:

SHOT:

PANEL:

ACTION
C walks to D

INTERACTIVE
CINEMA

Storyboard containing the panoramic panel and the top-down view.

Set Design

Set design is another crucial element that defines and enhances the story. There is a difference between setting it up for a regular movie and an interactive one. The entire set will be seen on camera during every shot and there is no way for the crew to physically be there unless they partake in the movie.

Since it is contributing to the atmosphere of the story, make sure you make the setting interesting for the viewer. This especially applies to a 360° movie, because the director can not play with the camera shots nor direct the viewers attention.

The viewer will be standing still in a scene for a majority of the time, having a setting that doesn't bore them to look around could be useful if they decide to replay the experience.

Props on set should be, if possible, not moved, because it would disrupt the continuity of the movie and the critical eye will notice. This especially applies for the interactivity points and scenes that are recorded in a non-chronological order.

A way to make sure the continuity remains intact, is for instance to make sure the cups don't seem empty. This can be done by having the cups not be see-through, having them taped to the tables so nobody drinks out of them or to move them around too much.

A few tips:

- When recording, record a neutral scene, where nobody is on set. This neutral scene can be used to mask out objects that disrupt the continuity.
- Take pictures for every scene of the prop setting. This way if you have to move a certain object, you know where to put it back.
- Fix all props and objects so they don't move.
- Marking stitch lines can be done by planting props.
- No patterned wallpaper, since it will be visible on the stitch line.
- Remind actors and extras that they need to remember their positions.
- Everyone on set needs to be reminded that they are on camera the whole time, this can be exhausting, so make sure you have breaks to relax and the actors to rehearse their lines.

Another point that needs attention is the lighting of the scene. For a regular movie the softboxes and other light sources are usually hidden from the camera. If your storyworld design includes such a light system, then this is possible because everything is visible on set.

However if it doesn't then you will have to be more creative. Using natural light might become complicated, since you would have to pay attention to the weather, for example how fast the sky would be darkening.

The usage of white light is preferable, especially daylight bulbs ranging from 70W to 100W. These could be best used in normal light stands and lighting armatures that fit the storyworld.

The reason for choosing white light is because it is easier to adjust in post production. This means that you can adjust the set to look more cold or warm than it was during the shooting. You will also have to remove or mask anything holding the camera in its place from the video. The video's post-processing and rendering will take time, which is due to the fact that you will have to work with large stitched footage.

Directing

In a regular movie, the director chooses what the viewer sees and conveys his opinion of what is important through the use of cinematic techniques (e.g. close ups). This is a different case in a virtual reality movie, since the user has the freedom of looking around wherever they wish.

One of the challenges you will be facing when making a movie in 360°, is the way you direct attention. Since the viewer will have the freedom to look around, they probably might miss certain cues or important scenes. Narration is a possible solution to prevent the viewer from missing information, but the use of sound effects to guide the viewer is also a good alternative. For example, hearing a door opening or closing, will trigger the user to look at the door to see what is happening.

If you choose to have your viewer be part of the interactive movie, it is important to remind the actors that they are going to interact with the camera. To help the actors understand the concept of VR, have them experience a VR scene.

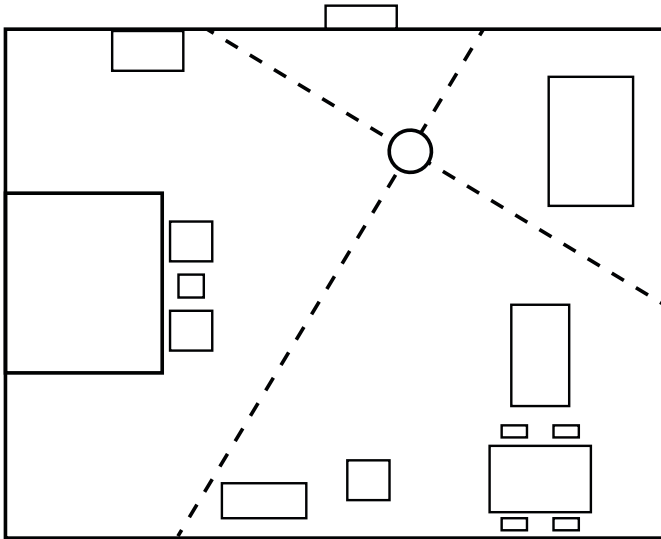
It is also important to note that certain camera's require there to be 1 meter distance between the actors/extra's and the camera. If the actors/extra's come too close, the footage will become unusable and distorted, resulting in the actors/extra's being split in half.

These are all points that can and will come up during the rehearsals, which is a good thing, since they can be tackled and handled before the shooting.

The stitchlines need to be marked, actors need to be reminded that they can not linger on the stitchlines.

Though the lines are not noticeable while wearing a VR headset and looking at the VR scene, they will be noticed once someone stands or lingers on them. The person standing on the stitchlines will look like they are cut in half.

Having props on the set to indicate these lines, will visualize to the actors where the safe zones are.



Stitchlines indicated on the storyboard.

Post Production

After having shot all your footage, it is now time to start on the post production. To create a 360° image that is also stereoscopic, you need a camera that has multiple lenses. Depending on the camera you will be using, there will be several lenses attached to the camera.

The footage off these twelve lenses has to be stitched together during post production to create a 360° image. The stitching can be done yourself, or by a VR specialized company such as WeMakeVR (Amsterdam). Depending how much footage you have, this process might take a while.

After the stitching you will have the opportunity to edit the footage if needed, to mask out what is out of place and to adjust the footage for the final render.

Then the technical part plays a role. Since a movie in 360 is more technical than a regular movie, it will take time to go through all the points and get the movie ready. Hotspots need to be integrated, audio synchronized, grading, interaction points implemented and tested with the VR headset.

The technical planning needs more time than usual, so you have to be patient with your programmer. The bigger the movie becomes, the more time will be put in post production and the technical elements. The file size will be big, so it is ideal if you could have a computer with good specifications that can play the video file without causing any latency.

Technical

For the stitching of the Interactive Cinema movie, the team of WeMakeVR stitched the movie, using a special algorithm they have developed themselves.

After you finish stitching the video together, there are several programs you can use for the development of the 360° movie. Two of the main choices are Unity and Unreal Engine.

The Interactive Cinema group decided to use Unity because it was more accessible to them, and the programmer had more experience using the program itself. Based on your own preference, you can decide which program you would like to work with.

Another important point in the development department is the synchronization. It is extremely important, especially when your audio is played from a different source than your video. With the synchronization you will make sure that the audio and video are played at the same time, so the movie harmonizes. Also make sure the audio is made spatial, to make it feel 'real'.

Summary

In this chapter a short summary will be given, to refresh the memory and to walk you through the important choices you will have to make regarding your interactive movie.

Since the technology is still being developed, there are some limitations that you have to work around or use to your advantage. Depending if you have a 360° camera or are able to borrow/hire a camera from a company that specializes in VR filming, there are several limitations you have to keep in mind. If you decide to hire a company for the filming of your movie, then you should most definitely inquire about their cameras limitations.

Avatar vs no avatar

Deciding if you want to enhance the presence of the viewer through the use of an avatar is important. If you decide to use one, then you have to make sure the movements sync up with the viewer experiencing the movie.

Focalization and Perspective

Do you want to guide your viewer in the movie? Do you want to have them interpret the movie for themselves? Deciding which perspective to use to guide the viewer, will also mark the way you write the script and how the viewer will perceive the information given.

Fly on the wall vs Breaking the fourth wall

If you decide to have the viewer be part of the storyline, then actors will need to speak to the camera as if it is a person and part of the scene. However you can also choose to have the user be invisible in the story.

Footage

Depending on the camera, you can usually view the recorded footage only after you have shot it. This means that whenever you shoot scenes, you will have to estimate if it was good enough. If this is not the case, you will have to retake certain scenes several times, without knowing how well the actors performed.

Movement

Camera movement is currently often restricted, however there are creative solutions to working with a camera that is supposed to be static. One could place it on a moving vehicle or a selfie stick. If you do decide to do this, make sure you take the stitch lines into account.

Stitch lines

Stitch lines, regarding cameras in a VR, are lines that define the field of view of a camera and need to be joined after the footage has been shot. The tricky thing about stitch lines is the fact that movement is possible, but lingering on these lines has to be restricted.

Set

Everyone on set is visible, which means everyone on set plays a part in the movie. Everyone else that is not part of the scene, has to hide and not be visible to the camera, which means as a director you can either choose to be part of the scene and to monitor the actors, or to not see how the take was until later. If you decide that you want to be part of the scene, then you have to make sure you direct yourself as well, or have someone direct you.

Glossary

Agency

The feeling of control.

Continuity

Consistency in the movie regarding detail, actors and actions.

Engagement

A user interested and wanting to continue the game/experience.

Engrossment

A user investing emotionally in the game/experience.

Flow

A mental state of mind in which a person is fully concentrated on the task being performed.

Focalization

Perspective through which a narrative is presented.

Hotspot

A spot that can trigger an action.

Immersion

A degree of involvement.

Interaction

A mutual or reciprocal action.

Interface

A device or program enabling a user to communicate with a computer.

Oculus Rift

A virtual reality headset fabricated by Oculus.

Presence

The feeling of being “there”.

Stitch line

The place where the images of two camera lenses overlap.

VR / Virtual Reality

A computer-generated world in which the user can interact with, through the use of a helmet with an integrated screen.

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AVROTROS

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