

VR Story Production on Disney Animation's "Cycles"

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Figure 1: Left to right: Character and set design, VR blocking, and a final rendered frame from the VR short film project "Cycles"

ABSTRACT

In this talk, we will explore the design, challenges, collaborative workflows, and technological execution of "Cycles", a VR short film created within Walt Disney Animation Studios' internal "Short Circuit" program for professional development.

Of particular note will be the incorporation of various VR techniques and technologies into the production pipeline as a means of facilitating our team's ambitious creative goals.

CCS CONCEPTS

• **Computing methodologies** → **Animation; Virtual reality;**

KEYWORDS

production, animation, virtual reality, VR, storytelling

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1 INTRODUCTION

"Cycles" is a VR short created at Walt Disney Animation Studios as part of the internal "Short Circuit" program, which seeks to foster professional development through creation of experimental content. The resulting piece is emotional and intimate; it is inspired by the director's personal interactions with architecture, exploration of abandoned spaces through freestyle BMX, and the experience of moving his grandmother to an assisted living program. The story of "Cycles," which navigates the life of one space over the course of several decades, follows the ebbs and flows of a growing, changing family and the interpersonal challenges that accompany them.

Despite "Cycles" small team and short four-month production schedule, it still sought to tell a driven, engaging story on par with the initial designs. This brought about many technical challenges, but through collaboration the team found successful workflows and VR integration techniques. These efforts helped the final experience blur the line between viewer and story, connecting the audience to the characters and spaces in the film. Navigating these processes proved to be an insightful learning experience for the studio.

2 COLLABORATION OF ART & TECHNOLOGY

Artists at Walt Disney Animation Studios are all trained to create appealing characters, stories, lighting, animation, etc. As our team worked through the project, we realized that the artistic decisions and processes key to our films were equally if not more important in a medium like VR. However, how does one go about translating such practices into this new space?

There were a lot of unknowns at the beginning, but teamwork between artists and technology proved to be essential in solving them.

We worked in a very iterative and collaborative way to address challenges such as guiding the audience's eye, character acting, and storytelling. We approached these with the same tenacity as on our feature films, but adapted to virtual reality. The following sections outline a number of the techniques that resulted from this collaboration and the design context that governed their development.

3 STORYTELLING IN VR

It is often the case that stories will be created and then put into VR secondhand. This story, however, was specifically designed with virtual reality in mind. The medium allows the viewer to experience a place or space, and the house featured in "Cycles" is not only the setting but also a lead character. Thus, VR is essential to the development of the story, wholly transporting viewers into the space and allowing them to develop a deep connection with the home as the arc is told through one room and into the next.

However, VR poses an inherent problem with direction: how does one direct the audience's eye when they can look anywhere and everywhere they wish? To address this problem, we had to develop unique storytelling techniques that guide the audience.

The mode of storytelling is meant to mimic the experience of human memory. When the audience looks away from the defined story beats, the view will begin to darken and desaturate. The idea here is that, in looking back on a personal memory, you often do not remember what happened behind you or in any of the spaces on which you were not focused.

Furthering this idea of memory as direction, "Cycles" relies heavily on the idea of time lapses. The time lapses are represented as a rapid succession of disconnected actions and dialogues, much in the way that one's memories of moments between milestones tend to blur together over time. These lapses are not only storytelling devices that bridge the main story beats temporally; they also serve to direct the viewer's focus spatially as the visuals of the time lapses navigate their way through the home.

4 PIPELINE TECHNOLOGY

The production of "Cycles" was done using a game engine, where everything needs to be "alive" and synched in real time. This is very different from the way we are used to working on feature productions. Usually, we create our shots separately, render them offline, and everything is added together at the end. For this VR piece we had to develop our own scripts and plugins to keep our assets in sync, allowing us to enable and disable elements in real time as needed per shot. We developed our own shot loading technology with which we were able to configure lights, sound, animation, and effects in real time.

At Walt Disney Animation Studios, our artists have access to an incredible suite of tools for authoring both characters and art-directable cloth simulations on feature films. For "Cycles," we wanted to get as close as possible to feature film quality, which meant we needed to leverage some way of transferring these techniques to a game engine in order to be played in real time in VR. We addressed this challenge by building a bridge between the two pipelines: we used the traditional Disney pipeline to produce assets, then converted them to the Alembic file format to successfully transfer them to the VR space. There has been extensive work on optimization

and in-house scripting to find the ideal way to enable this process for VR. As a result, we were able to output our final experience at a much higher resolution than we had been in earlier experiments.

Custom scripting was also used to blend or animate textures and emissive lights. Post process camera effects were configured in real time, depending on the viewer's position and the direction of their gaze (i.e. desaturation of the images to direct focus). We also used custom scripts to develop our mirror effect featured near the end of the film, which serves to directly connect the viewer with the character. These many real time changes help achieve a believable and immersive VR experience.

5 USE OF VR TOOLS TO CREATE CONTENT

Storyboards: Early on we were able to use VR painting tools to create VR sketches that we could use to pre-vis our story. These paintings are different from flat drawings because they have volume and can be imported in the game engine together with the model of the set. We were able to identify early on how it felt to be inside of the set with our characters, rather than using less representative flat cards with textures.

Painted Keys: Using a similar technique to our story boards, the artist created painted keys for shots that took into consideration the entire environment and not only the area where the action took place.

VR Animation Posing Tool: With the VR posing tool created in house by our technology department, animators were able to work inside of our set, posing characters much like they would a stop motion puppet. This enabled them to get a sense of scale with regard to movement and character action throughout the shot.

Environment Scout Tool: Within the first week of our project we were able to create a rough scout model and walk around in it in VR. This helped to inform the flow of action and camera placement in the scene.

Camera Capture: Performance capture was used early on to rough out animation and do pre-vis in VR. To create a flat version of the film (which we also rendered out as a separate experience for viewers without VR capabilities), we leveraged our camera capture techniques to work inside Unity and allow a camera operator to be in the virtual set recording the action. With that recorded camera movement we were able to create offline renders.

6 CONCLUSION

Through the developmental "Short Circuit" program at Walt Disney Animation Studios, our small team has created a short film project in a new medium that still maintains a strong emphasis on story telling and visual quality. To achieve this, we had to combine our traditional way of creating assets with new techniques to make them run in a real time game engine. The collaboration of the different disciplines was an essential factor in finding solutions to the many roadblocks we encountered. This led us to the development of custom solutions to help tell this story in an innovative way. It is our hope that this presentation will represent a comprehensive overview of our process and the lessons we learned along the way.