Imagining the Great Before

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Figure 1: You Seminar from Pixar's *Soul* ©Disney/Pixar.

ABSTRACT

During the making of Pixar's 2020 animated movie Soul, we were tasked with having to create a brand-new world, the Soul World, which posed as a challenge to design and express within traditional art forms. As with most animated features, we had to execute within in a limited amount of time, while responding to an ever-evolving storyline. In order to achieve this goal, we had to approach it unconventionally. One method that helped greatly, was expanding an in-house texture development tool into a real-time look development environment. This new tool enabled us to iterate much more quickly and frequently, which in turn, helped us receive more timely feedback from the Director and Production Designer in order to hit the look they were after.

We also used more established tools to explore new looks. Maya, for example, allowed us to effectively and quickly mock up entire environments with enough color and lighting information to make broad decisions. Since one of the new worlds we were building had to emulate a child's playground while incorporating symmetry, we were able to establish the language quite effectively thank's to Maya's familiar interface. For the parts of the set that were unfamiliar to us, like 'etherial Pavilions', we turned to Houdini to try capture something fresh and new. We achieved the look of these by freezing motion blur into still kinetic forms. All three techniques, whether using new tools or existing, ended up contributing to the 'not-of-this-Earth' look, desired by the Director and Production Designer on Soul.

KEYWORDS

volume, modeling, look development

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1 LOOK DEVELOPMENT

To create the Soul World, we leveraged an internally-developed prototype shading tool to generate patterns using glsl shader code and a node-graph. This technique provided access to a wide variety of compute, vertex, tessellation and fragment shaders, enabling our Technical Artists to create assets such as fields of grass, volume shaders and particle effects with controls to iterate in real-time.

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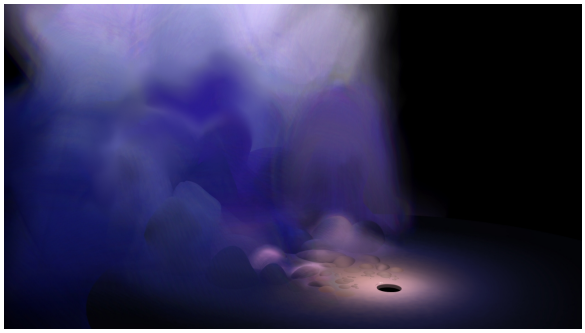

Figure 2: Dressing in Maya Viewport ©Disney/Pixar.

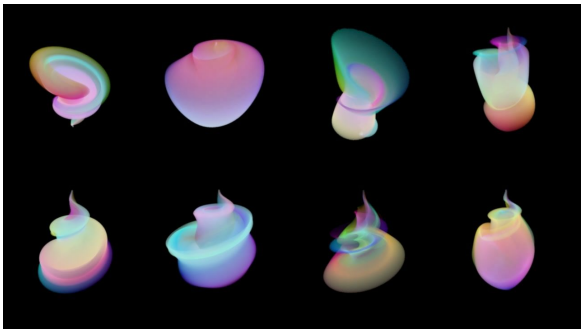

Figure 3: Pavilion Shape Prototypes ©Disney/Pixar.

Thanks to real-time frame rates and millisecond re-compile time, we could quickly explore unique look-dev options, while modifying what we saw on screen as well as the underlying code, all on-the-fly, while presenting work to the Director and Production Designer.

2 DRESSING

Similar to Coco's 'World of the Dead' and Inside Out's 'Mind World', Soul's 'You Seminar' set is an imaginary environment that required a brand new visual language. One of the biggest challenges in creating the 'You Seminar' was making it feel both comfortable and inviting, while maintaining its ethereal and other-wordly atmospheric look. The purpose of the 'You Seminar' is to provide new souls with their personality profiles, and to help prepare them for their life on earth. It needed to look and feel warm, inviting and nurturing, but also completely different from anywhere humans have been on earth. After countless design revisions and look-dev iterations, the Art department finally settled on the idea of a 'children's playground'. Using this idea as the base concept, we gradually defined the sets' own unique rules and visual language.

To depict the feeling of an inviting, calm and orderly space, we incorporated lots of repeating circles and round mounds, strategically arranged into rings that framed the 'Earth Portal' at the center of the 'You Seminar' set. In order to make the set feel orderly and manicured, we incorporated a Mathematical use of symmetry, which meant the mounds we dressed in the set had to be equally spaced apart. Because the mounds were perfectly round, they looked identical from all angles. This sense of order in the 'You Seminar' also included the grass. While it would have been easy to approach a set with grass if it were a 'human-world' set, because we know very well how to make our outdoor environments look natural, organic and asymmetrical, making grass look 'etherial' was quite difficult. We had to constantly remind ourselves not to follow the same laws we would see in nature, and instead help define what 'soul-grass' would look and feel like. This meant having the grass follow the repeating circles, yet remain at the base of the mounds, which was a different material altogether. Even with all the symmetry we were incorporating into the world, we still found ways of sprinkling in bits of asymmetry by adding paths, trees and pavilions, which helped balance out the compositions and allowed the Layout department to frame the shots in interesting ways. Otherwise, it would have been a challenge to depict the proper scale within the set.

We strove to create an environment with a balanced combination of precision, simplicity, clarity of purpose, and appeal. Ultimately, the You Seminar's visual language and characteristics created a clear distinction between the Human World and the Soul World for the film audience.

3 PERSONALITY PAVILION

The Personality Pavilions in the Soul World are where personality traits are assigned to new souls. We chose to use volumes to create the shapes of the pavilions because of the soft and ethereal visual quality that volumes provide. It was difficult to make simple volume shapes look appealing, however, due to the fact that the pavilions had to look un-earthly, while still portraying the personality that it was assigning. For example, the 'Insecure' pavilion needed to look and feel insecure, while still fitting within the Soul World.

To solve this problem, we developed new volume sculpting methods to help make the simple volume shapes more appealing and readable. Inspired by motion blur, we created a color gradient in 3D space (a visual layer) that was associated with the shape of the volume. A deforming grid of nurbs patch was animated, during which the surface uv attributes and time values were captured as RGB color volumes, and accumulated using max filter. Between 5,000-10,000 sampling points were scattered on the animated nurbs patch and smeared between the beginning and the end of each time-step with the interpolated time value, so the number of time-steps could be reduced without stepping artifacts. 300-1000 time-steps were used for the You Seminar's 16 unique pavilions, depending on complexity of the shapes.

The captured RGB volumes were used as look-up channels for the final color and density volume instead of directly used as is. This helped save the artists' time, allowing them to iterate more quickly during the look-dev phase. The final volume colors were set by the Lighting artists via a color ramp parameter of the volume shader, that looks up the captured RGB values.

Additional volume deformation was done by resampling the captured volume with mathematically warped sampling space. In some cases, we defromed the volume recursively for volume smudge and non-linear deformation. SDF volume was also generated and deformed to create a low resolution polygonal mesh for proxy geometry and auxiliary shadow geometry.