OOOOO Energy: Adding Dynamic Shading and Lighting to Environments on Pixar's Elio

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Fig. 1. Elio rides the "Bubble Transport" filled with "ooooo" energy. ©Disney/Pixar.

The production design for Pixar's *Elio* (2025) called for complex and dynamic elements throughout the "Communiverse" environments of the film. In this talk we showcase several of these effects and discuss the differences in implementation to acheive specific visual goals, workflow efficencies and render optimizations. Many of these approaches blurred the lines between traditional disciplines and departments such as modeling, shading, lighting, dressing and animation. We leveraged features in Houdini, and USD, as well as custom shader solutions in Pixar's proprietary look development environment Flow to achieve the dynamic features in the film.

CCS Concepts: • **Computing methodologies → Animation**.

Additional Key Words and Phrases: materials, look development, procedural modeing.

1 INTRODUCTION

On a typical Pixar production, a look development artist is tasked with creating relatively "standard" materials such as wood, brick, dirt and so on. The visual design for *Elio*'s "Communiverse" sets were entirely novel, and unlike anything we ever had the opportunity to do before. Many of the materials need to move, shift and change in some unique way to add visual interest to the set. This talk takes a tour of the techniques employed to achieve *Elio*'s dynamic look.

2 "OOOOO" ENERGY

When Elio first arrives at the Communiverse, he meets a tiny character named OOOOO. A liquid supercomputer, she resembles a gelatinous blob of circuits and electricity. The production design called for this language to be echoed in the surrounding environment in numerous ways.

Early experiments with these features were fairly subtle, and merely needed interesting animation to enhance the surface. One example is the vessel that abducts Elio, which is powered in part by this "OOOOO energy." Because the vessel comprises identical panels with consistent UVs, we decided the quickest approach would be to apply the energy signals to the panels as an animated texture, borrowing the setup devised by our character shading colleagues for

OOOOO herself. We then generalized the setup to be simpler, more art-directable, and applicable to arbitrary meshes. We rendered multiple loops of energy on a simple plane, which we converted to textures for application on the vessel.

Eventually we would need to use the OOOOO energy as a primary light source in the set, which meant using the circuit geometry directly as an animated mesh light source. We leveraged the "value clips" feature in USD to ensure the animation was a loop-able cycle, because it was impractical to adjust the animation timing per-shot.

One hybrid example is of the transport platform used to travel about the Communiverse, which was pancake-thin and –without significant complexity– couldn't support the geometric approach used by larger set pieces or OOOOO herself. For these "bubble transports" we rendered more purposeful animated textures (also loop-able), and applied those to a thin card placed inside the pancake surface.

3 DIFFUSION CURVE-BASED SHADING SIGNALS

In addition to animated circuitry, Elio's "Bubble Transport" vessel need to open and close cleanly. We accomplished this by projecting an arbitrary curve onto the surface, and generating a diffusion curve texture [Bartsch et al. 2023], which was then offset and thresholded to animate the signal. We also employed this technique for the doors to the cloning clay chambers.

4 AURORA ENERGY

At the core of the Communiverse is a "sun" of sorts. Rather than being a uniformly glowing core, we wanted to give the impression it was slowly roiling and evolving. To do this, we wrote an OSL shading node that progressively warps a 3D coordinate system with multiple octaves of noisy sine and cosine offsets, producing a signal that vaguely resembles the aurora borealis. This was successful enough that we began to apply it to walls and floors across the communiverse, as a way to provide a more ethereal, lower-frequency keepalive effect than the OOOOO circuit energy.

5 PORTAL

When Elio is abducted, he's approached by an origami-inspired vessel. As it draws him in, it opens up to reveal a tunnel through spacetime, which links Earth to the Communiverse. The geometry of this portal was initially intended to blend seamlessly with the ship's exterior. However, while the traditionally modeled closed mesh looked beautiful, it was impractical for iterating the design and rig. Furthermore, as the story evolved it became clear this "portal" would need to show up elsewhere in the film as a standalone asset.

We decided to implement the portal as an asset in HoudiniEngine rather than a traditional environment like maya or blender. This gave us the opportunity to quickly iterate on the look, and design an intuitive and accessible parameter set for animators in presto and lighters in katana. In turn this allowed us to include animation and lighting in our look development discovery process, which took us in directions we couldn't have imagined.

REFERENCES

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