

Pixar's OUT: Experimental Look Development in the SparkShorts program

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Figure 1: Alternative production processes helped provide OUT with a unique look. ©Disney/Pixar.

ABSTRACT

Pixar's OUT, released summer 2020 on Disney+, is a short film with a highly stylized look, produced under the in-house SparkShorts program. The program champions new creative voices and storytelling via tight-knit production teams that work with limited budgets to push the boundaries of animation production at Pixar. In this talk we present the conception, design and implementation of the film's unique visual style. Armed with some early inspirational artwork and some pre-production technical exploration, much of the look for the short was found during the course of production. Ultimately we landed on a style that was somewhere on the bridge

between 2D and 3D animation. When we had it right, shots felt like a "living painting" with characters and sets that felt like a medium come alive, instead of a series of paintings per-frame. Our goal was not to emulate a particular traditional medium but to evoke a feeling of something crafted that stood on its own as a novel style, which we achieved with a small but enthusiastic crew.

KEYWORDS

stylization, compositing, non-photorealistic rendering, virtual production

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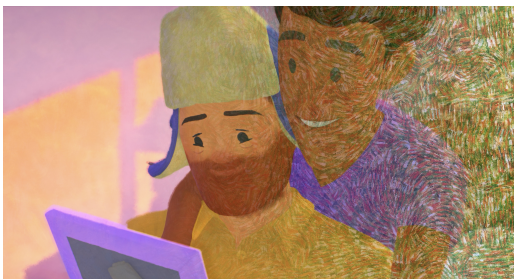


Figure 2: "Groomable" hextile texture synthesis imbued objects with a painted feel without the manual labor. ©Disney/Pixar.

1 VIRTUAL PRODUCTION FOR LAYOUT

One of our goals from the beginning was to develop our look in the context of actual shots. Our Director and Camera DP had experience with motion capture on previous productions and were excited by the prospect of collaborating on scenes to rapidly provide previsualization footage to our looks-dev and editorial teams. Virtual production enabled us to work quickly, keep our headcount low, and involve our creative team with the live creation of the images themselves.

2 ANIMATION

The unique vision of the director and the pioneering mission of the SparkShorts program gave OUT's animators the perfect opportunity to explore stylistic techniques more often associated with the 2D realm. Experimentation with frames on 2s and 3s, static holds, smears to indicate motion blur, and the use of multiple limbs presented new challenges to our traditional pipeline, but also created an unusual opening for spontaneity, freshness and bolder expression that imbued our small team with a creative energy that carried us through the fast-paced production. Additionally these approaches helped provide cohesion with the overall visual style of the film, and served to anchor the painterly style created in look development.

3 PAINTERLY TEXTURES

While it was clear early on that a key portion of the look needed a painterly quality, it was also apparent that we lacked the time or the budget to achieve that by manually painting frames. Our solution manifest in a procedural approach which automatically "groomed" tile-able textures using a "hex tiling" system driven by 2D camera-plane based orientation and tracking layers, all combined during compositing. This system was used heavily, often in place of traditionally texture painted 3D models, so that the painterly feel of the scene felt cohesively generated "on the canvas" rather than on geometry in the scene.

4 DEPTH OF FIELD

Depth of Field is a powerful cinematic storytelling tool, which brings important aspects into focus, and throws the less important elements into blur. We found that mapping an optically correct approach to painterly elements betrayed our visual goals. To arrive



Figure 3: 2D signed distance fields, combined with object tracking noises helped create edge work that stuck to characters and environments. ©Disney/Pixar.

at painted depth of field, we expanded our painterly texture toolkit and applied them to an image distortion technique driven by focal distance maps. The result was a layering of paint strokes that yielded a "blurry" feeling that reinforced our style and provided our director with a visual storytelling device that he wanted for the film.

5 EDGE BREAKUP

One aim was to have a dry brush feel to the edge of objects and characters, with lots of scattered and broken silhouettes. At the same time, these broken edges needed to feel applied on the camera frame, or on the canvas, without revealing a "swimming" behavior. To achieve this feature, which looked applied in 2D but still stuck to the 3D environment, we combined screen-space signed distance fields with camera projected noises and textures that tracked with geometry. This combination was then used to distort the edges from objects throughout the image, with a fully automated system for most objects in the environment, and a more controllable system for features like rim lighting on the characters.

6 HYBRID LIGHTING

Much of the textural approaches we developed necessitated a lighting pipeline that diverged considerably from the physically-based lighting toolset at Pixar. As such we developed a hybrid approach wherein much of the environment lighting was rendered in context in 3D, then split out into layers per light and combined with a 2D character lighting system that leveraged parametric layers such as normals and other custom signals to evoke an illustrated appearance. Combining the two systems to get a cohesive appearance took yet more layers. In fact, our system generated a very unusually high number of layers per frame, by Pixar standards. While straining from a storage perspective, this approach provided considerable benefits in terms of user time, which was at a premium given the small size of the team.