Smash and Grab: Off the Rails Filmmaking at Pixar

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Figure 1: Production shots of exterior and interior sets. *Smash and Grab* ©**Pixar Animation Studios. All rights reserved.**

ABSTRACT

In 2016, Pixar launched an internal, experimental storytelling initiative to enable new creative voices, as well as explore alternative storytelling techniques, pipelines, and workflows in production. Filmmakers are granted total creative freedom to develop a story, design a world, and produce a short film, within six months, and without any executive supervision. *Smash and Grab* is a seven minute short film that explores the use of comic book sketches, virtual production, motion/camera capture and procedural shading and lighting techniques. With the backdrop of a busy feature studio, limited resources, and a minimal crew, this talk is the story of our journey.

CCS CONCEPTS

• **Applied computing** → **Media arts**;

KEYWORDS

Pixar, short films, animation, virtual production, studio programs

1 STORY DEVELOPMENT

One of the primary challenges in animated filmmaking is the ability to define the world, set the pacing in editorial, and create the character arcs and relationships as quickly as possible to send work downstream. On *Smash and Grab*, our director, Brian Larsen, wanted to sandbox within a 3D representation of the film as much as possible, iterating on the story in context. Instead of relying on traditional storyboarding, the director first drew a "comic book" schematic of the entire film to quickly establish the core visual language between the director, editor, camera DP, and crew. The structure of the comic represented the general pacing and staging of the shots. This served as a guide as we moved directly to 3D shots within Presto, our proprietary animation system, using motion and camera capture to explore, iterate, and generate footage for editorial in real-time.

Custom virtual production tools built on top of the existing system empowered individual artists to work at a larger scale and experiment more freely than in our traditional pipeline. While 3D work typically can't begin until a cut has been locked, our approach allowed a small crew to create multiple takes and full coverage of a scene for delivery to editorial, more like a live-action production, and quickly react to new demands as needed.

2 ALTERNATIVE PIPELINE

Another challenge in creating a seven minute film in a short period of time was data I/O and flexibility. We knew we needed to create a pipeline that was tailored to approximately 170 shots which allowed us to prototype and collaborate at a faster pace than a more traditional pipeline used in executing a 2,000 shot animated feature film (Fig 2).

Following our work in Presto, our proprietary animation system, we used Pixar's Universal Scene Description (USD) to transfer and assemble our scenes within Houdini. We took advantage of Houdini's procedural paradigm by creating a directory structure where
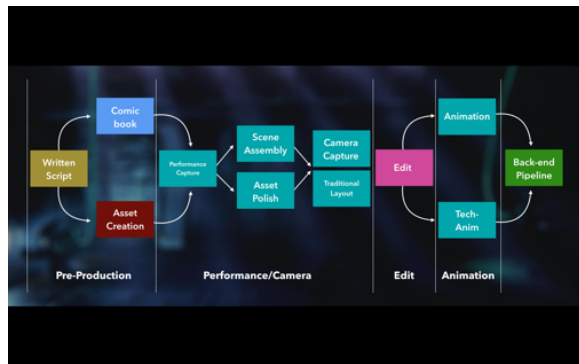
Figure 2: High-level Smash and Grab front-end pipeline overview.
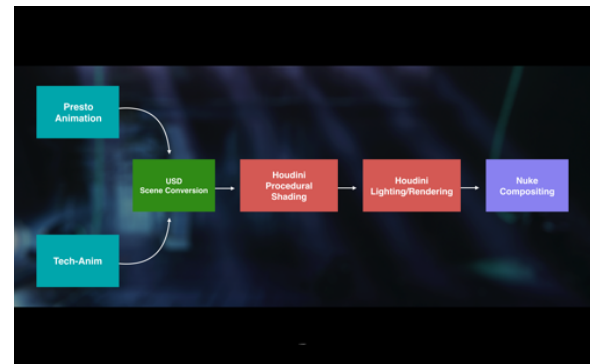
Figure 3: High-level Smash and Grab back-end pipeline overview.

a single exterior and interior scene file was used for the entire short film. Using Houdini's VEX language, procedural BSDF materials were created to automatically shade assets. Furthermore, Houdini's packed data structure and Blosc compression format allowed for interactive light dressing while deferring data expansion until render time via Houdini's built-in render engine, Mantra.

3 LIGHTING AND RENDERING

Giving the director and lighting DP flexibility to make changes in the late stages of production was crucial. We turned to Nuke to construct the scene and setup master lighting by exporting arbitrary output variables (AOVs) and Deep Data via Mantra. Using Houdini's HDA system, all assets, shading and lighting components were packaged and deployed into shot production (Fig 3). This allowed the lighter to branch off, update and modify the shading per sequence or shot, if needed. Additionally, due to a limited lighting team size of one, as well as limited time for iterations, we used Houdini's API to construct custom tools for intelligent light shaping assistance, which helped to avoid the time consuming work of manually tweaking certain light rigs per shot. We also developed a layered inheritance system that allowed us to share lighting setups easily across multiple shots within a sequence. Once shots were approved, we used a visual web based interface to interact with active shots and manage re-rendering and miscellaneous fixes.

4 CONCLUSION AND FUTURE WORK

The production of *Smash and Grab* had a number of positive results at Pixar. As the program intended, we gave a new director a chance to put their creative vision on screen. The project provided numerous creative, technical, and leadership roles, many of which provided growth opportunities for our artists. Despite having no executive or technical mandates for the project, the aggressive timeline and budget constraints enabled the team to develop new processes and apply technologies that we may not have otherwise experimented with at the studio. As a result, these experiences can then inform applications on our Feature Film development, or how we decide to structure our own in-house tools, workflows, and processes.