Leveraging Third-Party Tools for Art-Driven Fluids & Foliage

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1. Abstract

For the CG animated movie *Shrek 2,* we needed to create dozens of steam elements and assets with hand-placed foliage. We turned to Maya Paint/FX and fluids technologies combined with PDI/Dreamworks' in-house tools to create an efficient production workflow with an improved feedback loop between Art Directors, Modelers and the final rendered imagery.

2. Approach

Our approach involved using Maya as an interactive front-end for generating raw data for position, density, velocity and scale. After exporting this data to disk, we exploited in-house tools for generating geometry, shading, lighting and rendering. Storing data in our proprietary file format permitted us to view the data with PDI/DreamWorks' standard file viewers and allowed us to organize, copy and manage the data as assets for re-use in other shots.

3. Application & Integration

Maya Fluids: We wrote an exporter for the fluid simulation tool which looped through every grid voxel and exported either raw density plus velocity values to a vdf file, or particles with velocity and opacity attributes to a particle file. The data was then read into our proprietary lighting tool, assigned a volumetric shader or particle shader, and rendered in our studio renderer.

Paint/FX: There was no concrete geometry to export so the foliage creation process was done collaboratively with our Modeling and Surfacing departments. We exported particles with connectivity information representing points on the Maya Paint/FX tubes and then generated sets of curves for each category of tubes: stems, leaves and flowers. The Modelers and Surfacers provided leaf and flower geometry to instance and deform along those curves. The foliage was then coupled with an environment model, installed and rendered in the shot.

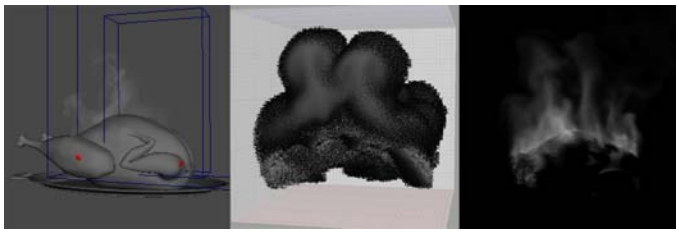

Fig. 1 *Steam Process*

With Maya's front-end, integration was successful for both technologies. Artists were able to pick up the tool and create elements quickly and efficiently. In both cases, this approach allowed for a higher level of art-direction than had previously been possible creating these types of elements.

The high level usage of the tools required us to write scripts, create shelves and paint brush settings, setup sample files and prepare export, lighting and rendering templates. This held the pipeline together and greatly facilitated the data conversion steps for the artists.

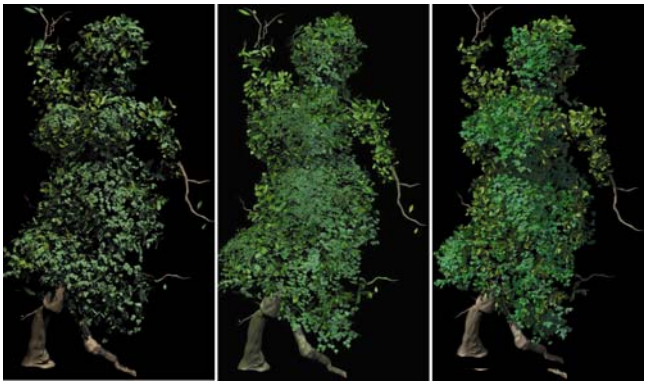

Fig. 2 *Increasing levels of art direction*

4. Optimizations

The next objective was to reduce iteration cycles and enhance artistic creativity so Art Directors could approve elements shown in the Maya front-end. To accomplish this we needed to tightly correlate the data viewed in Maya's viewport with the data that would be exported and rendered. For example, Maya displays its fluid simulation using a number of sprite-like camera aligned slices of volumetric data, giving the simulation sharpness and contrast not present in its rendered form. In response, we wrote a tool to slice the exported data in a manner similar to Maya, therefore getting a closer result. For Paint/FX, we created custom sprites for leaves and flowers for the brushes which would match both the artwork handed to us by the art department and the models prepared by the Modeling and Surfacing departments.

5. Feature Production Efficiency

Finally, we needed to transform our exported data into assets. For the Paint/FX pipeline, we decided to paint the foliage on an asset basis, with each separate environment or prop model linked to only their corresponding foliage. This made scenes with large amounts of foliage manageable. For fluid simulations, the level of resolution we sometimes required for close-ups exceeded Maya's simulation capabilities. In those cases we switched to a similar approach to assets, breaking down a simulation into smaller parts to build a library and then recombining them together in the shot using our proprietary lighting tool.

6. Credits

Marty Usiak, Rick Glumac, Jason Waltman