Quill: Birds of a Feather Tool

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Figure 1: *A cast of owls. ©Warner Bros. All rights reserved.*

Abstract

Legend of the Guardians: The Owls of Ga'Hoole (LotG) features over sixty distinctive, art-directed, hyper-realistic feathered characters. We developed a procedural feathering pipeline, *Quill*, to efficiently realise more than fifteen unique bird species required by the story. This toolset allows a procedural representation of feathers to be developed by surfacing artists, augmented with automatic deintersection, animation, character effects and dynamics and rendered with extensive level-of-detail support.

1 Character Design

LotG depicts a world of owls, requiring many individual characters to be clearly distinguishable, directable and emote in a broad repertoire of performance including dialogue, combat and flight. Characters were art-directed with a realistic aesthetic (see figs 1,2) requiring their feathers to be fully modeled, articulated and simulated. Almost every shot of the film included a number of birds, from subtle close-ups to wide, kinetic crowd scenes.

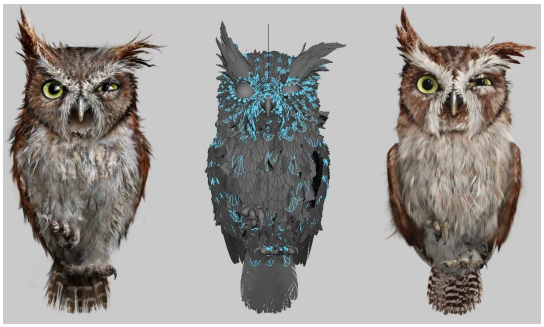

Figure 2: *Character designs such as* Ezylryb *(left) were captured with an interactive toolset (center) to produce rich rendered output (right). ©Warner Bros. All rights reserved.*

2 Pipeline

Quill feathers are available in every department in the production pipeline. Our proprietary node-based, procedural animation and simulation engine *ALF* was extended to support modeling, surfacing, animation, effects and rendering of feathers. Procedural feathers may be controlled and visualised throughout our pipeline in *XSI*, *Maya* and *PRMan*.

3 Grooming

Typical grooms contain upwards of 20,000 feathers of which 500 to 1000 would be individually configured. Through interactive manipulators in *Maya*, artists directly control many aspects of a parametric feather primitive such as outline shape, length, density and shape of barbs and also deformations such as twist, fold and curl. Feather parameters and orientation are interpolated across the bird's surface to other 'passive' feathers with modulation from maps and noise. Groom poses may be defined for extremes of movement (e.g. open flight vs closed perched wings) and emotional performance (e.g. prominent ear feathers).

4 Feather Construction

The feather primitive produces both 'flat' geometry (a subdivision mesh or curves, depending on level-of-detail) and a simple 2d lattice for deformation. Lattices are treated as proxy meshes for automatic feather deintersection and simulation. Deintersection is achieved by generating an implicit normal field from all of the interpolated lattices and then reconstructing each lattice to be orthogonal to the normal field.

5 Animation and Dynamics

Feathers are animated primarily through rig-based control and deformation of the surface mesh and auxilliary meshes such as wing *membranes*. Animators may also key the blend weights of feather poses and the kinematics of hero feathers. Character effects are performed on the deformation lattices through procedural effects and soft-body simulations which are then applied to the feather geometry for preview and rendering.

6 Rendering

Extensive level-of-detail and procedural data management is required to efficiently render close shots of feathers with millions of individual barbs as well as crowd shots with hundreds of feathered characters. The procedural *ALF* node-graph provides support for deferred evaluation of graph components and level-of-detail allowing each feather to be rendered from a simple quadrilateral to thousands of curves.

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