# Modeling Tools at Disney Animation

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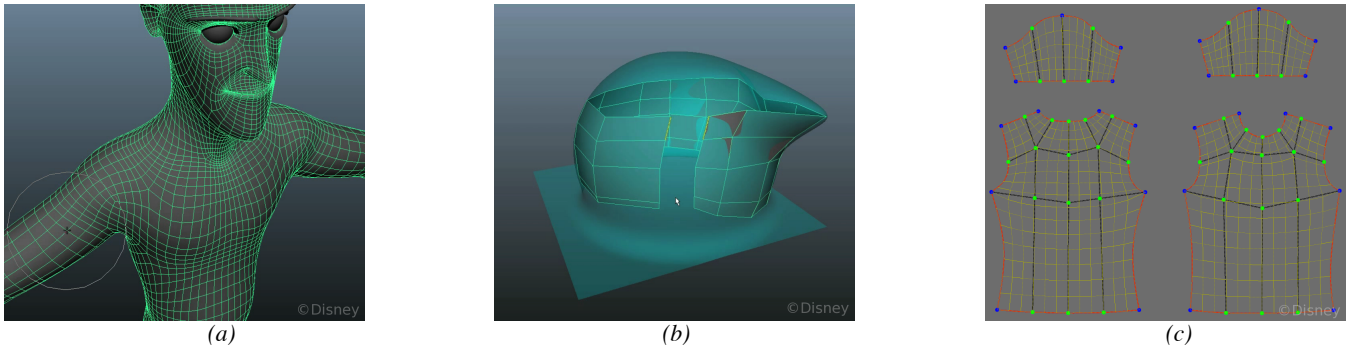


*(a)* *(b)* *(c)*

**Figure 1.** *Main Disney custom modeling tools include Dragnet that features 3D sculpting brush (a), dPatch to construct a low-res model from a high-res surface (b), and Retopology tool that uses panel-based approach for modeling garments (c).*

## 1. Introduction

Models are fundamental for any digital production. Ranging from main characters to secondary props, they always must satisfy the aesthetic and technical requirements. Consequently, tools to create production models become essential in digital movie making. Therefore, Disney Animation has invested heavily in proprietary modeling software. Our tools strive to meet two main goals. First, they need to be intuitive to use, seamlessly integrated into Autodesk Maya (our main production tool for asset creation and modification). Second, they have to be efficient, and to achieve this, we develop and employ state-of-the-art algorithms.

## 2. Tools

Disney Animation's main proprietary modeling tools include Dragnet, a suite of 3D brushes to build model topology, dPatch to generate light meshes from high-res models, and Retopology to create meshes with prescribed edge flow from garment 3D models.

### 2.1 Dragnet

We start with Dragnet, which provides low-level control and fine per-vertex placement via a 3D brush interface. Dragnet's brush, similar to Maya's brush in the paint-attribute-weights tool, defines a set of affected vertices, covered by the brush's circular area on the polygonal surface (see Dragnet's brush in Figure 1a). The most popular Dragnet's operations include *Move-Along-Camera-Plane* brush to quickly block the general profile of a smooth, organic asset, *Smooth-Along-Surface* brush that relaxes the topology with shape preservation and *Move-Along-Surface* brush to slide vertices along the surface (as described in [*Pinskiy 2010*]).

### 2.2 dPatch

At the initial stages of developing new assets, many of our modelers benefit a lot from using different modeling packages as Z-Brush. Unfortunately often models produced with those tools have vertex counts higher than allowed in our pipeline. Therefore, we introduce dPatch, which lets us enforce a desired tessellation on a high res surface (see Figure 1b). dPatch offers much higher-level operations than Dragnet since its workflow is built around patches, i.e. grids placed onto the high-res surface. With this tool, a modeler covers the high-res surface with a set of grids, and the end the grid points become vertices of the new tessellation.

### 2.3 Retopology Tool

To achieve higher quality clothing for our characters, we create garments using Marvelous Designer (MD). Meshes produced in MD are too dense to animate. Fortunately MD meshes are generated with associated panels, given as nicely laid-out UVs. Therefore, instead of using dPatch, we wrote the Retopology tool with an even higher level of control that takes advantage of the UV layout. In this tool the artist lays out patches in UV panel space. Initially each patch is individually tessellated with as a grid, but then our algorithm enforces continuity along patch and panel boundaries by adjusting position of the grid point (see UV patches on four panel in Figure 1c). Finally we end up with smooth UV space tessellation, which we convert to 3D mesh tessellation.

## 3. Conclusions

Modeling tools at Disney Animation are continuously evolving to meet the ever-changing needs of production. In the future we will continue refining our existing tools and adding new options.

## References

Pinskiy, D. *Sliding Deformation: Shape Preserving Per-Vertex Displacement*. In *Eurographics* 2010 - Short Papers, pp. 1-4