Applying Painterly Concepts in a CG Film - Bolt

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1. Introduction

The leadership of the animated film *Bolt* set out to bring back the textural warmth found in classic Disney animated movies, something not usually found in CG generated images. CG algorithms characteristically produce hard clean geometric solutions and can also often generate unlimited amounts of detail. We analyzed paintings from masters and also stepped back and thought about how a painter approached a painting here at Disney. We focused on fundamental ideas such as massing, a term in painting which refers to the process of editing detail into bigger shapes, and also edge quality, the use of the painter's brush to vary edges of shapes which can bring emphasis to the image and/or direct the eye. This lead to the development of new algorithms and tools for the film *Bolt*. It also required a change in the mind set and work flows for the CG artist. We will discuss things such as "raypainting" and painterly "normals" which were part of the toolbox created on *Bolt*. These concepts mixed with photographic ideas such as exposure and film response lead to the rich and unique look of *Bolt*.

2. What is Painterly?

In the past there has been emphasis on the reproduction of brush strokes when creating CG with a painterly aspect. If you take a painting and reduce it to the size of a postage stamp it still looks like a painting, yet the brush strokes are hardly evident at this size. It is the process of editing and simplification of detail with techniques such as massing that really become significant to the painting. The brush strokes did become a issue we dealt with but primarily to break up edges and loosen things up.
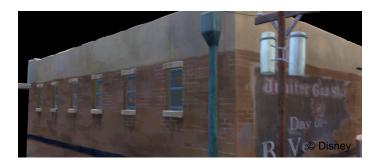

In this painting things such as massing detail are important even at a postage stamp size where as brush strokes aren't as evident.

3. Work flows

The texture artist all participated in a plein air painting workshop. In this condition you have a very limited time to paint a landscape. It forces you to get in the broad strokes down quickly. A group of leaves might become a single brush stroke and there isn't time to paint the grain of the wood on the fence off in the distance. Often CG artist don't approach textures this way. This approach seen in plein air painting was crucial to our texture artist because the technology and shader development would require the artist to paint in layers.

Painting LOD

A shading system was designed to capture the different levels of detail as the artist painted. These different levels of detail could be controlled via a expression procedurally or using renderman AOV outputs. The details of textures could be stripped away to reveal something simpler and abstract.

This is the lowest level of detail blocked in. At this level the painter maybe only suggest bricks.

This is the highest level of detail with every brick on the building fully detailed.

This shows the levels of details integrated using distance from camera as a expression.

Raypainting

We had the desire to have the clean, hard silhouettes when rendering a 3D model broken up with brush strokes. We developed tools which could place brush strokes out in 3d space and apply them to the 3d model. We called this technique "raypainting".

Painterly Normals

Having light react to the surface of a object as if it was painted with brushstrokes meant taking the normal used in the lighting calculations and altering them. We developed a tool set in our 3d paint package to do this and then modified are shading system to integrate these normals into the final lighting calculation.

5. Conclusion

While we made many optimizations to the tools, throughout the show, many things could be proceduralized and things, such as shaders, streamlined in the future. Algorithms such as textural synthesis have already been developed at the studio that could be applied to better propagate brush stokes in the raypainting process. Although there is room for improvement, the final images took on a unique richness when coupled with tools from film such as exposure and depth of field.

A final frame of Bolt which all the techniques described are applied.