

From 2D to 3D Painting with Mesh Colors

Thibault Lambert*
BUF Compagnie



Figure 1: Left: *Total Recall* ©Sony Pictures. Right: *Life of Pi*, ©Fox 2000 Pictures. All rights reserved

Abstract

Mapping is a critical part of a visual effects pipeline, especially with photorealistic rendering. We present our work on updating a 2D mapping pipeline to a 3D painter and the novel work of having a production ready painter with Yuksel’s Mesh Colors [Yuksel et al. 2010] mapping technique.

Keywords: mapping, mesh colors, 3D paint, VFX

1 Introduction

Known for its work on *The Matrix* trilogy, *Fight Club*, *Thor*, *Life of Pi*, *The Grandmaster* and *Kingsman: the Secret Service* to name a few, BUF only works with proprietary software developed by the R&D team. Historically, we have always been using implicit mappings to stay as modeling independent as possible. We notably started using camera mapping in 1993 for *The City of Lost Children* which then became a standard. Camera projections are used for photogrammetry and photoreal texturing. Complex meshes may use several images.

2 Painter

Making seamless transitions between these mappings is usually tedious and time demanding due to frequent back and forths between 2D representations of images and 3D rendering. This is what convinced us to develop our own 3D painter in order to modify textures directly on the 3D model with advanced realtime rendering. This painter is entirely GPU based which lets artists instantly interact with our OpenGL 3D view.

*e-mail:tlambert@buf.com

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The first project that heavily relied on this technology was *Life of Pi*. We now use it on all our productions.

3 Mesh Colors

Using only implicit mappings can be quite limited with complex geometries. To take full advantage of the 3D painter, we needed a better mapping algorithm. And we still wanted to avoid the complex process of UV-unwrapping. Our pipeline relies on custom Bezier surfaces and a mix of triangles and quads that prevented us from using Disney’s Ptex [Burley and Lacewell 2008]. Thus, we decided to integrate Mesh Colors [Yuksel et al. 2010] into our pipeline.

Mesh Colors can concatenate several regular mappings into one mapping or be created from scratch. Once created, they are ideal for 3D painting and can benefit from all 3D painting tools and features such as symmetry, 3D masks, curved brushstrokes etc...

We added support for scripting, automatic resolution computation on the whole mesh or a subset, on-demand per-face resolution changes, transfer between models etc... Most of all, we built a highly optimised GPU painter coupled with a fast octree search that let artists paint on millions of pixels in realtime.

4 Conclusion

Artist now work with a much easier and faster workflow. Using Mesh Colors is easy to set up because it does not require UV assignments. And painting directly on the model is more intuitive.

One of our current production is a full CG short which uses almost exclusively Mesh Colors mappings. Several 4K images with more than 12M pixels each have been used to design the main character with our in-house painter.

References

- BURLEY, B., AND LACEWELL, D. 2008. Ptex: Per-face texture mapping for production rendering. In *Eurographics Symposium on Rendering 2008*, 1155–1164.
- YUKSEL, C., KEYSER, J., AND HOUSE, D. H. 2010. Mesh colors. *ACM Transactions on Graphics* 29, 2, 15:1–15:11.