Towards Simulation of Handmade Painterly Animation
Adrien Russo, David Vanderhaeghe

To cite this version:

HAL Id: hal-01341927
https://hal.archives-ouvertes.fr/hal-01341927
Submitted on 5 Jul 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
Towards Simulation of Handmade Painterly Animation

Adrien Russo
IRIT - Université de Toulouse, CNRS

David Vanderhaeghe

Introduction

As research on painterly animation mostly focus on temporal coherence, the generation of an animation that could have been done by hand remains an open challenging problem. To produce an handmade painterly animation, the artist paints on a back lighted glass canvas. He creates successive frames one over the other. Paint is erased, smeared and added to convey the animation.

We propose to render painterly animations with a visual aspect tending towards handmade results. To this end, we combine two techniques: an automatic strokes generation and a paint simulation. We observe that previous approaches could not adapt as-is to our goal for the two following reasons:

- Paint appearance in painterly animation is backlit: Most of paint contrast comes from paint thickness which is usually not computed by paint simulation approaches.
- Automatic strokes generation make the assumption that a stroke covers underlying strokes without having thickness accumulation. In our case, paint thickness quickly increases if we do not apply special treatment.

We also investigate new kind of strokes that can only be generated by a paint simulation approach, as smear and erase strokes.

Stroke generator

We follow the approach of Hertzmann and Perlin (2000). To paint a frame, the approach is to paint several layers, each layer corresponding to a brush radius R. To compute new strokes we first compute a paint factor for each pixel. If the sum of paint factors over a cell is large as the brush is larger than a user controlled threshold, we trigger the creation of a new stroke. Then, we determine stroke position and shape. A stroke starts where the paint factor is maximum, the stroke path following the normal to the gradient of luminance.

The paint factor \( P \) is computed as follow:

\[
P = S(B_R(I))|B_R(I) - C|)
\]

Sobel edge detector Gaussian blur input frame Current paint

We also use a cumulative difference between frames of the input video. This difference allows us to focus creation of strokes where the input video actually changes.

Area of investigation:

- Improve stroke generator to have better suited strokes.
- Build specific strokes to push paint.
- Build specific strokes to erase paint.
- Decompose paint factor in thickness and color, to render back lighted paint.

Ad-hoc Paint Remover

We do not obtain good results yet when we create strokes to erase paint. Instead we test an ad-hoc paint remover. It removes paint accumulation without loosing thickness variation details. It is implemented by subtracting a blurred version of the thickness from the thickness of the canvas with the following formula:

\[
\alpha \leftarrow \min(\alpha, \max(\alpha - \text{max}(B(\alpha) - .5, 0), 0.1))
\]