

Projet final

Par Pier-Luc Auger

Idée

● Implémentation de l'article de Peter Litwinowicz

Processing Images and Video for An Impressionist Effect

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ABSTRACT

This paper describes a technique that transforms ordinary video segments into animations that have a hand-painted look. Our method is the first to exploit temporal coherence in video clips to design an automatic filter with a hand-drawn animation quality, in this case, one that produces an Impressionist effect. Off-the-shelf image processing and rendering techniques are employed, modified and combined in a novel way. This paper proceeds through the process step by step, providing helpful hints for tuning the off-the-shelf parts as well as describing the new techniques and bookkeeping used to glue the parts together.

1. INTRODUCTION

In the 1800's, Claude Monet created paintings that attempted to "catch the fleeting impression of sunlight on objects. And it was this out-of-doors world he wanted to capture in paint -- as it actually was at the moment of seeing it, not worked up in the studio from sketches." [Kingston80].

Impressionist paintings provide the inspiration for the work presented here. We have produced images that are *impressions* of an input image sequence, that give a sense of an original image without reproducing it. These images have a "painterly" feel; that is, they appear as if they have been hand-painted. Furthermore, we have produced entire animations with these same qualities.

Producing painterly animations from video clips *automatically* was the goal of this work. Our technique requires that the user specify a few parameters at the start of the process. After the first frame is produced to the user's liking, our technique processes a whole video segment without further user intervention. Previous painterly techniques require much user interaction and have only been presented in the context of modifying a single frame (with the exception of a technique applied to 3D animated scenes).

While this technique is not the first to produce images with an Impressionist look, our method has several advantages. Most

significantly, this paper presents a process that uses optical flow fields to push brush strokes from frame to frame in the direction of pixel movements. This is the first time pixel motion has been tracked to produce a temporally coherent painterly style animation from an input video sequence. Brush strokes are distributed over an input image and then drawn with antialiased lines or with supplied textures to produce an image in the Impressionist style. Randomness is used to perturb the brush stroke's length, color and orientation to enhance the hand-touched look. Strokes are clipped to edges detected in the original image, thus preserving object silhouettes and fine detail. A new technique is described to orient strokes using gradient-based techniques. In the course of being moved from frame to frame, brush strokes may become too sparse to cover the image. Conversely, brush strokes may become overly dense. The necessary algorithms for adding and deleting brush strokes as they are pushed too close or too far apart by the optical flow field are described within this paper.

The following section describes previously presented painterly techniques. Then we present the details of our technique:

- 1) the stroke rendering and clipping technique,
- 2) the algorithm for producing brush stroke orientations,
- 3) the algorithm for moving, adding and deleting brush strokes from frame to frame.

In conclusion, we discuss limitations of the algorithm and possible future directions.

2. BACKGROUND

Techniques for computer-assisted transformations of pictures are presented in [Haeberli90]. Many of those techniques involve extensive human interaction to produce the final images. More specifically, the user determines the number of strokes as well as their positions. The user controls the orientation, size and color of the strokes using combinations of interactive and non-interactive input. Examples of interactive input include cursor location, pressure and velocity; and non-interactive input include the gradient of the original image or other secondary images. Brush strokes can be selected from a palette and include both 2D and 3D brushes.

Painting each image in a sequence is labor intensive, and even more work is necessary to produce a sequence that is temporally coherent. "Obvious" modifications can be made to Haeberli's technique, but each has their drawbacks. For example, imagine keeping the same strokes from frame to frame and modifying the selected drawing color and position of the strokes.

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Motivations

- Comparer les talents artistiques de la machine à ceux des peintres
- Mettre en application des notions apprises

Première itération

Ébauche de code et premiers résultats



Calcul de coups de pinceau

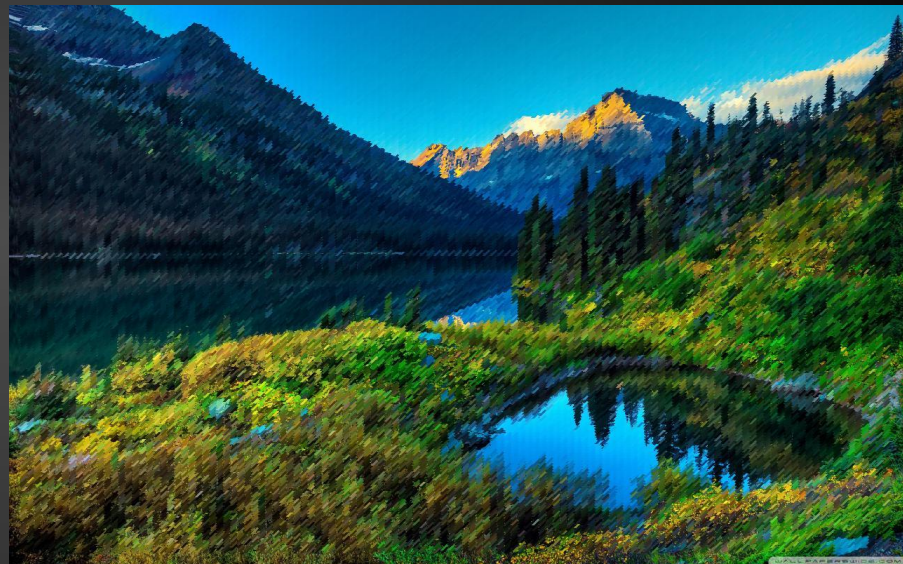
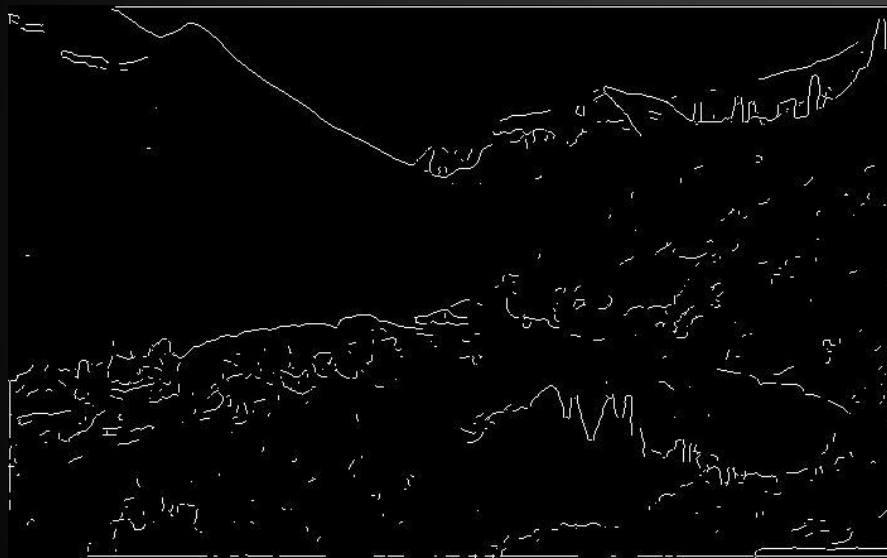
- Filtrage
- Détection de contours
- Déterminer un coup de pinceau typique
- Peinture de manière aléatoire

Filtrage

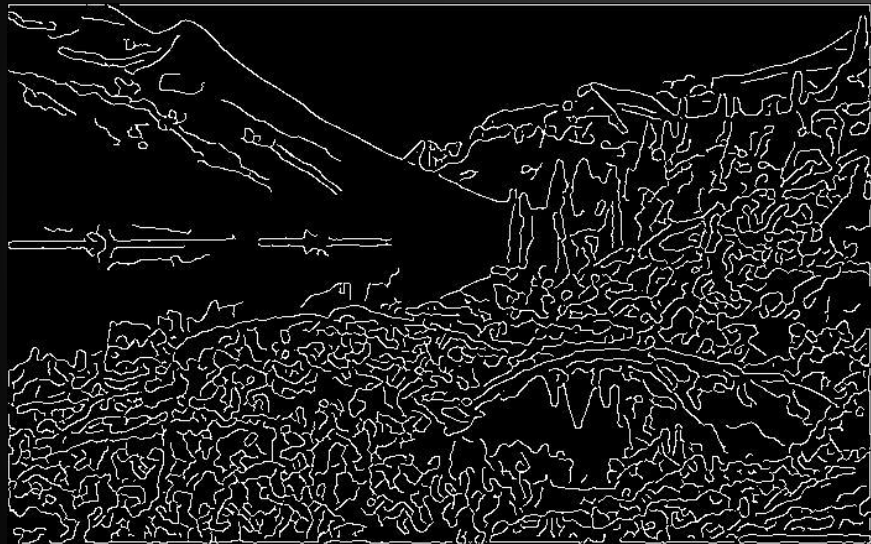
- Passe bas
 - Gaussien



Détection de contours: Sobel



Détection de contours: Canny



Angles de coups de pinceau

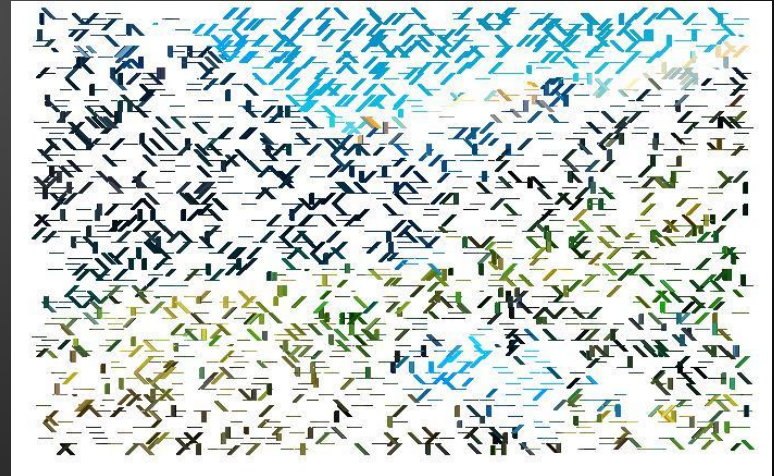


Angles de coups de pinceau



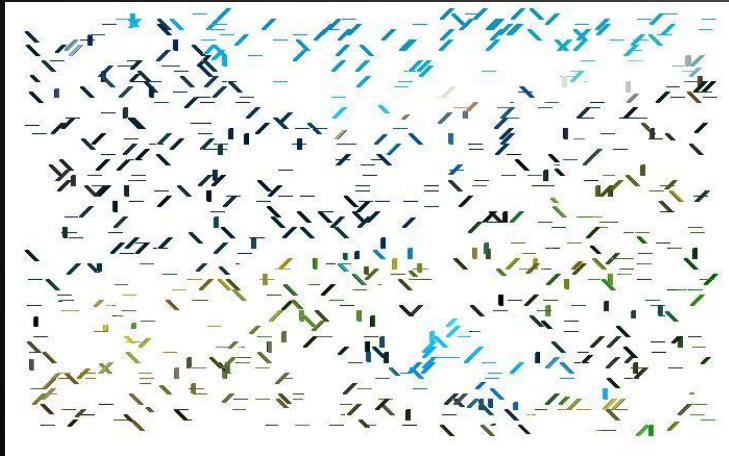
Superposition de coups de pinceaux

- Ordre au hasard
- Superposition



Superposition de coups de pinceaux

- Ordre au hasard
- Superposition



Résultats



Résultats



Résultats



Résultats



Résultats



Résultats

