Master of Science in Informatics at Grenoble
Master Informatique
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Procedural Stylization

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Research project performed at YOUR LAB

Under the supervision of:
Your Supervisor

Defended before a jury composed of:
Head of the jury
Jury member 1
Jury member 2

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Abstract

Your abstract goes here...

Acknowledgement

I would like to express my sincere gratitude to .. for his invaluable assistance and comments in reviewing this report... Good luck :)

Résumé

Your abstract in French goes here...

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Introduction

1.1 Background

1.2 Problem Statement

The main problem of stylizing a 3D object in an animation is the *temporal coherence*. The effect given by the stylization has to be kept if the object is moving, rotating and scaling. Many research have been done to solve this problem of *temporal coherence* [5, 2, 1]. This problem is three sections:

1.2.1 Flatness

The impression of drawing on a flat surface gives the *flatness*. The stylization has a good *flatness* is the image rendered has a good 2D appearence. In order to keep this effect the size and the distribution of the marks of your stylization has to be independant to the distance between the stylized object and the camera.

1.2.2 Motion Coherence

Motion coherence is a correlation between the motion of marks and the motion of the 3D object. Bad *Motion coherence* will give the impression to see the scene through semi-transparent layer of marks, this is called *shower door* effect [3].

1.2.3 Temporal continuity

example *Loving Vincent*

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Previous Work

The problem of stylizing a 3D object has received many attentions in previous work. There are many methods to stylize. Each of these methods has its advantages and disadvantages about the temporal coherence. We separated these ways to stylized in four different sections : image space, object space, texture mapping and stroke based rendering.

2.1 Image Space

This simplest way to stylize a 3D model is to do in image space. The scene is rendered as an image in texture and from this image, the stylization can proceed. The idea is from this image succeed to compute at each pixel the right colour of the splat if this is stroke-based rendering or which colour of an external texture has to be put on this pixel. To do a brush painting with strokes Hertzmann's [Image and Video-Based Artistic Stylisation, 2013] add strokes coloured depending on the image in the image and decide to delete or replace it to fit at best curves to edges of the image. But this method suffer to *temporal continuity* between frames when the camera is moving some brush strokes will disapear and some will appear because every frames are computed independantly of the previous frame and from the 3D model. The method of Vergne et al [5] use convolution of points to have a hand drawing effect. These points are placed depending on the *feature profile* which is extracted from the image using the maximum of the luminance gradient and the DeCarlo algorithm [DeCarlo, 1985].

In image space, it is easier to have and keep *flatness* and we can do effects like brush paintings, pencil hand drawing. But the disadvantage is there is no information about the geometry (the depth, the normals) and because of that it is hard to ensure *motion coherence*.

2.2 Object Space

The most common way to display texture on an object is to do it in object space (also called 3D space) this permit to anchor the texture to each vertex of the models. In 3D space, we treat each vertex from the mesh independantly. Each vertex can have many informations about itself: position in the 3D space, normal of the surface, distance from the camera, ... OverCoat[4] is an interface that allow users to paint manually 2D strokes on a 3D model. To do so the user draw 2D splats in image space (in his camera view) and then these splats are anchored on the object on points that are image points projected on the 3D model. Because the splat are anchored to

the object, they follow the movement of the object and so Overcoat have no problem of *motion coherence*.

2.3 Texture Mapping

Textures are

2.4 Stroke Based

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