DRAWINGS FROM PHOTOS

A PREPRINT

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ABSTRACT

1 Introduction

Many digital artists specialize in producing stylized, non-photo-realistic (NPR) digital paint drawings. These lovingly-created drawings can be very expressive and incorporate unique aesthetic decisions that become part of the artist's style. Our goal aims are achieving image translation: produce NPR drawings from real-world photographs. Our project can be decomposed in two main parts: getting the contour edges of the drawing and applying the colors. Depending on time constraints, we would like to extend our deterministic image translation method to a more customizable method that allows extensive artistic control over the result. One axis of customization we would like to have: change how realistic a drawing looks, how close to the original picture it is. This involves both choosing the threshold of the edges, and adjusting the color balance applied.

2 NPR components

We believe that a pleasing result can be obtained by producing several NPR components from a source image and blending them together. We aim to start with the following components and add others depending on time constraints.

1. **Edges**
   Gradient-based edge detection offers a simple method to extract a line drawing from a photograph (Sobel filtering or Canny edge detection). This algorithm produces grayscale representations of the lines in the photographs. By changing the detection threshold, the amount of detected points changed. Using Hough transform to join points, line sketches can be constructed. Effectively this changes the granularity of the sketch. However, this is not very customizable and unlikely to match the style diversity of drawings.
2. **Pencil sketch**
   There are several existing methods to produce a pencil sketch-like drawing from a source photograph. These methods allow for more control over the output.
   Line-integral convolution (LIC) methods [1] [2] extract a vector field from an image by local Fourier analysis. Then, the original image is convolved with a noise texture applied along the streamlines of that vector field. This produces pencil-like shadings of the image. Both the noise texture and the vector field can be customized to change the appearance of the result. For our project, we can offer a selection of different noise textures to produce different styles. We can also perform region-aware vector field editing [3] to control the sketch line direction.

Feature-based methods such as [4] extract lines from the image. These lines are then recomposed into an image using a pencil and paper model for NPR line rendering. The resulting pencil sketch appearance can be controlled by tweaking the parameters of the pencil and paper model.

3. **Stylized colors**

   A simple method to extract and manipulate the color information from a photograph is to cluster the pixel values in CIE xy chromaticity space. The computed clusters are used as a fixed color palette used to re-render the photograph. Then, we can also select customizable transformations to exaggerate or minimize color differences, or perform smoothing of the boundaries between colors.

   More involved methods like [5] also perform foreground/background image segmentation to remove the background color information.

Finally, the end result is given by applying the stylized colours over the pencil sketch.

3 Implementation

The user will be able to control the result by selecting parameters: tweaking knobs that change the components parameters. Additionally, we can produce presets for all these values to allow the user to switch easily between drawing styles.

We will iteratively prototype and develop the components in MATLAB. However in the best case scenario, we would like to port it to a web language to add a friendly user interface.

We will not be using an Android device for this project.

References

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