Cartoon Transformation

EE 440 Final Project -- Jake Garrison -- 12/5/2015

# Features and Functionalities

The core of the program relies on a gradient minimization algorithm based the *L*0 gradient minimization concept. This filter generally flattens the color content and removes high frequency noise while still retaining the edges and primary color change. In my experience, the gradient minimization algorithm I implemented preforms better than ‘cartoon filters’ and ‘bilateral filters’ found online which simply combing a blurring filter or bilateral filter with and edge detection. After the gradient minimization, the edges of the original image are extracted and altered using a a customizable morphological transformation that serves to thicken the edges and display them in a more ‘hand drawn stroke’ form. After applying the modified edges to the gradient minimization output, the final output is formed after a simple color quantization is applied, reducing the color depth to better represent a cartoon. These stroke and color settings, as well as the gradient minimization parameters are customizable through the GUI.

An additional mode inspired by old newspaper cartoons and the pop art style is also available in the GUI. This mode performs binary operations and color masking to output a simple, binary representation of the input that emphasizes the features present in the input image. As in the cartoon mode, this mode has morphological operations to better simulate human strokes, but the true elegance of this effect comes from its ability to accurately emphasize borders rather than all edges. The border is extracted with a function that scores all edges based off continuity and density to identify possible borders, then gaps in edges are filled in and the resulting fully closed edges are added to the output effectively emphasizing the borders.

# Transformation

# Implementation

We present a new image editing method, particularly effective for sharpening major edges by increasing the steepness of transition while eliminating a manageable degree of low-amplitude structures. The seemingly contradictive effect is achieved in an optimization framework making use of *L*0 gradient minimization, which can globally control how many non-zero gradients are resulted in to approximate prominent structure in a sparsity-control manner. Un- like other edge-preserving smoothing approaches, our method does not depend on local features, but instead globally locates impor- tant edges. It, as a fundamental tool, finds many applications and is particularly beneficial to edge extraction, clip-art JPEG artifact removal, and non-photorealistic effect generation.

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# User Guide

# Comments

# Future Research