Project 7 - Edge Detection

Blair Gemmer

CSCI 548 - Pattern Recognition

Spring 2013

Sobel

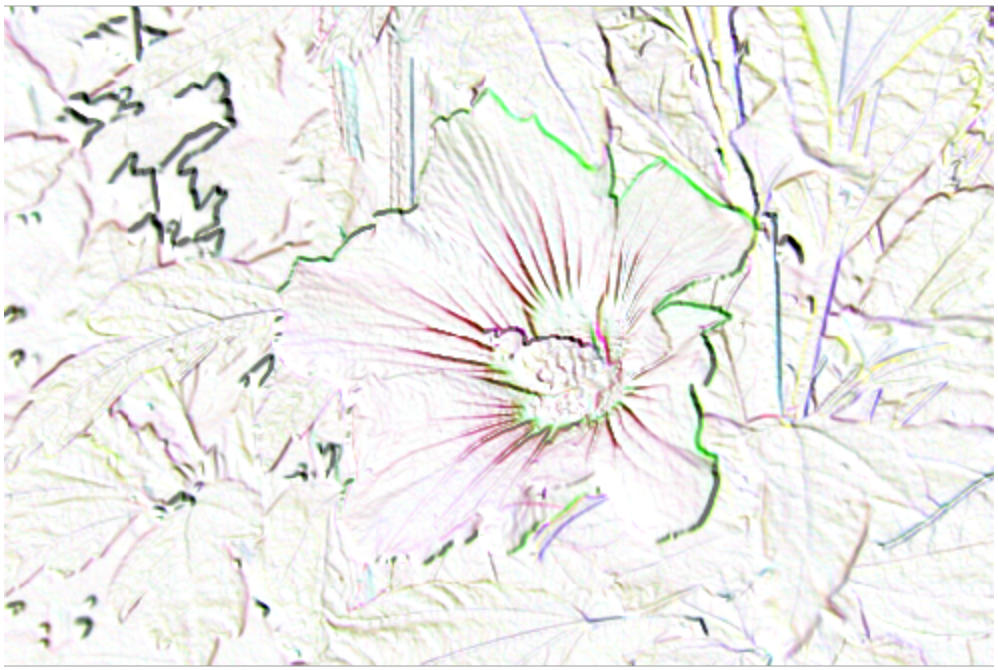

Figure 1. Violet.jpg plotted using the Sobel edge detection algorithm.

Canny

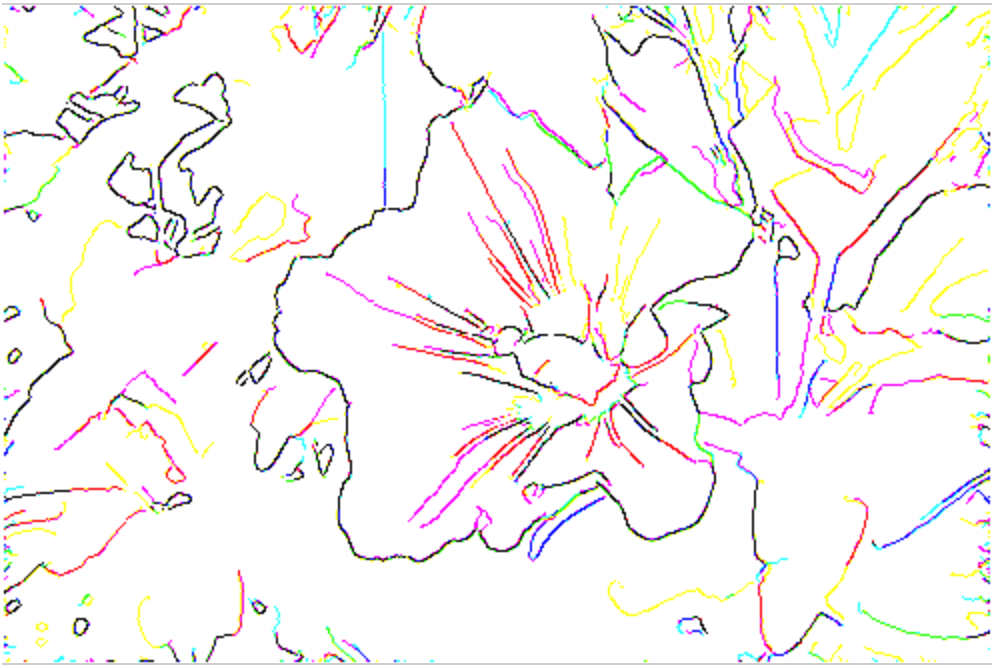

Figure 2. Violet.jpg plotted using the Canny edge detection algorithm.

LePlacian

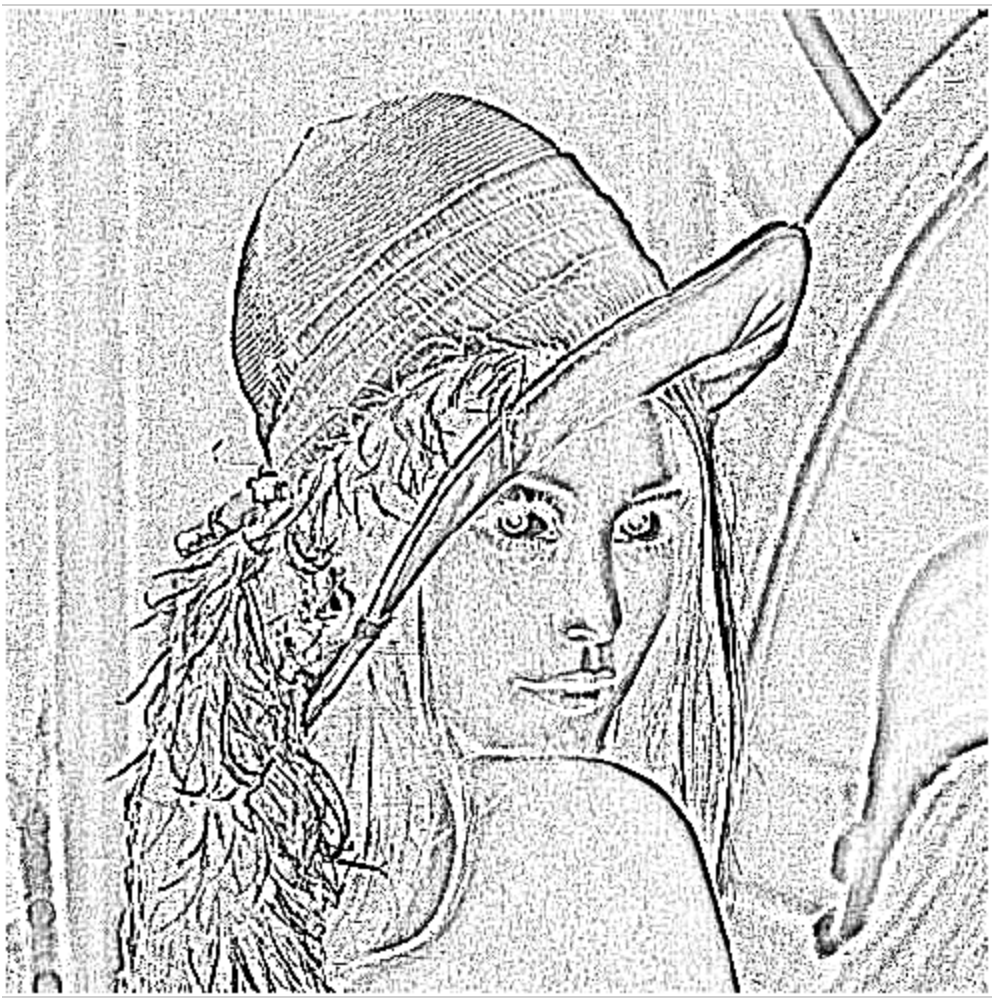

Figure 3. Lenna.jpg plotted using the LePlacian edge detection algorithm. A LePlacian mask is applied to each pixel of the image to create this effect. Threshold for coloration is between 0-255.

Gaussian

Figure 4. Lenna.jpg plotted using the Gaussian edge detection algorithm. A Gaussian mask is applied to the image first, then a LePlacian mask finishes the image to create this effect. Threshold is between 0-255.

Gaussian (with Threshold)

Figure 5. Lenna.jpg plotted using the Gaussian edge detection algorithm. Same method as Figure 4., except the threshold for coloration is between 100-255.

Canny

Figure 6. Lenna.jpg plotted using the Canny edge detection algorithm. Same method as Figure 1.

Questions

Is the LaPlacian edge detection better than Canny edge detection?

Yes. Although the first image with just LePlacian seems to capture more than just the edges, once you apply LoG (LePlacian of Gaussian), it really seems to clear up the picture and reveals the edges quite nicely.

Why do you think that is?

Canny uses the first derivative of the image (Sobel mask convolution in the x and y direction). In this algorithm, the lines are identified using pixels of high value (more white). The Canny algorithm also applies non-maxima suppression and line-tracing (from wikipedia).

LePlacian, on the other hand, uses the second derivative of the image. The highest response is at the center of a portion of the image (in our case, we used a 5x5 portion to determine this). Lines can be defined by inflection points (zero-crossings), rather than by areas of high magnitudes. This also makes it highly sensitive to noise (hence the Gaussian helps to smooth out the LePlacian).

I think that if the image is full of noise, Canny might actually be better, however. This image seems to prove that. Although Canny doesn't seem to capture every edge, the ones it captures seem to be much better in terms of discretization between the white and black. That seems to be because of the amount of noise in the original image.