

COMPUTER VISION  
#MP5  
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Description:

Create a canny edge detector to get well defined edges.

Algorithm:

Gaussian Smoothing-This function blurs the input image, where a kernel of size  $n$  is created and then convolved over the entire image array. Depending on the size of the kernel and the sigma(standard deviation), the result is more or less blurry.

Image gradient-The gradient is a representation of change in intensity, returns both the magnitude and direction of change. The larger the magnitude of the gradient, the greater the change in intensity. Depending on the method, the image is made to convolve with a  $x$  and  $y$  kernel, the resulting  $x$  and  $y$  arrays are used to calculate the gradient and theta direction.

High and Low Thresholding- Using a cumulative histogram and the percentage of non edge the higher threshold can be calculated. The lower threshold is half of the higher threshold.

Suppressing Non maxima-This function cleans up the gradient magnitude image and creates thinner edges by removing double lines. By iterating through input image pixels, it determines the pixels with maximum values in the direction of the edges(LUT method).

Thresholding and Edge Linking-The result from non maximum suppression is used to recursively link the edges using the threshold calculated above. The stronger edges are linked followed by the weaker edges which fill the edge gaps.

Result Analysis:

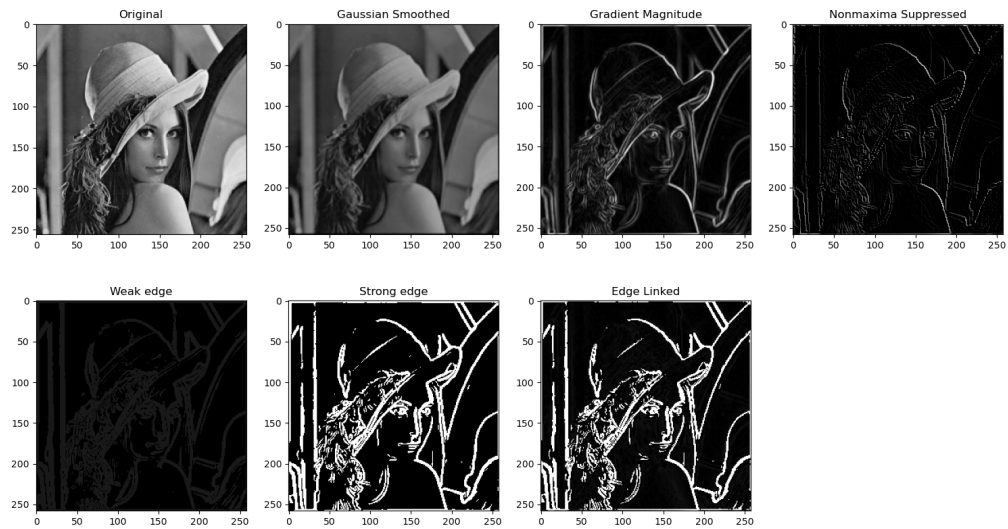


Fig. Lena image results using sobel method with gaussian kernel size 3, sigma 1.0 and percentage on non edge 0.8

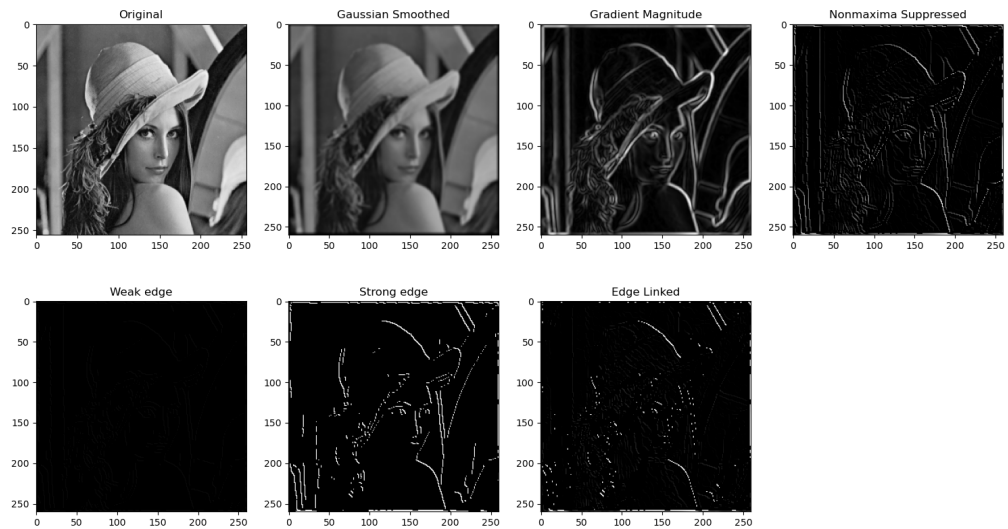


Fig. Lena image results using sobel method with gaussian kernel size 5, sigma 1.5 and percentage on non edge 0.9

The images above show that a greater sigma and kernel size increases the image blurring which results in ill-defined edges. Increasing the percentage of non edge also causes less edges to be detected resulting in worse edge quality.

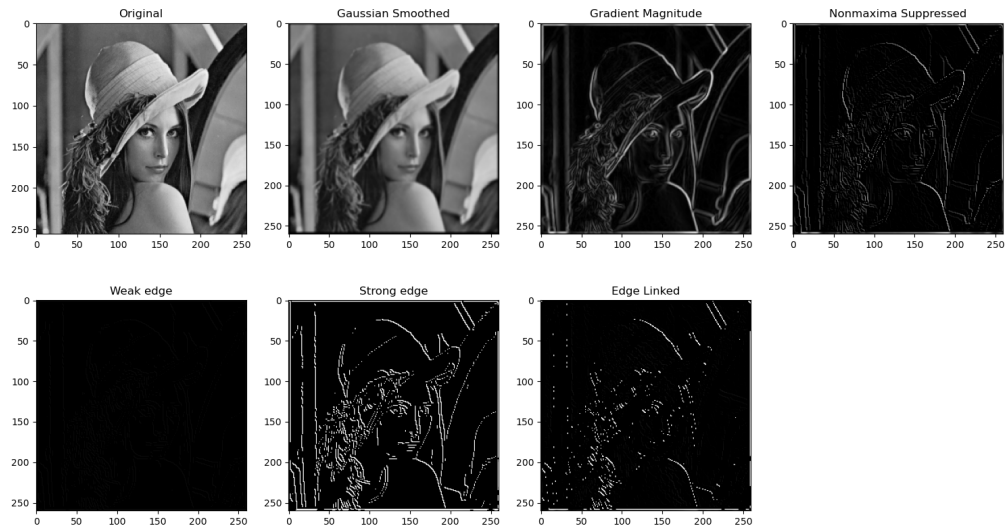


Fig. Lena image results using robert method

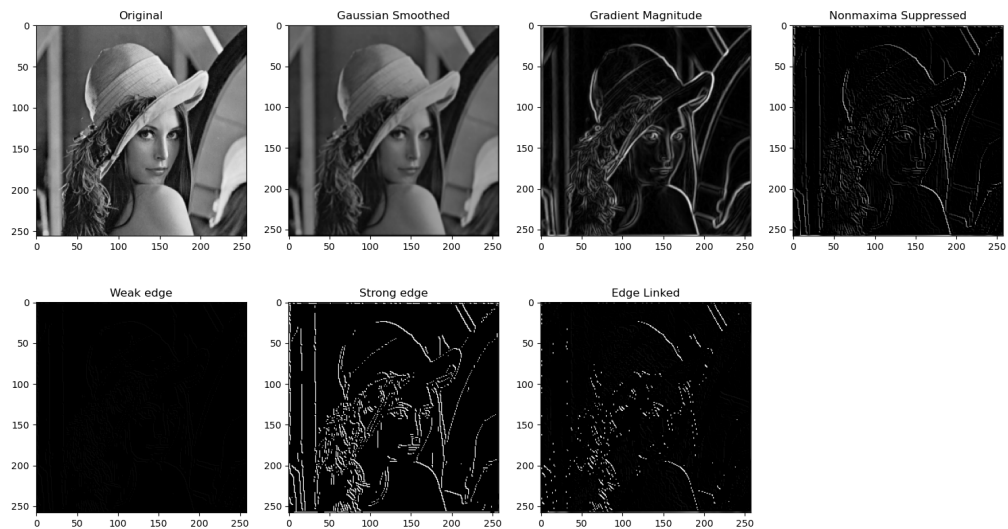


Fig. Lena image results using prewitt method

When different detectors are used, namely robert and prewitt instead of sobel, the sobel method gives the best results.