VIP Assignment 2

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1 Gaussian filter

(a) σ=1

(b) σ=2

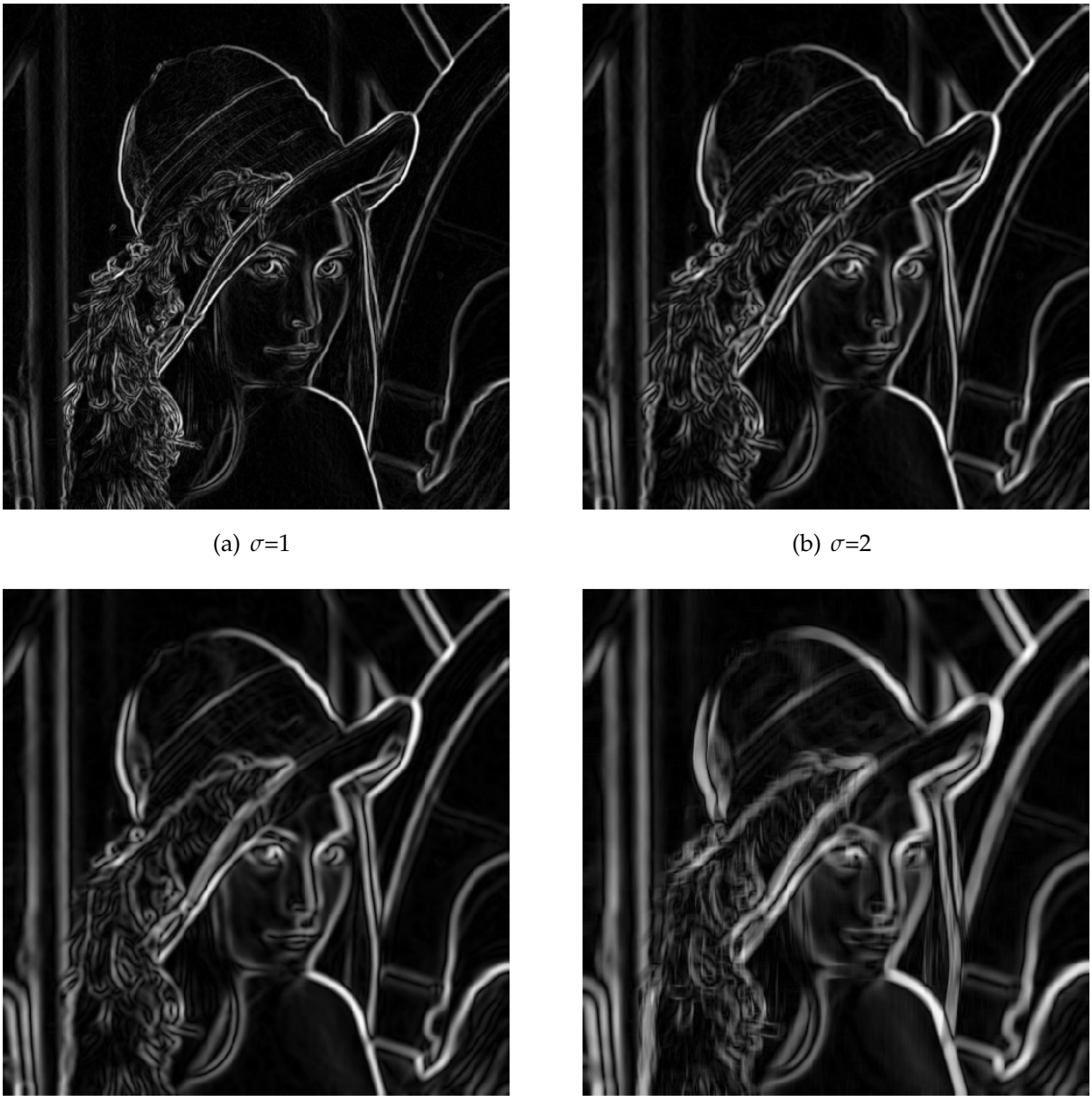
(c) σ=4

(d) σ=8

Figure 1: Applied Gaussian filter with different σ

A bigger σ means the curve of distribution will be broader, the peak will be less spiky. When it applys a same kernel size, if we increase the sigma value, the image will be more blurry.

2 Gaussian derivatives



(a) σ=1

(b) σ=2

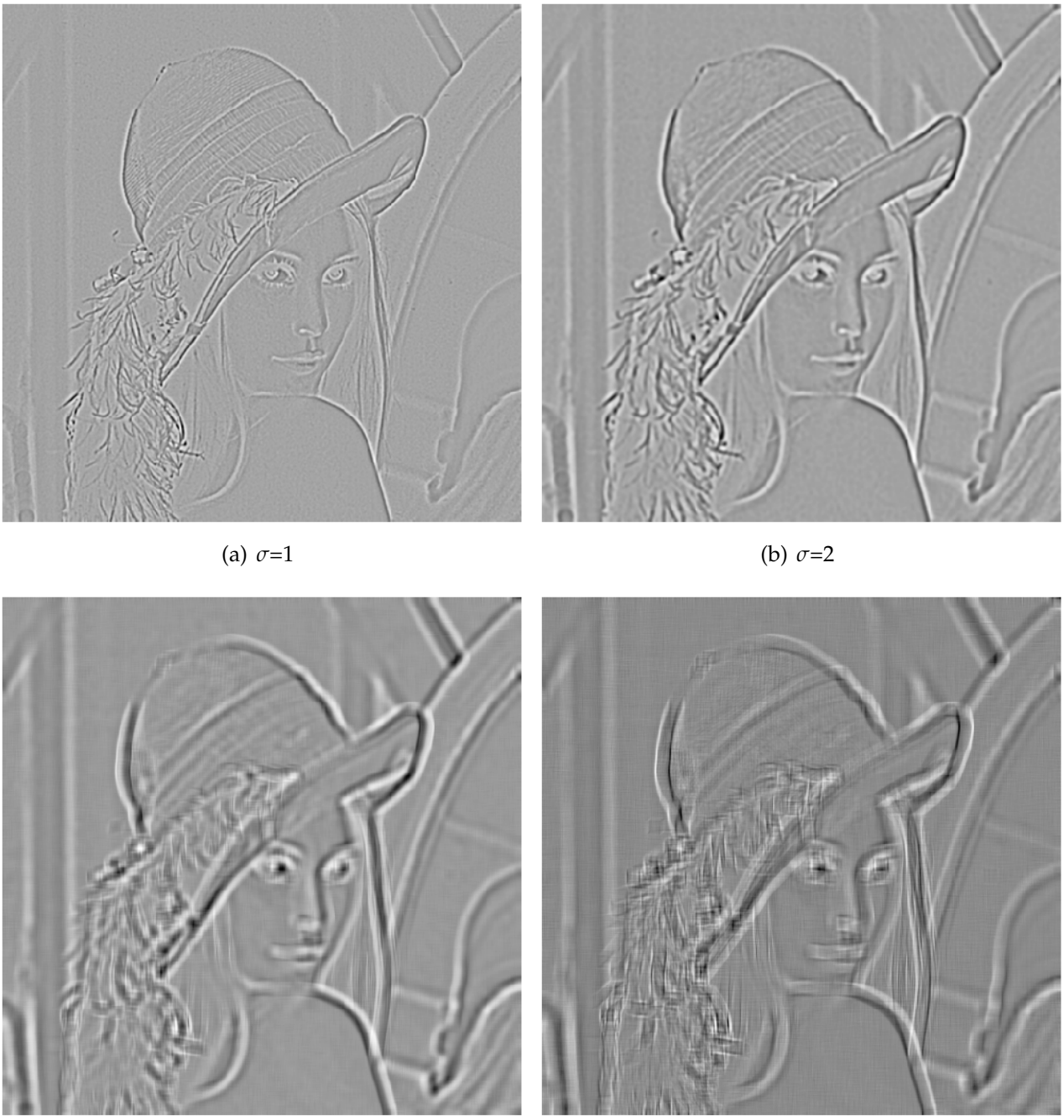
(c) σ=4

(d) σ=8

Figure 2: Applied Gaussian derivatives with different σ

We use the derivatives of Gaussian to estimate the gradient magnitude. And gradient points in the direction of most rapid increase in intensity. Smaller σ means the filter responds on each side of the line, which we can see the rising and falling edges. Thus, large values of the gradient magnitude will form thick trails.

3 Laplacian-Gaussian filtering



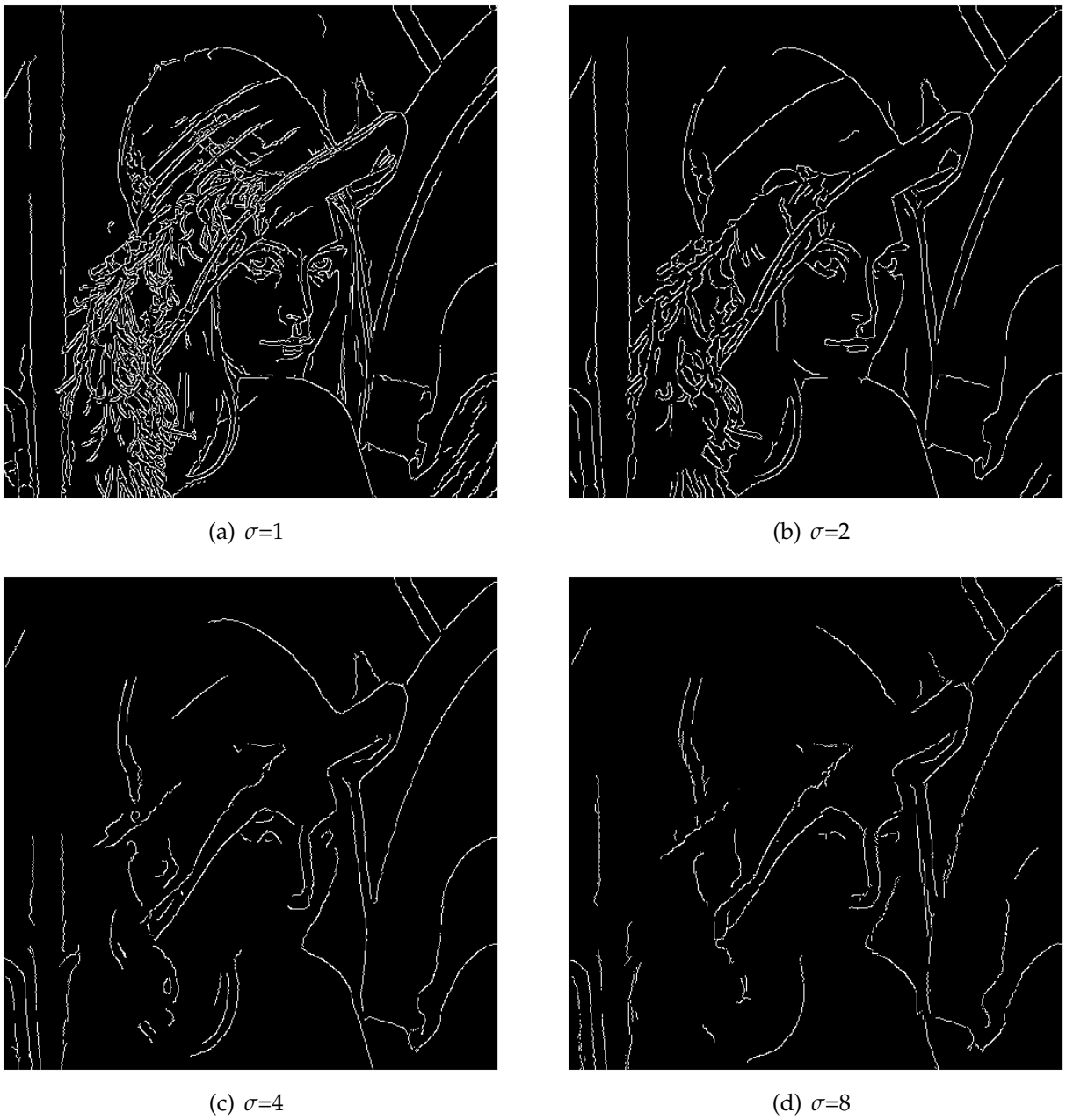
(a) σ=1 (b) σ=2

(c) σ=4 (d) σ=8

Figure 3: Applied Laplacian-Gaussian filter with different σ

We use 2nd derivative of Gaussian to estimate the Laplacian-Gaussian filter. It responds to a white/black spot on a black/white background. If we use a larger σ value, the lines will wider, the edges will smoother.

4 Canny edge detection



(a) σ=1 (b) σ=2

(c) σ=4 (d) σ=8

Figure 4: Canny edge detection with parameters[40,80] and different σ

To get a clean image, canny use two thresholds to decide which edges should be preserved. Any edges with intensity gradient more than high-threhold are edges and those below low-threhold are non-edges, so discarded. In this report, we used the 40 and 80 as the threholds.
From the Fig.4 we can see that, with a bigger σ, the image will become more clean. And $\sigma = 1$ or 2 will be the best.