Canny Edge Detection

1. Gaussian blur to subdue details and denoise.

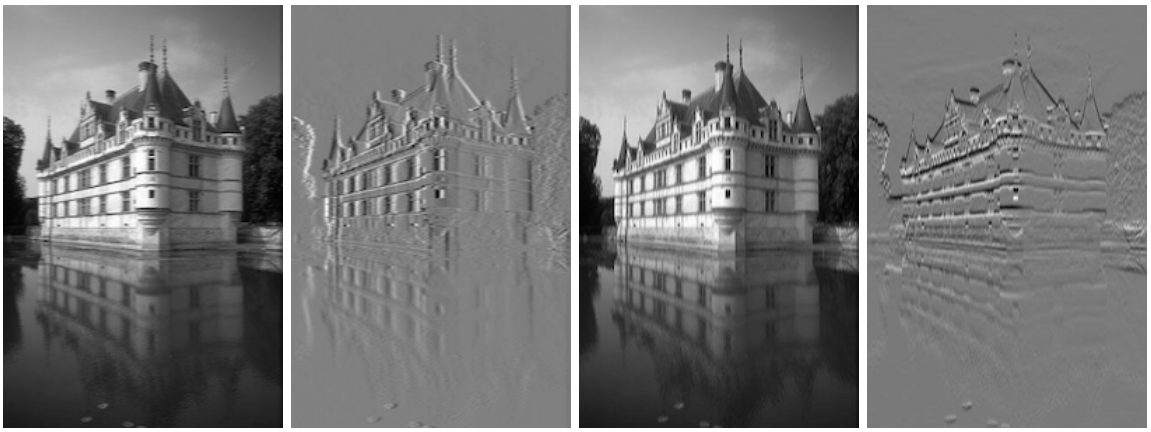
$$G_{1D}(x;\sigma) = \frac{1}{\sqrt{2\pi}\,\sigma}\, e^{-\frac{x^2}{2\sigma^2}}$$

2. Compute gradient magnitude (rate of change in intensity) and direction.

$$\sqrt{g_y^2 + g_x^2}, \quad \theta = \tan^{-1}\left[\frac{g_y}{g_x}\right]$$

3. If the gradient magnitude at a pixel is larger than that of its neighbors along the gradient direction, mark the pixel as an edge.
4. Confirm or extricate weak edge signals through double hysteresis thresholding.

To determine the horizontal and vertical rates of change in intensity, we perform four 1D convolutions. We firstly 1D-convolve along the rows and columns with a 1D Gaussian filter and secondly with its derivative.



For single edge response, only local maxima along the gradient direction are retained. Then, local maxima are classified as either “real” edges or background through thresholding and 8-neighbor connectivity.