

Canny Edge Detection

Monica Chan

What is Canny Edge Detection?

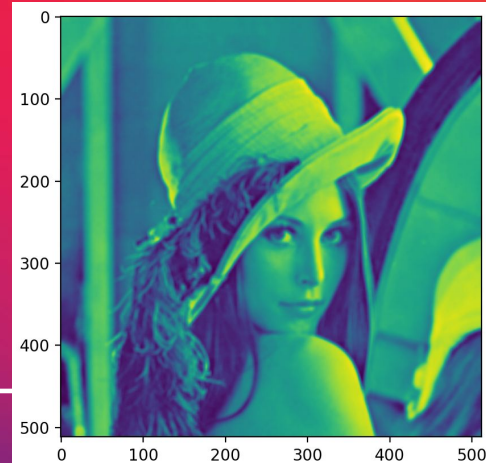
- Goal: Limit the amount of information a computer has to process for an image
 - Edge detection
- Canny Edge is a popular method.

Brief Overview of the Algorithm

- Noise Reduction
- Gradient Calculation
- Non-max Suppression
- Double Thresholding
- Hysteresis

Noise Reduction

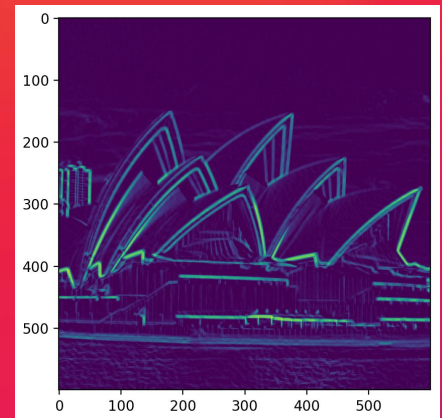
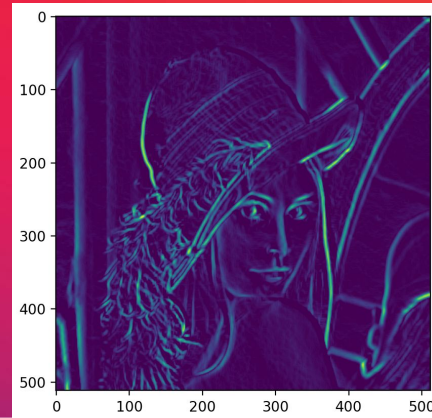
- Normally, images will have a high amount of noise
 - Use a blurring filter to reduce this (Gaussian)
 - Important for the Gradient calculation step.



Gradient calculation

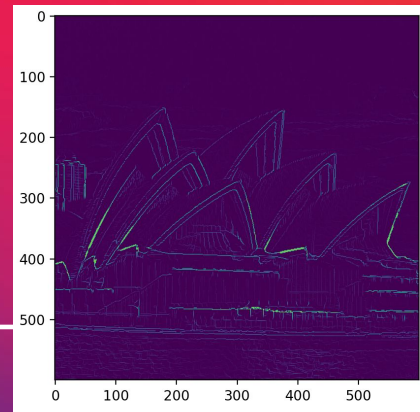
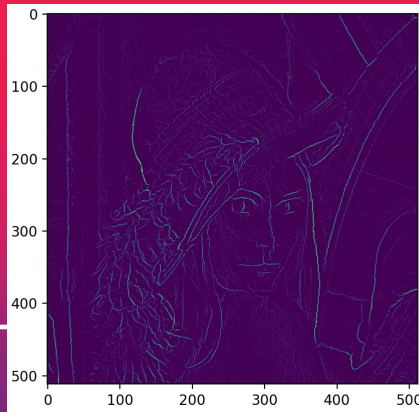
- What classifies an edge?
 - High level of change in pixel intensity.
 - Gradients!

$$K_x = \begin{pmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{pmatrix}, K_y = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{pmatrix}.$$



Non-max suppression

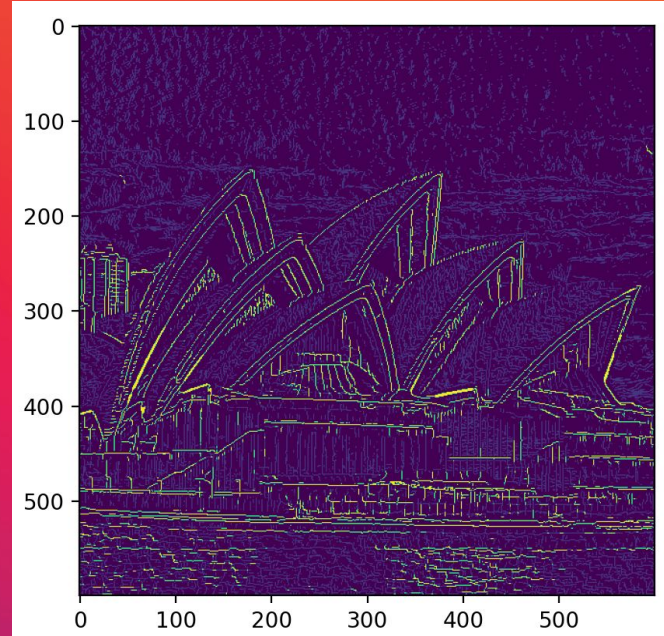
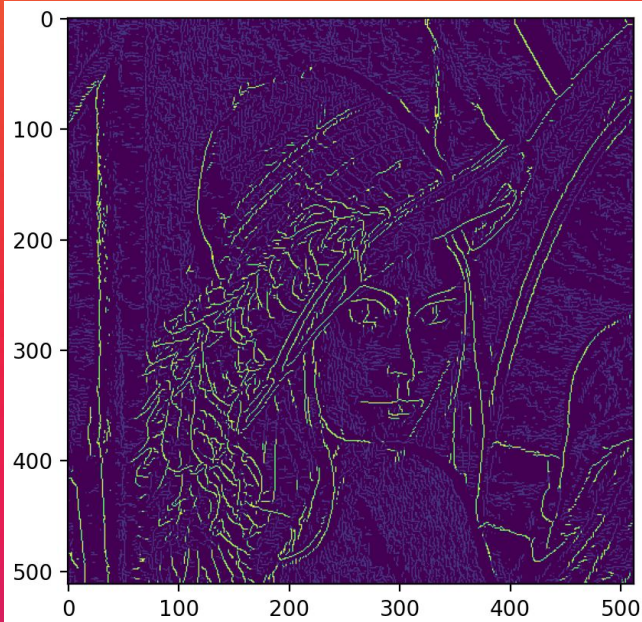
- Edges at this point are pretty smooth and not uniform.
- Analyze the two pixels on either side of the one in question (in the direction of the edge).



Double Thresholding

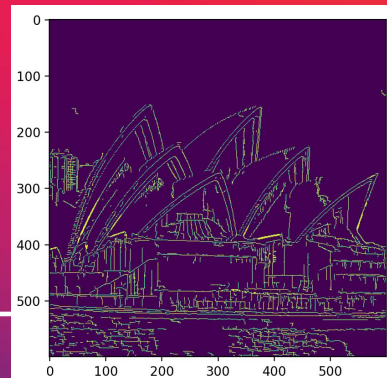
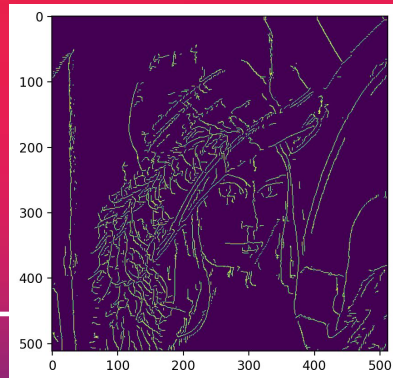
- Still variation in intensity in some of the pixels
- Goal of this step is to classify “weak,” “strong,” or non relevant.
- Weak pixels fall between the intensity bounds.
- Strong pixels are as intense or stronger than the high threshold.
- Non relevant pixels are ones that fall below the low intensity threshold.

Double Thresholding Results



Hysteresis

- Check whether the “weak” pixels are actually strong or not.
- We do this by analyzing the 8 surrounding pixels around each weak pixel.



Adjusting Thresholds

