Canny Detection

Step 1: GrayScale Conversion.

Step 2: Gaussian Blur

The blur removes some of the noise before further processing the image

STEP 3 - DETERMINE THE INTENSITY GRADIENTS

The gradients can be determined by using a Sobel filter where A is the image And edge occurs when the color of the image changes, hence the intensity of the pixel also changes

$$G_x = \begin{bmatrix} -1 & 0 & +1 \\ -1 & 0 & +1 \\ -1 & 0 & +1 \end{bmatrix} A, \; G_y = \begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ -1 & +2 & +1 \end{bmatrix} A$$

Calculate the magnitude and angle of the directional gradient.

$$|G| = \sqrt{{G_x}^2 + {G_y}^2}$$

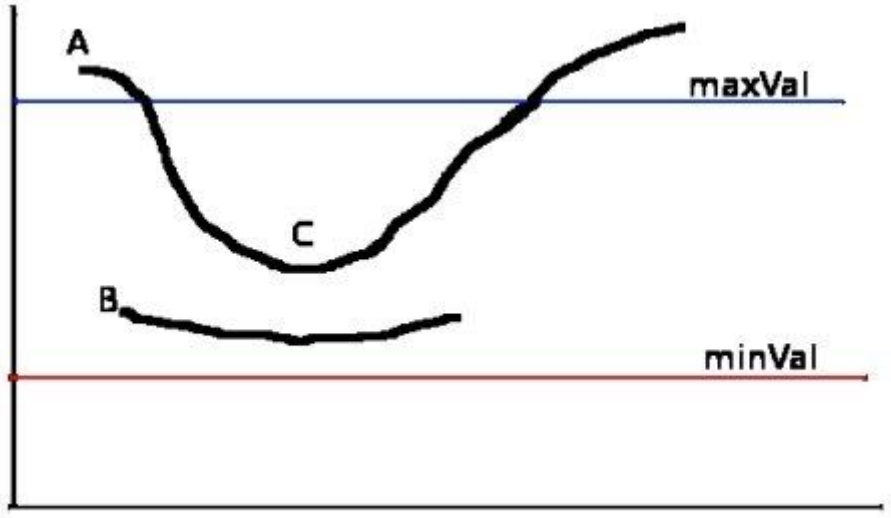
$$\angle G = arctan(G_y / G_x)$$

STEP 4 - NON MAXIMUM SUPPRESSION

The output image of step 3 will have a tick edge but the image should have a thin edge. **Non-max SUPPRESSION** work by finding the pixel value that has max edge value. If the magnitude of the current pixel is greater than the magnitudes of the neighbors, nothing changes, otherwise, the magnitude of the current pixel is set to zero.

STEP 5 - DOUBLE THRESHOLDING

The image from step 4 is not perfect as the edges may not be an edge. So, we double thresholding where the two sets of values high and low threshold, pixels with high threshold values are more likely to edge.



Edge A is above the maxVal, so considered as “sure-edge”. Although edge C is below maxVal, it is connected to edge A, so that also considered a valid edge and we get that full curve. But edge B, although it is above minVal and is in the same region as that of edge C, it is not connected to any “sure-edge”, so that is discarded.
If we choose The high threshold to be 0.7, this means that all pixels with a value larger than 0.7 will be a strong edge.

STEP 6 - EDGE TRACKING BY HYSTERESIS

to determine which weak edges are actual edges. To do this, we perform an edge tracking algorithm. Weak edges that are connected to strong edges will be actual/real edges. Weak edges that are not connected to strong edges will be removed.