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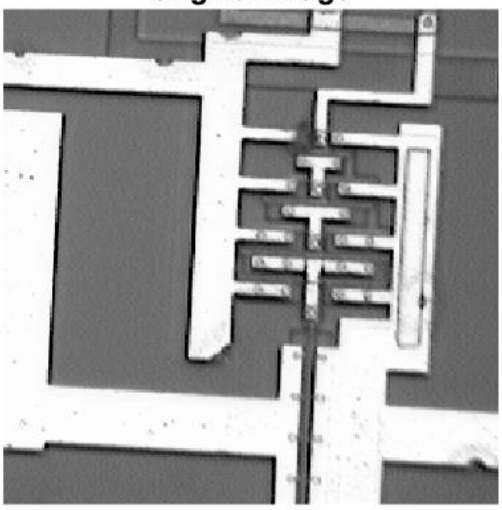
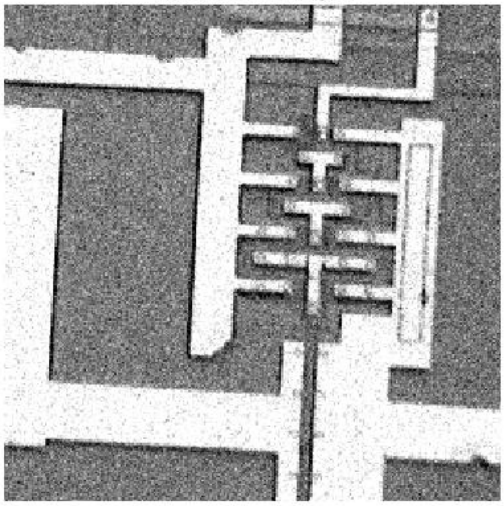
LAB SESSION 04 – EDGE DETECTION REPORT

- **Pre-Processing: De-noising**
  - **Step 01: Load the Image and Artificially add some noise:**
    - Adding noises to the image with the 'imnoise' function under Gaussian feature with the noise strength = 0.5.
    - The outcome that is highly perceivable in noise but still recognizable.

Original Image



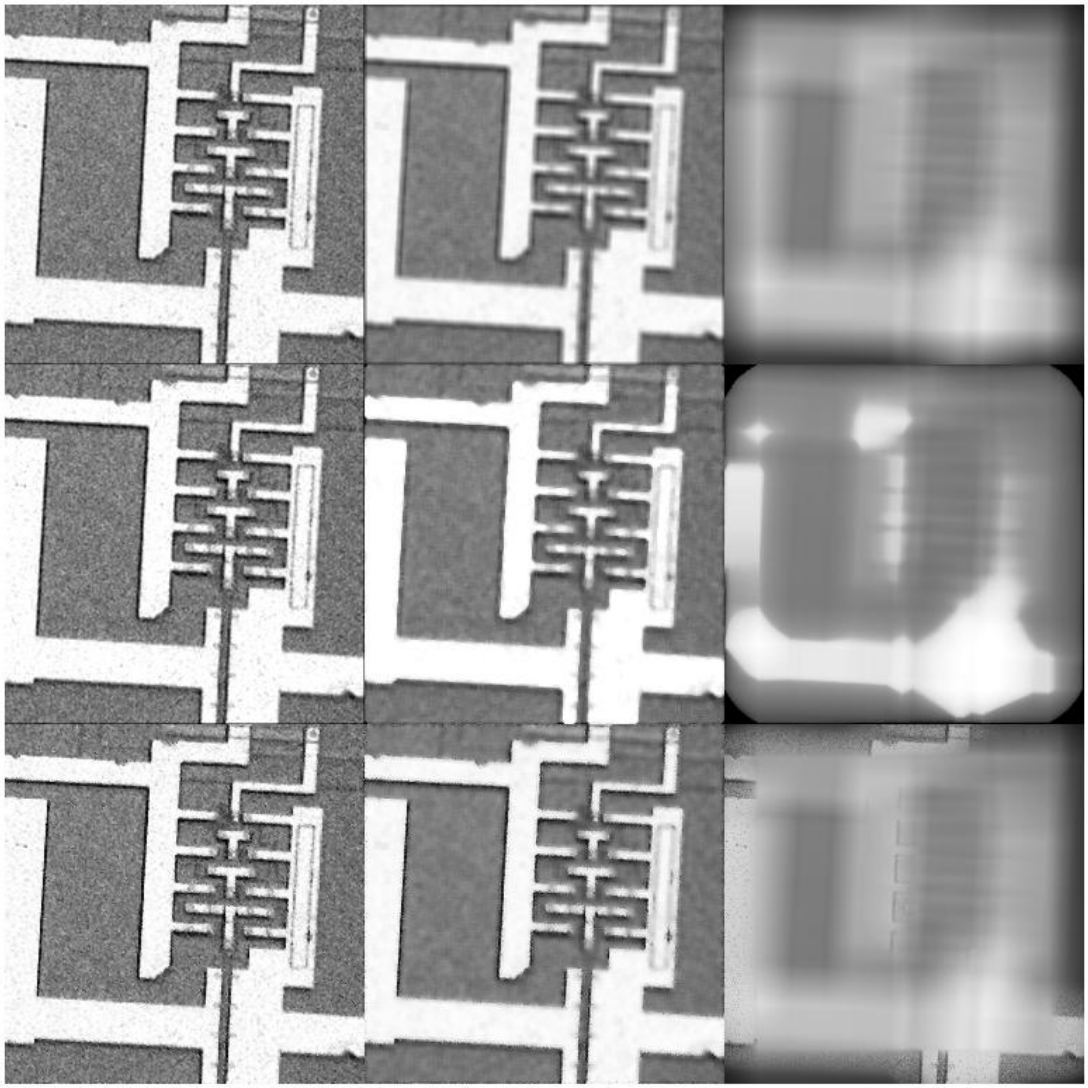
Noised Image



  - **Step 02: De-noise the Image**
    - De-noise the image using three methods which are:
      - Average Filtering
      - Median Filtering
      - Wiener Filtering
    - The neighborhood size for those filters will be [2 2], [5 5] and [50 50] respective.
    - The below 'outputs comparison' will be order as following table

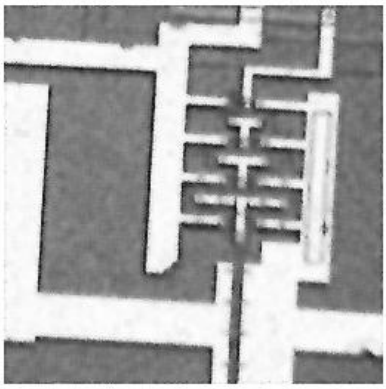
Average Filter – 2	Average Filter – 5	Average Filter – 50
Median Filter – [2 2]	Median Filter – [5 5]	Median Filter – [50 50]
Wiener Filter – [2 2]	Wiener Filter – [5 5]	Wiener – [50 50]

De-noise methods - ouputs comparison

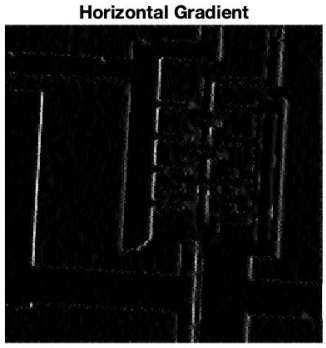


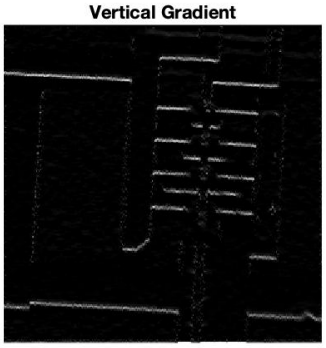
- The final choice is Wiener Filter with neighborhood size at [5 5] as it reduces most of the noises and not blurring out the image.

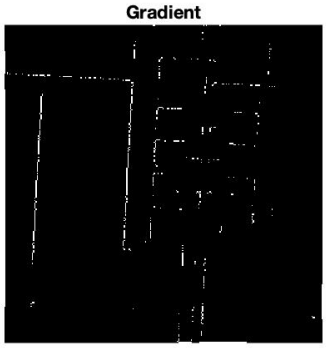
Final choice - Weiner filter with 5 5



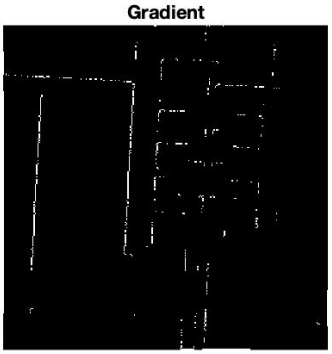
- **Processing: Low Level Feature Detection**
  - **Step 03: Highlight the Edges:**
    - The first method of edges highlighting results:

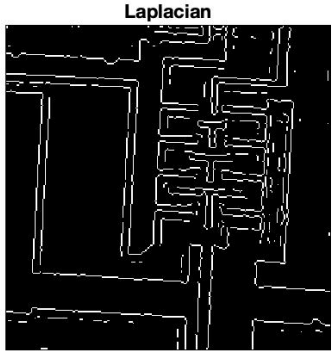


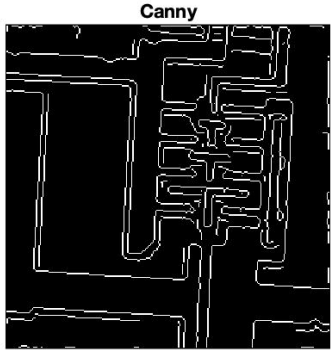




- The comparison of three techniques as Gradient, Laplacian and Canny in comparison after binarizing and morphological performing.
- In comparison, the Canny technique give out most edge detecting efficiency.



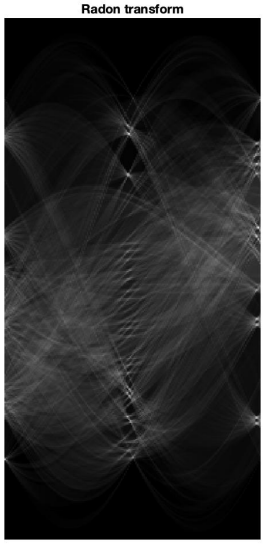




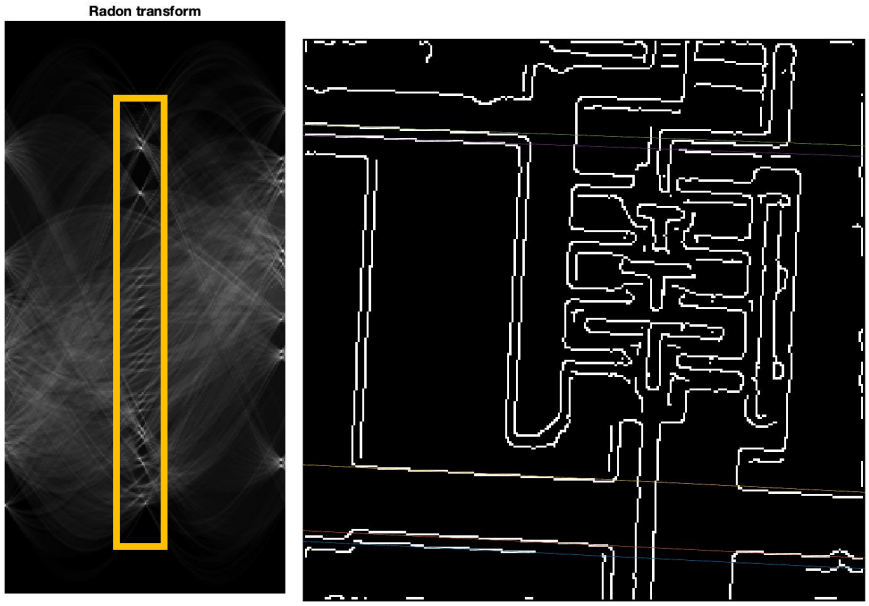
- **Step 04: Compute the Radon Transform:**
  - The bright points on Radon Transform will correspond to the edge lines of the original image.
  - If the bright points is on the same line in Radon Transform will correspond the parallel edge lines on original image.
  - Otherwise, If the bright points is not on the same line in Radon Transform will correspond the orthogonal edge lines on original image.

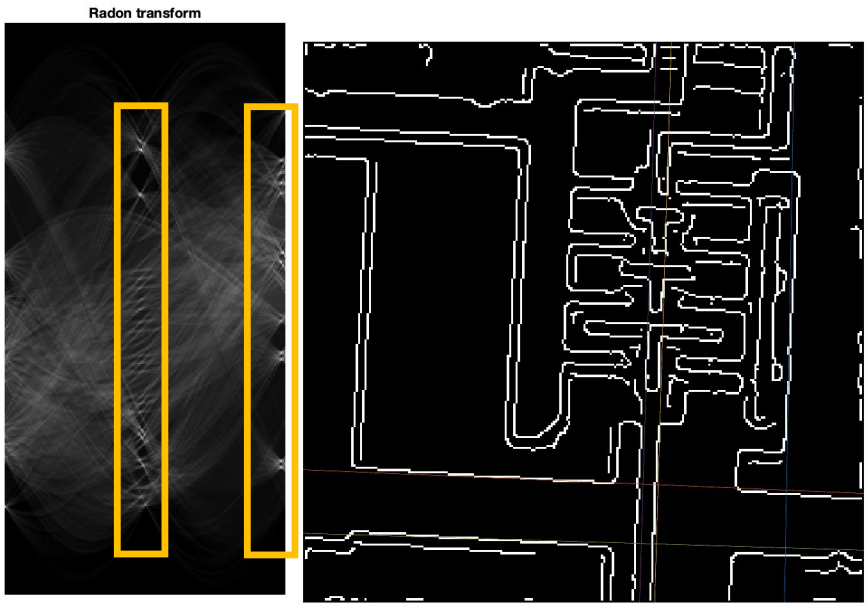
- Optional question:

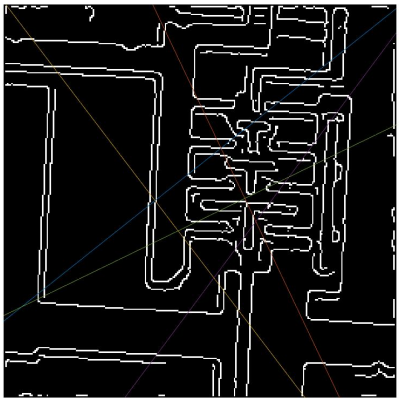
Hough Transform	Radon Transform
On discrete algorithm to detect lines and other shapes.	A continuous function which computes projections of an image matrix along specified directions



- **Post Processing: High Level Detection and Interpretation**
  - **Step 05: Choose the points in Randon Transform and Observe Associated Lines**
    - Testing by choosing 5 points on the transform map in 3 times and got different results as below.
    - The first photo (from left to right) gives us 5 parallel lines on the edges of the image when chosen 5 bright points on the same line in middle of the image
    - The second one gives us 5 different lines, which are two in parallel as we selected two bright points in the middle of the photo and three parallel lines which are orthogonal with the other two lines. Those three lines are the result of selected three bright points on the rear of the photo.
    - The last result showed out as random points were selected on the Randon transform.
    - Briefly, the bright points on Radon Transform will correspond to edge lines on the original image. The bright point on the same line of Radon Transform will resulted in the parallel edge lines in original image, if not on the same line, they be orthogonal edge lines on the original image.







- **Step 06: Find the Image Orientation and Rotate It.**
  - The below 1st image is plot of V and V(1:90) + V(91:180).
  - The last image is the comparison between the original image and it rotated version with corresponding angle.