SAI KUMAR MURARSHETTI
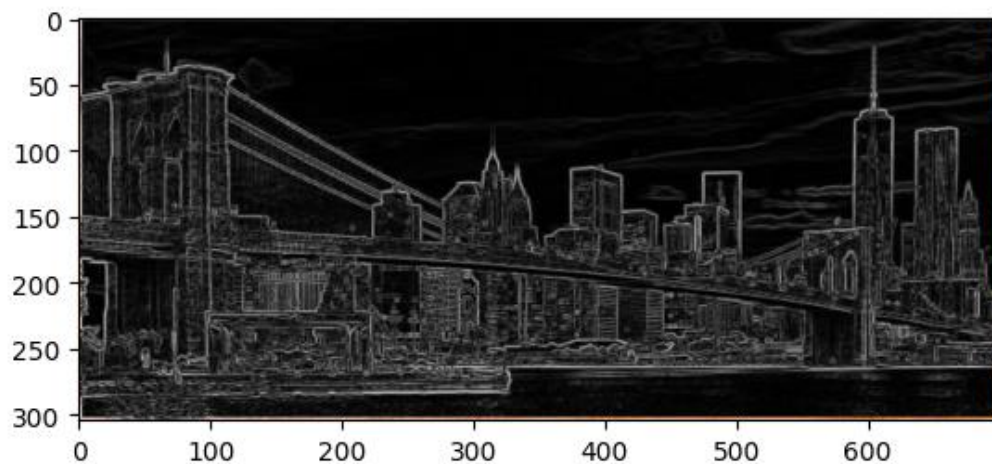**LEWIS ID: L30079224**

Report

1. Edge Detection Techniques:

Technical Description:

- Edge Detection is a fundamental technique for identifying edges in the image where the intensity varies instantly.
- It works by calculating the image's gradient and highlighting places with high intensity gradients.
- Common techniques include the Sobel operator and simple gradient-based algorithm design.

Algorithm Design:

- The algorithm repeats through each pixel in the image to calculate the gradient intensity.
- If the gradient strength exceeds a predetermined threshold, the pixel is identified as an edge point.

Output:

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2. **Sobel Edge Detection:**

Technical Description:

- Sobel Edge Detection is an important approach for highlighting edges in both horizontal and vertical orientations using convolution with Sobel filters.
- It is very useful for highlighting edges with exact inclinations.

Algorithm Design:

- Two Sobel filters (one for horizontal and one for vertical modifications) are applied to the images.
- The gradient intensity is determined using the outputs of these filters.
- Pixels with gradient values which exceed a certain threshold are recognized as edge points.

Output:

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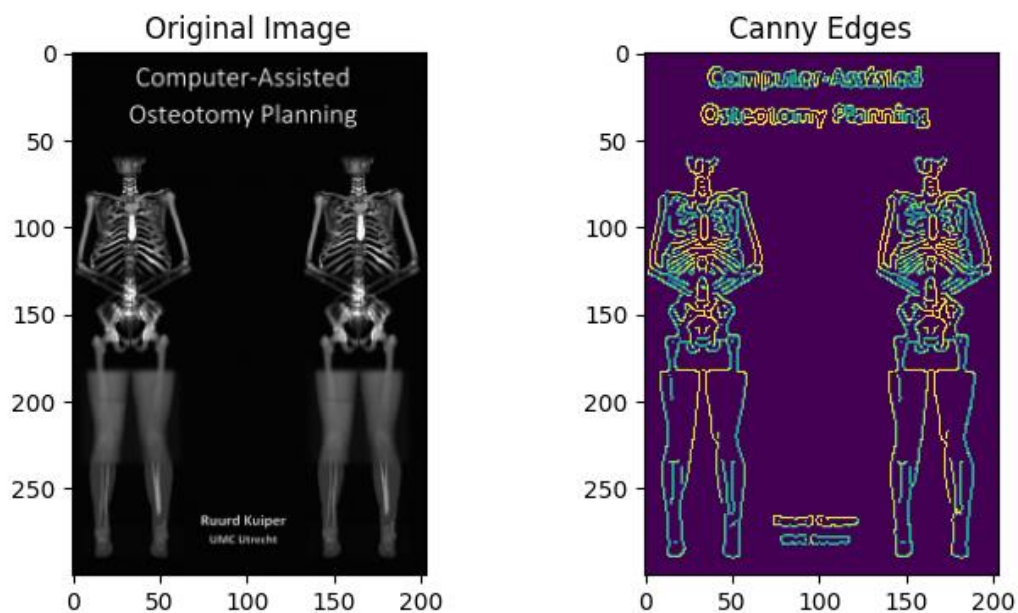**LEWIS ID: L30079224**

3. **Canny Edge Detection:**

Technical Description:

- Canny Edge Detection is a multi-stage technique that includes four important steps: smoothing, gradient calculation, non-maximum suppression, and edge tracking.
- Hysteresis is used to determine strong and weak edge pixels, which produces an accurate detection technique.

Algorithm Design:

- A Gaussian filter is used to smooth out the image and decrease noise.
- The gradient's magnitude and direction are determined.
- Non-maximum suppression is used to smooth out the edges.
- Hysteresis-based edge detection involves selecting strong edge pixels and connecting them to surrounding weak edge pixels.

Output:

4. **Edge Detection using Sobel and Gaussian Filters:**

Technical Description:

- This technique uses Sobel and Gaussian filters to improve edge detection by firstly decreasing   noise with Gaussian smoothing.
- Sobel filters are then used to highlight edges in both the horizontal and vertical directions.

Algorithm Design:

- Smoothing is achieved through using Gaussian filtering.
- Both horizontal and vertical applications are made of Sobel filters.
- The gradient magnitude is calculated and pixels with gradient magnitudes exceeding a threshold are marked as edge points.

Output:
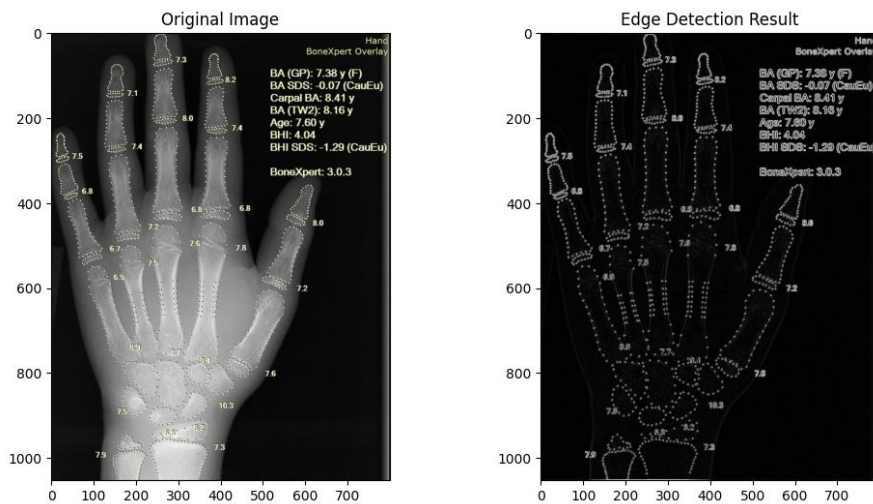
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5. **Gaussian Filter Detection:**

Technical Description:

- Gaussian Filter Detection reduces and highlights transitions in an image by applying a Gaussian filter to it, thereby highlighting edges.

Algorithm Design:

- Gaussian filtering is performed directly to the image.
- The gradient magnitude is determined and pixels with gradient values greater than a threshold have been chosen as edge points.

Output:

Sigma = 4.10
Threshold = 0.33