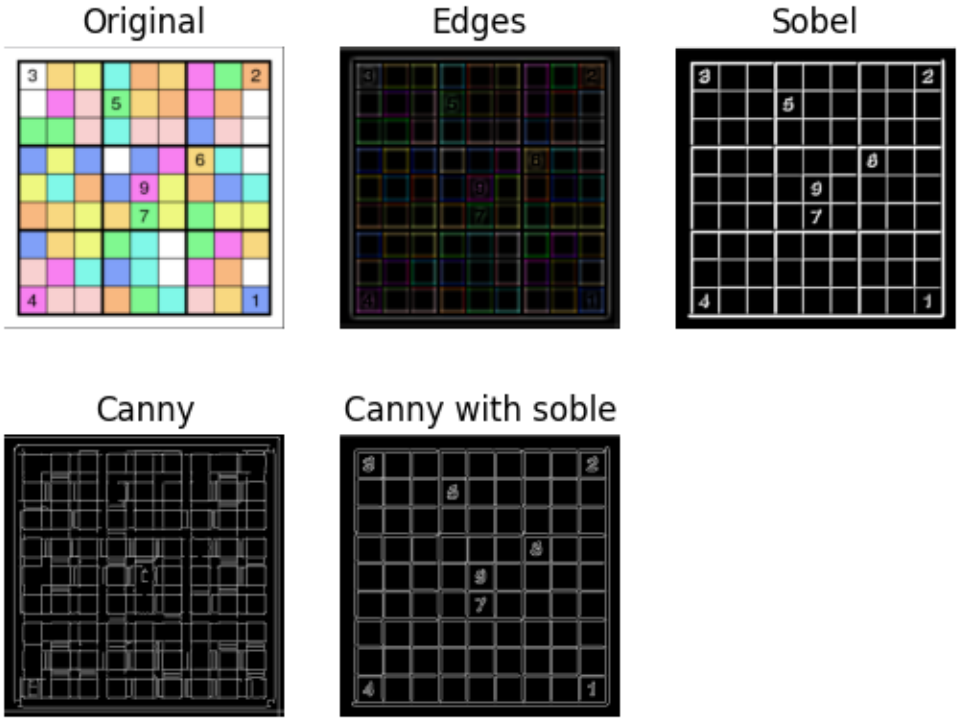
Edge Detection Methods Report



Introduction

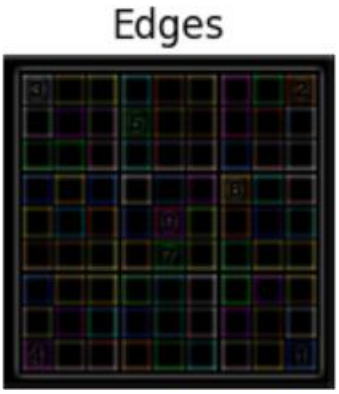
This report presents a comparison of three different edge detection methods applied to an image. The methods evaluated are: Edge Detection by Subtraction, Sobel Edge Detection, and Canny Edge Detection.

Methods and Results

1. Edge Detection by Subtraction

Method: This technique involves applying Gaussian blur to the original image and then subtracting the blurred image from the original. This method aims to highlight edges by removing the smooth, blurred regions from the original image.

Image:

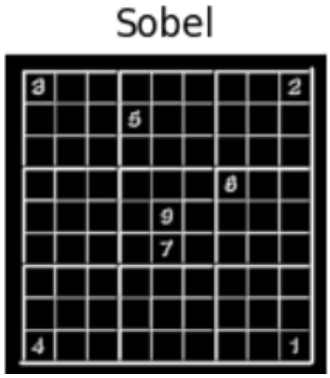


Brief Explanation: By subtracting the blurred image from the original, the edges become more pronounced. However, this method may not capture fine details effectively and can be sensitive to the choice of the blur kernel size.

2. Sobel Edge Detection

Method: Sobel edge detection uses convolution filters to compute the gradient of image intensity in both horizontal and vertical directions. The combined gradient magnitudes give an edge map highlighting the edges in the image.

Image:

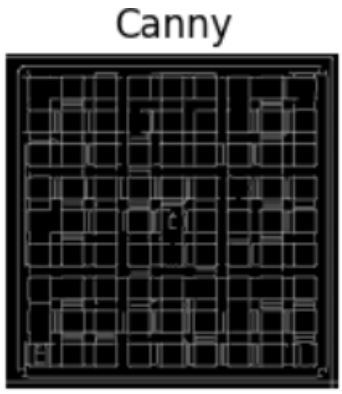


Brief Explanation: Sobel filters provide a more refined edge detection by focusing on the gradient changes in the image. This method is effective at detecting edges but can be sensitive to noise and may require additional processing to enhance results.

3. Canny Edge Detection

Method: Canny edge detection is a multi-stage algorithm that includes noise reduction, gradient calculation, non-maximum suppression, and edge tracking by hysteresis. It is designed to detect a wide range of edges and provides high accuracy.

Image:

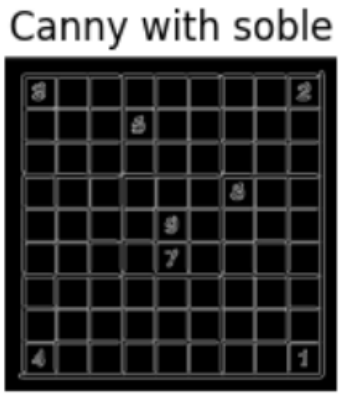


Brief Explanation: Canny edge detection is known for its robustness and accuracy. It effectively detects edges by considering gradient changes and suppressing non-edges. This method generally provides clear and precise edge detection.

4. Canny Edge Detection with Sobel Input

Method: This approach applies Canny edge detection on the result of Sobel edge detection to refine and enhance the edge map further.

Image:



Brief Explanation: Applying Canny detection on Sobel-filtered images can improve edge clarity and remove noise. This combined approach leverages the strengths of both methods to achieve more precise edge detection.

Conclusion

The methods evaluated each have their strengths:

- **Subtraction** is simple but may lack detail.
- **Sobel** provides refined edges but can be noisy.
- **Canny** offers high accuracy and robustness.
- **Canny with Sobel** combines the advantages of both techniques for enhanced results.