Image Processing Techniques and Analysis Report

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June 24, 2024

1 Techniques Applied

1.1 Image Sharpening

- Initially, the image underwent sharpening using a sharpening filter with a 3x3 kernel: `kernel = np.array([[-1,-1,-1], [-1,9,-1], [-1,-1,-1]])`.
- The purpose of this step was to enhance edges and fine details in the image.

1.2 Further Sharpening

- Subsequently, a second sharpening operation was performed using a 3x3 kernel: `kernel = np.array([[0,-1,0], [-1,5,-1], [0,-1,0]])`.
- This additional sharpening aimed to further enhance the image's details and edges.

1.3 Grayscale Conversion

- The sharpened image was converted to grayscale using `cv2.cvtColor(img_sharp, cv2.COLOR_BGR2GRAY)`.
- This conversion is often done before applying thresholding or other operations to simplify processing.

1.4 Thresholding (Binary)

- A binary thresholding operation was applied to the grayscale image using `cv2.threshold(gray, 127, 255, cv2.THRESH_BINARY)`.
- Thresholding helped in creating a binary image where pixel values above a specified threshold became white (255) and below became black (0).

2 Techniques Not Applied

- **Histogram Equalization**: Although histogram equalization is a common technique for enhancing image contrast, it was not used in this workflow. This decision was made based on the specific characteristics of the image and the desired outcome.
- **Gaussian Blur**: Gaussian blur is often employed for noise reduction or smoothing. In this case, it was not used as the focus was on sharpening and thresholding rather than blurring.

3 Analysis of Results

3.1 Sharpening Impact

- The initial and subsequent sharpening operations noticeably enhanced the edges and details in the image, making features such as stars more distinct.

3.2 Thresholding Outcome

- The binary thresholding operation effectively separated the foreground (stars) from the background, resulting in a clearer representation of the constellation.

4 Conclusion

By selectively applying image processing techniques such as sharpening and thresholding, the image's visual quality and feature visibility were significantly improved. The decision to omit certain techniques was made to prioritize specific enhancements tailored to the image's characteristics and desired outcomes.