Filtering in Frequency Domain with Spatial Enhancement

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1. Introduction

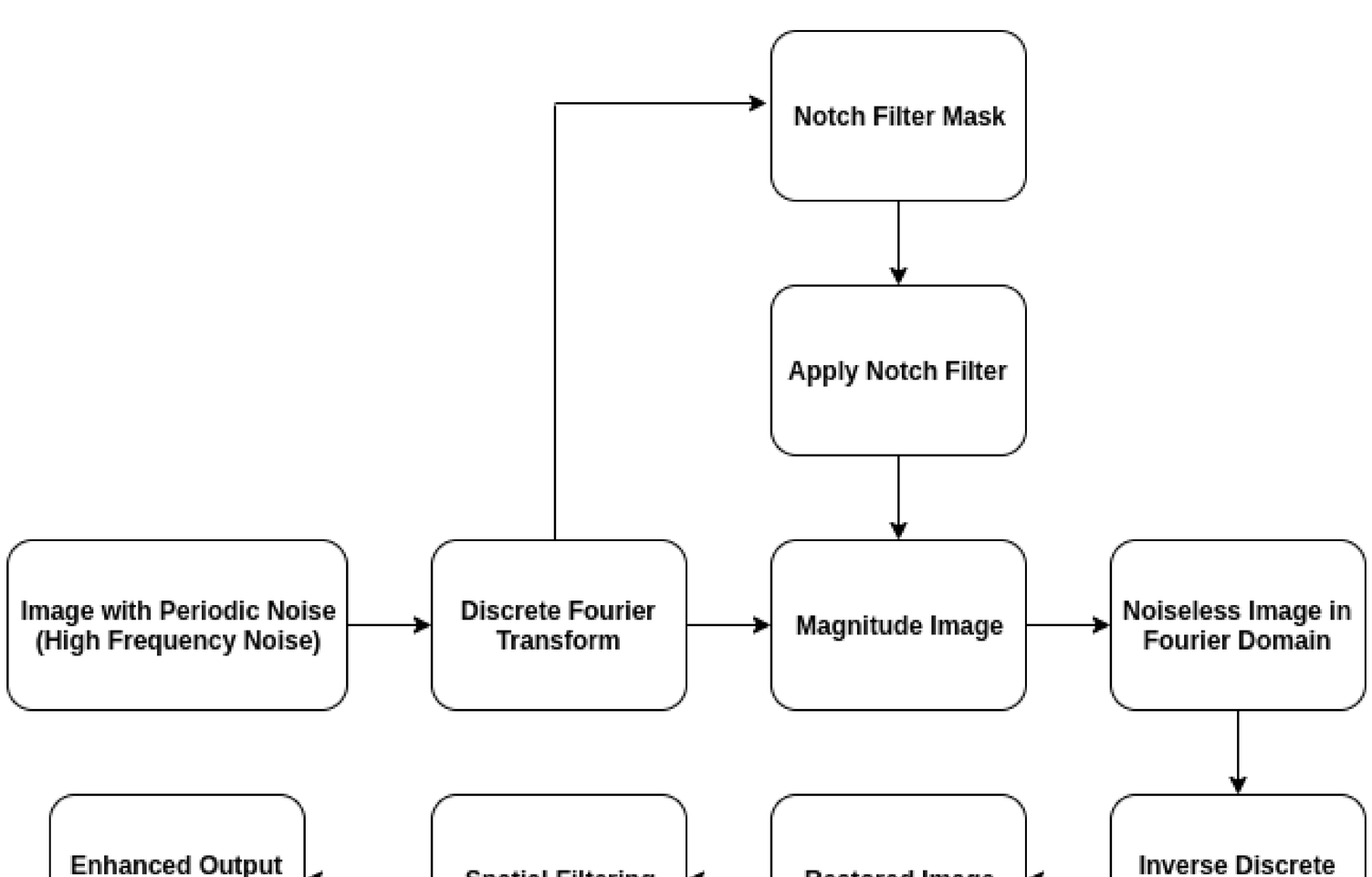
In Image Analysis, Fourier Transform plays a vital role extending its applications to Image Filtering, Restoration and Compression [1]. The goal of the project is to implement an algorithm to remove periodic high frequency noise from an Image without loosing useful information. This can be achieved by implementing an Algorithm combining both spatial and frequency domain filtering techniques.

2. Implementation

Notch Filtering: is a Technique to remove high frequency peaks from the Image in a Fourier Domain. One thing to be considered during Notch filtering is to design a mask that ignores the central peak of a shifted Fourier Transform Image because the central peak has useful Information about the Image.

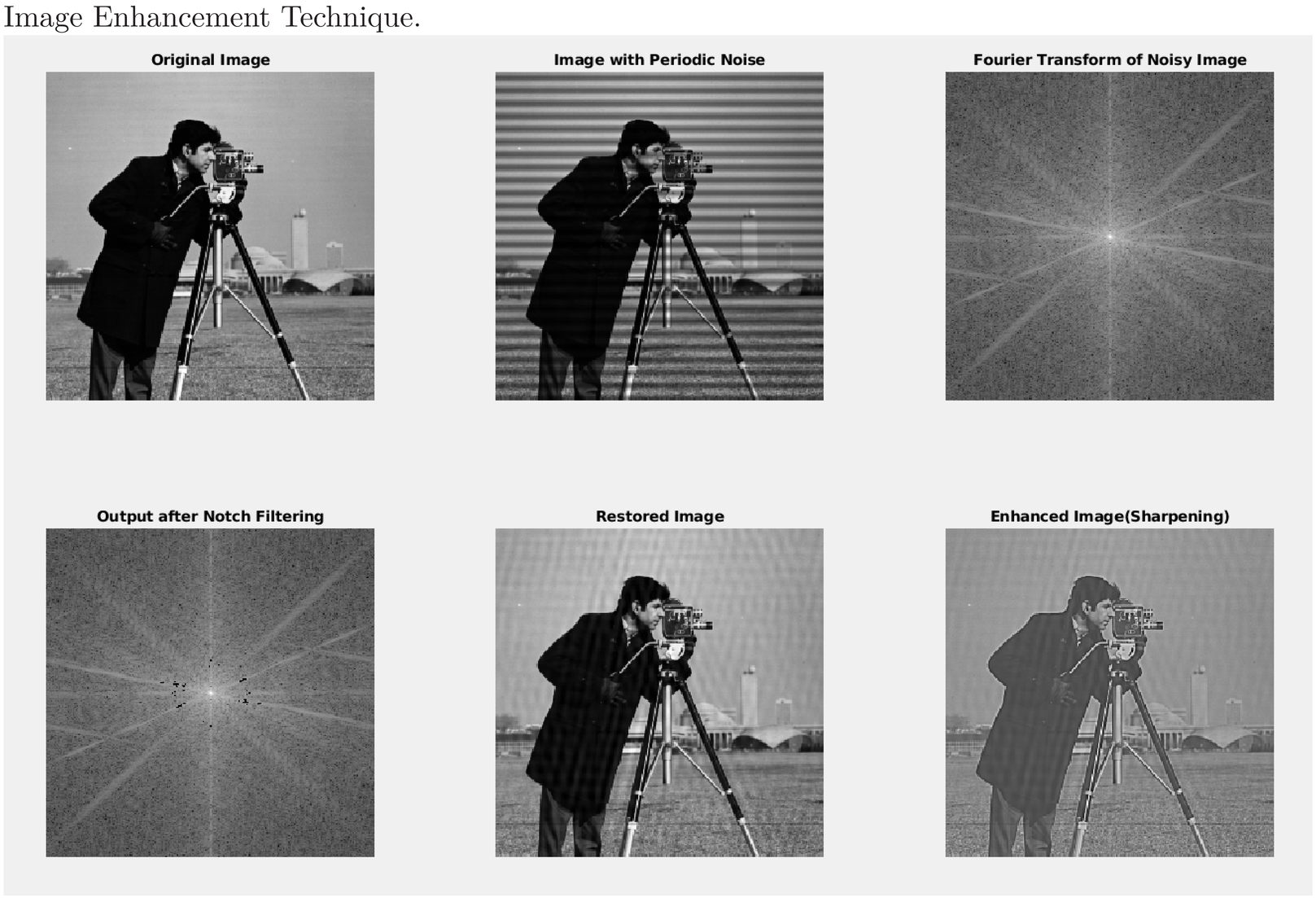
Image Enhancement: While removing High frequency noises from the Fourier Image, the Notch Filter may also remove some essential information which can be regained by using some Spatial Enhancement techniques.

3. Process Flow

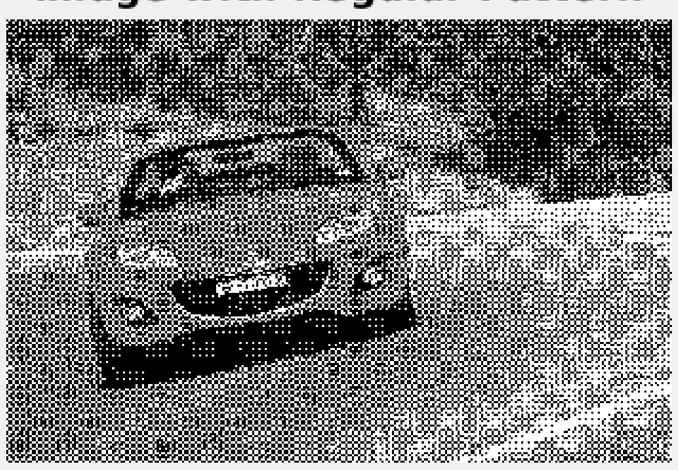


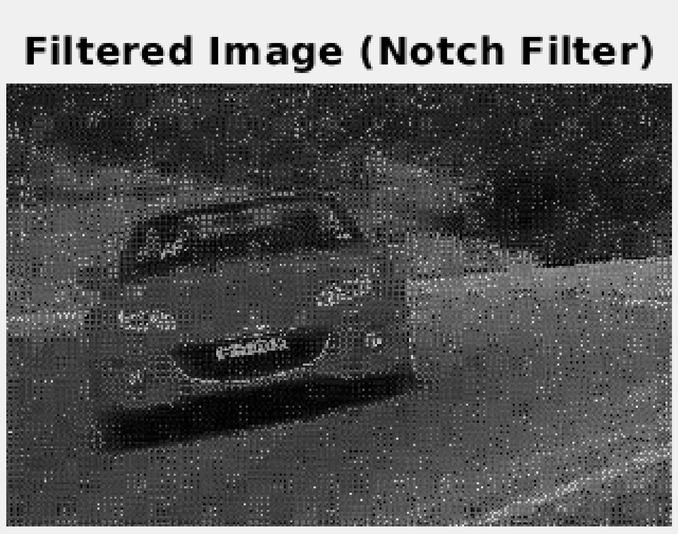
4a. Results

The following figure shows the Results obtained by the proposed Algorithm using Sharpening as Image Enhancement Technique.



4b. Results





6. Conclusions

The proposed technique binds together the advantages of both Frequency Domain Filtering as well as Image Enhancement in Spatial Domain. However, Selecting the appropriate Notch Filter design and Spatial Enhancement Technique influences the Output to a greater extent.

7. References

[1] R.C. Gonzalez. *Digital Image Processing*. Pearson Education, 2009.