CS446 Applied Digital Image Processing
Assignment 3

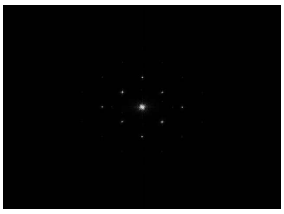
CS Program
Habib University

Fall 2023
Due Date: 8 November 2023 @ 11:59PM

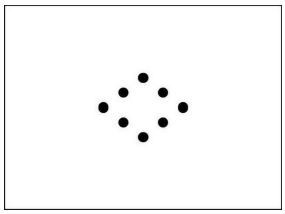
1 Introduction

In this assignment, you are required to implement a notch reject filter to remove periodic noise from the given images. The details are shared in our course textbook in section 4.10 selective filtering sub-section notch filters on pages 296-303. The basic idea is simple, you get the frequecy spectrum of the input image, observe the notches in the frequency spectrum, design an appropriate notch reject filter and apply it on the frequency spectrum. Then go back to the spatial domain to display the filtered image. Use a notch reject filter with an appropriate radius to completely enclose the noise spikes in the Fourier domain. The number of notch filters is arbitrary and their shape can be arbitrary (e.g. rectangular or circular). Figure 1 shows an example workflow. Figure 1(a) shows the input image containing noise. The frequency spectrum is given in Figure 1(b). The designed notch reject filter is given in Figure 1(c) and the final filtered image is shown in Figure 1(d).

(a) Noisy input image.



(b) Frequency spectrum of the input image.



(c) Notch filter.

(d) Filtered image.

Figure 1: An example workflow.

2 Sample Inputs and Outputs

Some other images that can be used for testing are shown in Figure 2. These will be provided to you as an additional download on the LMS submission module. The filtered figures are shown in Figure 3.

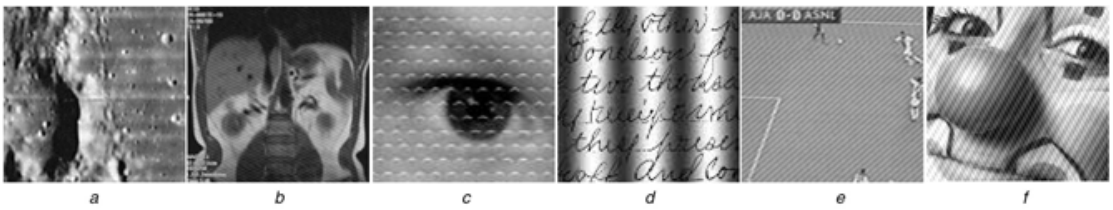


Figure 2: Sample noisy images.

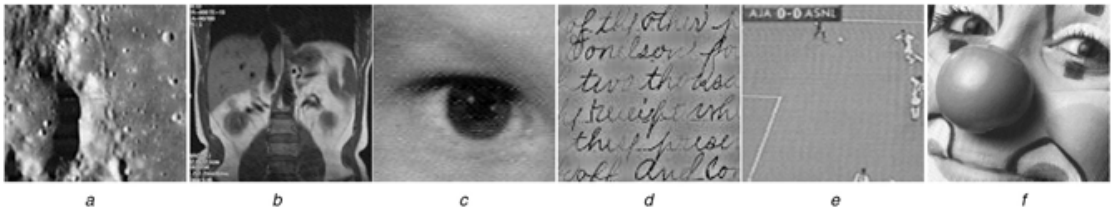


Figure 3: Sample images after filtering.

3 Deliverables

Provide a Matlab script (.m) file or a Python script (.py) or a C/C++ source file (.c) containing your code. Rename the file to you Habib ID and upload to the Canvas submission module.

4 Marks Distribution

The assignment carries 100 marks. The details of breakage is as follows:

1. Notch reject filter implemented correctly. (+30)
2. Viva questions were satisfactorily answered. (+30)
3. Code compiles and gives all correct outputs. (+20)
4. Code uses meaningful variable names, follows proper formatting and indentation, has sufficient code comments. (+20)

5 Using chatGPT or other AI software

You are not allowed to use any AI software to obtain the code for this assignment. Appropriate tool will be used to evaluate your submission for AI tool usage. If you are found using such a tool, you will be given a straight 0 and the Academic Conduct will be filed against you for academic dishonesty.

6 Plagiarism Policy

We have zero tolerance for plagiarism. Every submission will be screened using a plagiarism detection software. If there is any evidence of plagiarsim, the case will be reported to the Office of Academic Conduct and all offenders will get a 0. This is applicable even for cases when the code is copied or a significant amount has been obtained from an online repository on open source platforms like bitbucket or github without proper attribution. In case you are taking any material from online sources, we expect that a proper credit/reference is given to the source.

7 Late Submission Policy

Late submission policy as per syllabus will be applied. That is a submission post deadline will have a 20% reduction in grade. An additional 10% reduction will be made per additional day requested beyond the deadline. This means that a late submission after a week will results in a score of 0.