



CNG 466 – FUNDAMENTAL IMAGE PROCESSING TECHNIQUES

Assignment 2

Image Restoration and Reconstruction (Lectures 1-6)

Objectives: The purpose of this assignment is to familiarize yourselves with the image restoration techniques (including spatial and frequency domain). Due to hardware malfunction or other problems during image acquisition, there may be some additive or periodic noise patterns in the images. These can be identified and eliminated in the spatial/frequency domain. For this assignment, you are given images with the noise of different types and characteristics. Your job is to investigate the given images in spatial and frequency domains, identify the abnormalities, and design filters to eliminate them.

Description: You are required to identify the type of noise in the images noisy1.png, noisy2.png, and noisy3.tif, shown in Fig.1 by investigating their spatial and/or frequency domain representations. Your job is to remove the noise present in the images while preserving informative structures like edges and boundaries as much as possible.

Note that full recovery is not possible in some cases due to the information loss. Implement your solution as a MATLAB script named A2_StudentID.m which processes the noisy images. After running the script, an image named recovered1.png, recovered2.png, and recovered3.png should be created as the reconstruction.

Grading: for each noisy image is as follows;

- (7 pts) Investigating spatial and/or frequency domain representations of images using figures, histograms, plots, etc. (For additive noise, you should do analysis as in in-class exercises of Lecture 6 - Exercise 3)
- (5 pts) Identifying the noise type (additive/periodic) and noise based on the above investigation.
- (15 pts) Remove the identified noise present in the images.
- (2 pts) Differences (subtraction) between edges of noisy and reconstructed images (subtraction).
- (2 pts) Explanation of code step by step and reasons for used techniques.
- (2 pts) Creating/Writing recovered images.

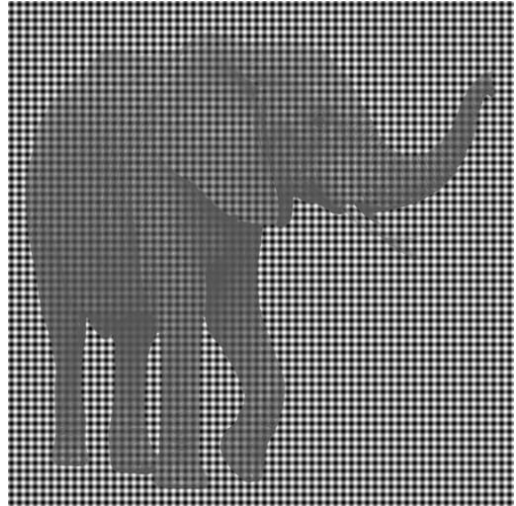
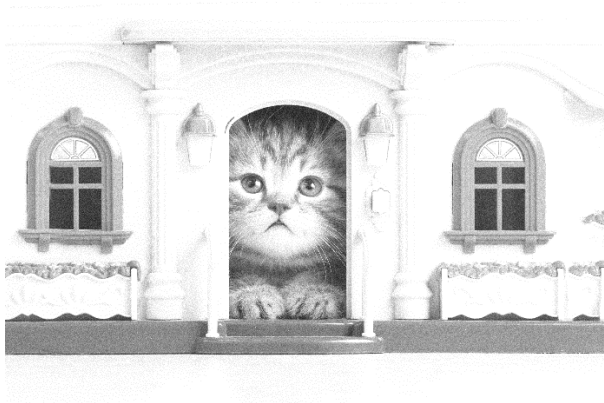


Fig.1: Images Noisy1, Noisy2 and Noisy3

Regulations:

- 1) **Programming Language:** You must code your program in MATLAB. You are expected to make sure your code runs successfully. If your code is not implemented in MATLAB and/or doesn't compile, your grade will be zero.
- 2) **Implementation:** In your solutions, you are NOT allowed to use any function from the "Image Processing Toolbox" of MATLAB other than `imread`, `imwrite`, `imshow`, `imhist`, `histeq`, `imtool`, `im2gray`, `rgb2gray`, `uint8`.

If you are not sure which functions belong to the image processing toolbox, check from the following link, or please ask me:

https://www.mathworks.com/help/images/referencelist.html?type=function&s_tid=CRUX_topnav

Some other functions that you cannot use are; conv, and conv2 (any function related to convolution).

If your code includes any of the “not allowed functions”, your grade from that part will be zero.

You must use the same input and output format which is given to you (+1 pts in total), including file names. Otherwise, there will be a mark deduction (-2 pts in total).

- 3) Submission:** Submit one .m file (divide it into 3 sections, one section for each image).
- 4) Deadline:** 24/11/2021 @23:00 Cyprus Time
- 5) Late Submission:** Late submission is not allowed; your grade will be zero.
- 6) Cheating:** Please read carefully the cheating policy from the course syllabus for more details. (Taking a code or a part of a code from any online resource is a cheating case and your grade will be zero.)