IMAGE PROCESSING FUNDAMENTALS PROJECT

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Abstract

This readme file includes information about image processing fundamentals project. This project made with 'Matlab' program. You can find some informations about project details and can see how to run these ".m" files.

This project helps you to see the detail of Image Transformation techniques, Histogram Enhancement, Image Noise and Image Restoration(filters).

1   Requirements

Matlab Version: This project made with "MATLAB$_R$2016b" version. 2016 version utilizes a new syntax of Matlab called "Implicit Expansion", older versions might cause some errors.
Operating System: Developed on Mac OS High Sierra. It is
proper for all OS.
Files:

- Part1.m

- Part2.m

- Part3.m

- averageFilter.m

2   Installation and Running Files

1. Download the package to your local path (e.g. Matlab/)

   by running: git clone https://github.com/ayberksunal/matlabProject.git.

2. Matlab will see the project automaticaly if file location is right.

3. Run Matlab and navigate to Matlab/, then run the each script one by one.

   (part1.m, part2.m, part3.m, averageFilter.m). Only clicking run is enough to see the results. Each part was setted to show with examples.

3 Overview

3.1 Part1

The part1.m file contains image transformation works. In project file there are three different transformed image.We recover these images and obtain a result image as close as to the original image. This is the compared result of the images;
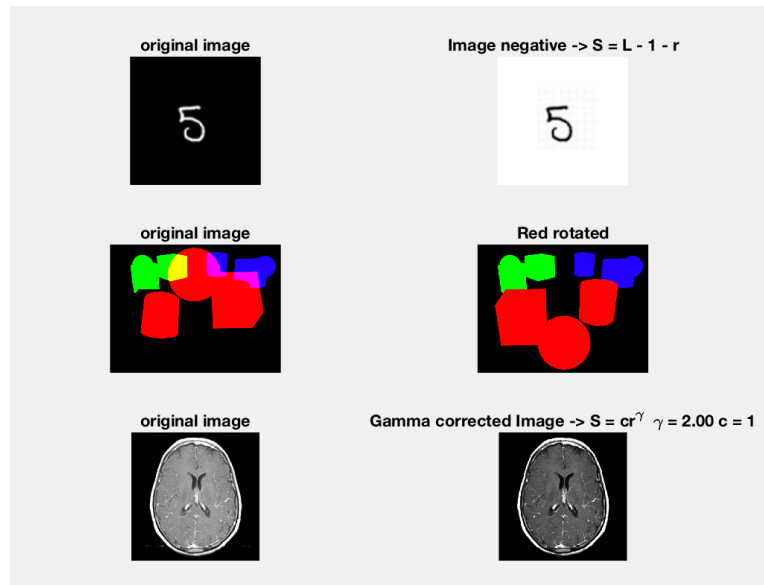
For the fist image, I used S=L-1-r formula to change the gray level values with there opposites. Second RGB images even if we could not see when we look the image, has three dimensional matrix for Red Green and Blue parts. I only rotate the red part and combine it with GB(green and blue) parts.
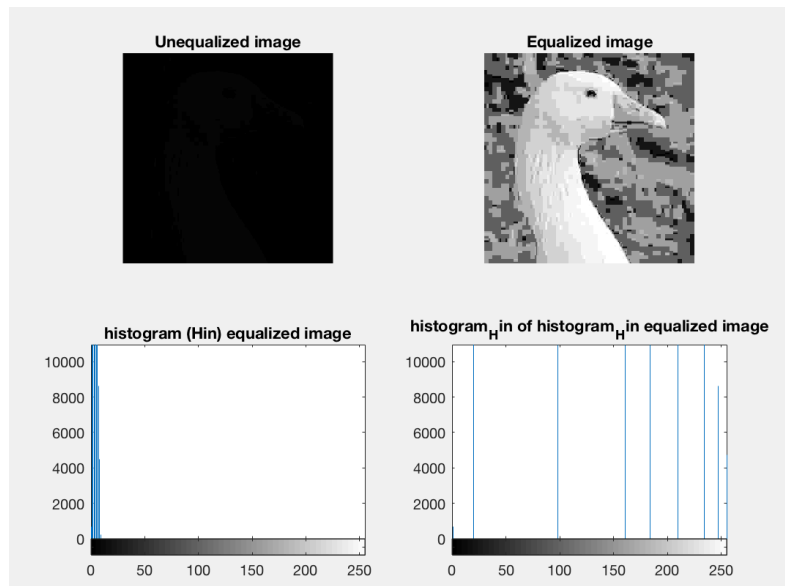Third image is recovered with gamma method the achieve a darker image.

3.2 Part2

Part2 is about histogram enhancement. At the beginning, we have a really dark image and we make the content visible by enhancing the histogram of the image.

We make visible this black photo without using histeq() method and plot the gray levels to see the distribution.

This is the result of the enhancement.

3.3 Part3

This part is related with Image Noise and Image Restoration. We have a cameraman image and add different noise types on it. After noising, we calculate signal to noise ratio (SNR). You can change the noise rate of the methods with making different the values in the method.
Noise Types are,

1. Salt and Pepper noise

2. The Uniform noise, [-47, 47]

3. Gaussian noise, sigma= 27
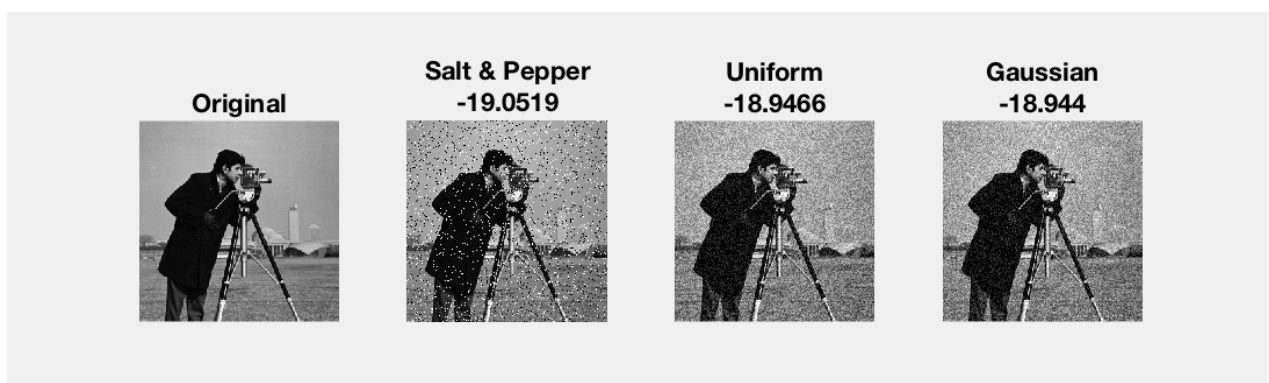
3.4   AverageFilter

This script has a generic function myfilter(image,filter). This function slides the given 3x3 filter on image. It calculates new value of each pixel with respect to its neighbor pixels. Remember to take care of border pixels. It calls myfilter() with averaging filter on noisy image and compares the result with medfilt2() matlab method.

Myfilter funtion have two input variable which are image and filter. I prefered to use 3X3 filter but you can change the size of it. This function is generic so it is proper for every image and filter.
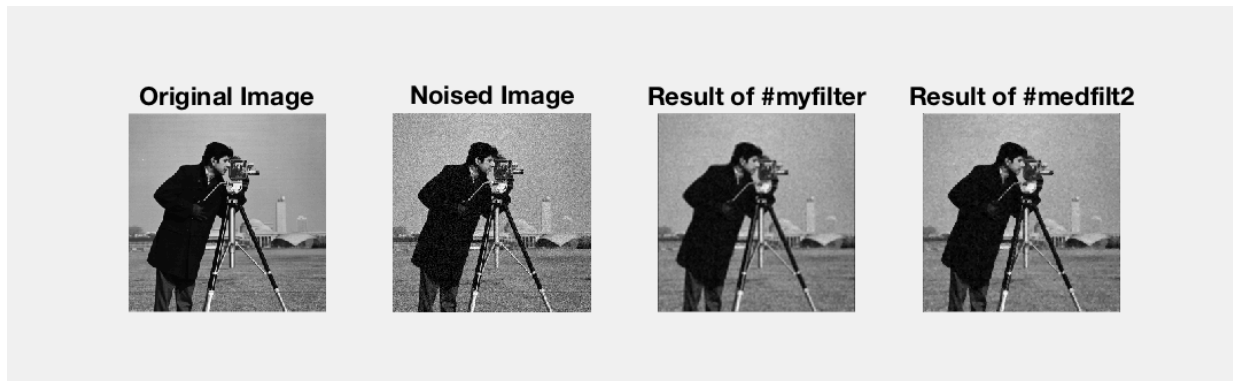
Resources Questions in this project are adapted from open source course materials of CENG 466 Fundamentals of Image Processing, Middle East Technical University.