

# DIP Assignment 2

CS20B1012  
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## Objective:

To get quality images from noisy images  $f_i$  where  $1 \leq i \leq n$ .

## Problem statement:

Let  $f$  be an image (Lena).  $0 \leq x \leq 255$  and  $0 \leq y \leq 255$ .

Generate

$f_i(x, y) = f(x, y) + \eta_i(x, y)$  where  $\eta_i(x, y)$  is the Gaussian noise with mean = 0 and variance = 1

Find  $1/n \sum f_i(x, y)$  ( $i=1$  to  $n$ ), say it as  $g$ .

1. Display  $f$ ,  $g$  and  $f_1, f_2, \dots, f_n$ .
2. Do it for  $n=5, n=10, n=20$  and  $n=30$

## Code :

```
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#Importing modules
import numpy as np
import matplotlib.pyplot as plt
import cv2

# Loading the original image
f = plt.imread('lena.png')

# Input array
k=[5,10,20,30]

for n in k :
    # Creating an empty array to store the noisy images
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    fi = np.empty((n, f.shape[0], f.shape[1], f.shape[2]),
dtype=np.float32)

# Generating the noisy images
for i in range(n):
    # Adding Gaussian noise with mean = 0 and variance = 1
    noise = np.random.normal(0, 1, f.shape)
    fi[i, :, :, :] = f + noise

# Finding the average image (g)
g = np.mean(fi, axis=0)

# Displaying the original image, average image, and noisy images
if n==5 :
    plt.figure(figsize=(10, 10))
    plt.subplot(3, 3, 1)
    plt.imshow(f)
    plt.title('Original Image')

    plt.subplot(3, 3, 2)
    plt.imshow(g)
    plt.title('Average Image')

    for i in range(n):
        plt.subplot(3, 3, i+3)
        plt.imshow(fi[i, :, :, :])
        plt.title(f'Noisy Image {i+1}')

elif n==10 :
    plt.figure(figsize=(10, 10))
    plt.subplot(3, 5, 1)
    plt.imshow(f, cmap='gray')
    plt.title('Original Image')

    plt.subplot(3, 5, 2)
    plt.imshow(g, cmap='gray')
    plt.title('Average Image')

    for i in range(n):
        plt.subplot(3, 5, i+3)

```

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        plt.imshow(fi[i, :, :], cmap='gray')
        plt.title(f'Noisy Image {i+1}')

elif n==20 :

    plt.figure(figsize=(10, 10))
    plt.subplot(4, 6, 1)
    plt.imshow(f, cmap='gray')
    plt.title('Original Image')

    plt.subplot(4, 6, 2)
    plt.imshow(g, cmap='gray')
    plt.title('Average Image')

    for i in range(n):
        plt.subplot(4, 6, i+3)
        plt.imshow(fi[i, :, :], cmap='gray')
        plt.title(f'Noisy Image {i+1}')

elif n==30 :

    plt.figure(figsize=(10, 10))
    plt.subplot(4, 8, 1)
    plt.imshow(f, cmap='gray')
    plt.title('Original Image')

    plt.subplot(4, 8, 2)
    plt.imshow(g, cmap='gray')
    plt.title('Average Image')

    for i in range(n):
        plt.subplot(4, 8, i+3)
        plt.imshow(fi[i, :, :], cmap='gray')
        plt.title(f'Noisy Image {i+1}')

else :
    print("Invalid number")

plt.show()
```

## Outputs :



