COL783

Assignment 0

Algorithmic Details

We have first loaded the given image using cv2.imread() function. This create a numpy array of the image. We observe that the shape of the array is (106,106). By observation we can understand that the image is divided into two parts- background and foreground(brighter). Next we try to find the exact boundaries of the foreground and background using inequalities such that background pixels and foreground pixels have an intensity difference of at least 50. So we keep iterating from one end to another of the 2d array and find the boundary where this difference first occurs. Using such process across width and length of the image we find that foreground ranges from [33,71] and [34,71] along row and column axis respectively. Next we find the average intensity across and background and foreground to recreate the image for contrast changing experiment.

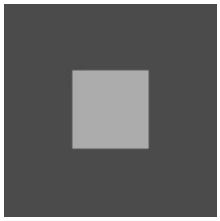
Average Foreground intensity = 172

Average Background Intensity = 75

PART 1 - Contrast Modification

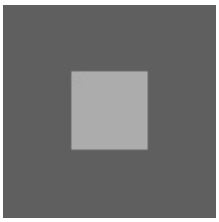
In this part, first we created an image with foreground intensity of 172, and background intensity 75. Then we increased the background intensity in gaps of 10. We can clearly see that how the contrast changes as we change the background intensity. The contrast change was slow initially but as we got close to the foreground intensity, the change in contrast was clear.

1) I=75

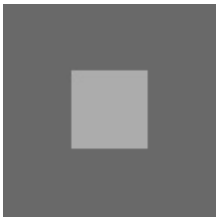


2) I=85

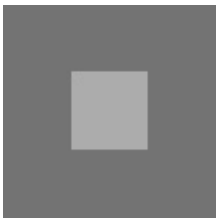
3) I=95



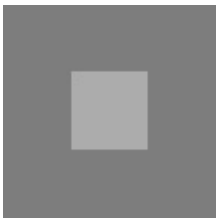
4) I=105



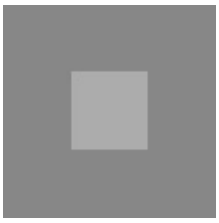
5) I=115



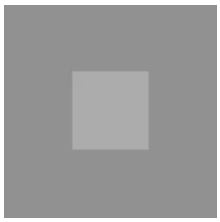
6) I=125



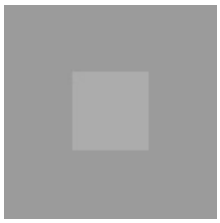
7) I=135



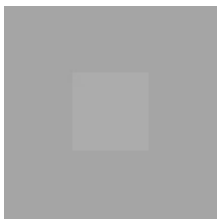
8) I=145



9) I=155

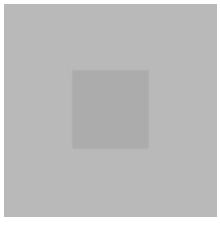


10) I=165

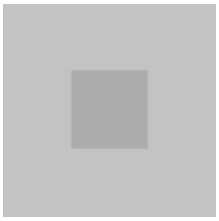


11) I=175

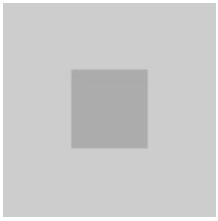
12) I=185



13) I=195



14) I=205



PART 2 – Finding Weber Ratio

Weber ratio is defined as the ratio of increment of foreground intensity (relative to background intensity) to the background intensity of the image. We find this ratio for different background intensities such that the contrast between fore ground and background is unnoticeable. Let the background intensity be I and foreground intensity be I+ΔI, then weber ratio is ΔI/I.

Hence, we find the weber ratio for different background intensities. We vary the background intensity from 10 to 250 in gaps of 10 and find the weber ratio for each intensity by modifying ΔI for a constant value of I. The weber ratio and images for different intensities are presented below. It's value close to 0.02 in most cases except in extreme cases of very high or low intensity.

1) I=10, ΔI=1 ➔Weber Ratio=0.1

2) I=20, ΔI=1 ➔Weber Ratio=0.05

3) I=30, ΔI=1 ➔Weber Ratio=0.033

4) I=40, ΔI=1 ➔Weber Ratio=0.025

5) I=50, ΔI=1 ➔Weber Ratio=0.02

6) I=60, ΔI=2 ➔Weber Ratio=0.033

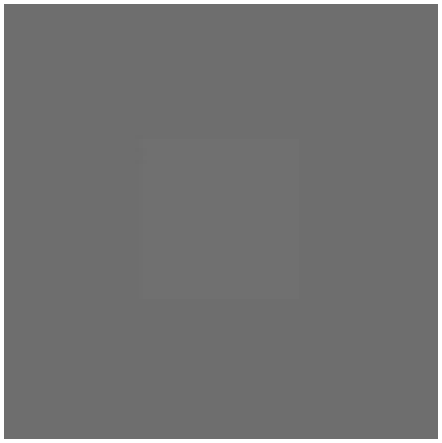
7) I=70, ΔI=2 ➔Weber Ratio=0.028

8) I=80, ΔI=2 ➔Weber Ratio=0.025

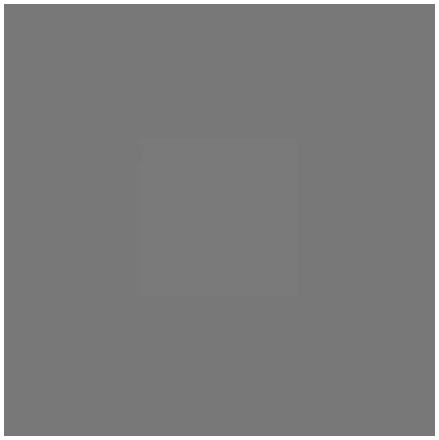
9) I=90, ΔI=2 ➔Weber Ratio=0.22

10) I=100, ΔI=2 ➔Weber Ratio=0.02

11) I=110, ΔI=2 ➔Weber Ratio=0.018



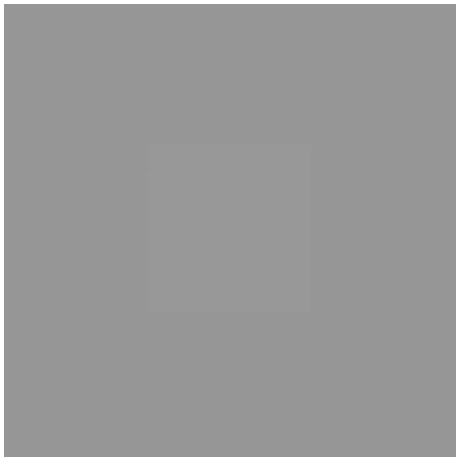
12) I=120, ΔI=2 ➔Weber Ratio=0.0166



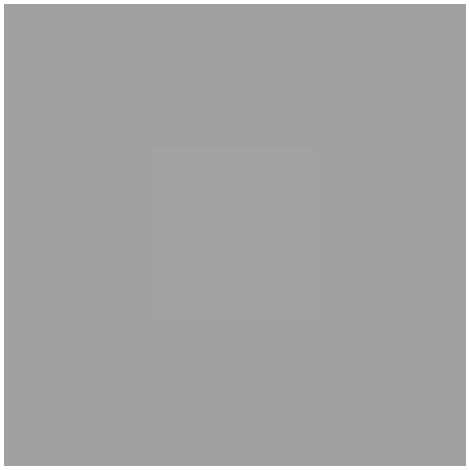
13) I=130, ΔI=3 ➔Weber Ratio=0.023

14) I=140, ΔI=2 ➔Weber Ratio=0.0142

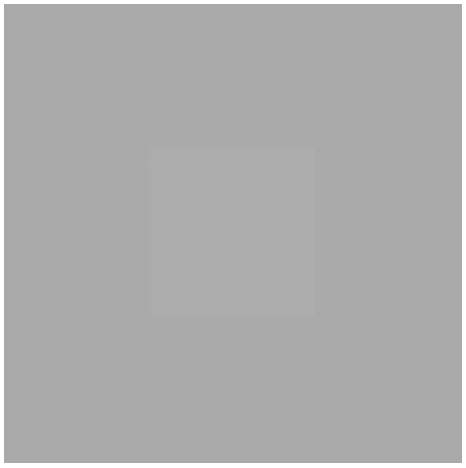
15) I=150, ΔI=2 ➔Weber Ratio=0.0133



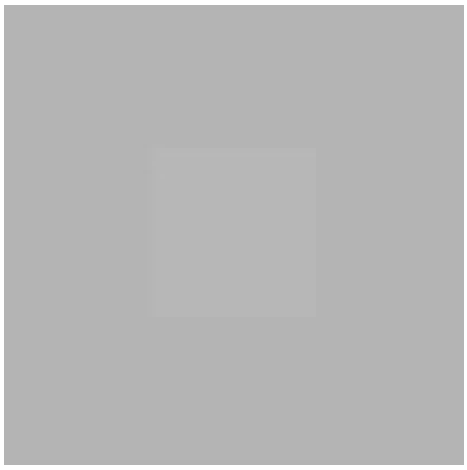
16) I=160, ΔI=2 ➔Weber Ratio=0.0125



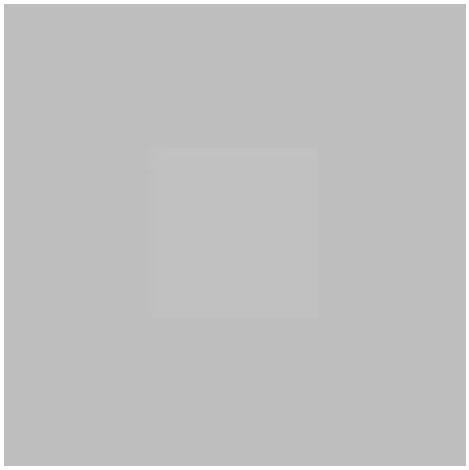
17) I=170, ΔI=3 ➔Weber Ratio=0.0176



18) I=180, ΔI=3 ➔Weber Ratio=0.0166



19) I=190, ΔI=3 ➔Weber Ratio=0.0157



20) I=200, ΔI=3 ➔Weber Ratio=0.015

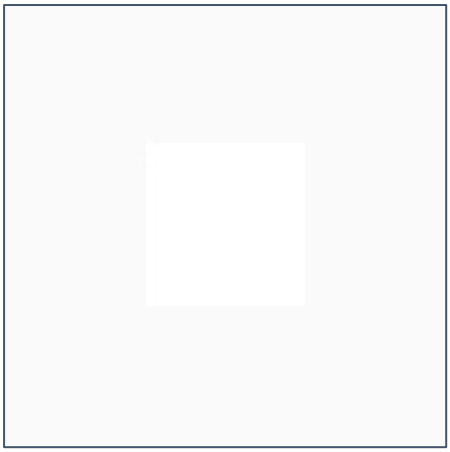
21) I=210, ΔI=4 ➔Weber Ratio=0.019

22) I=220, ΔI=4 ➔Weber Ratio=0.018

23) I=230, ΔI=3 ➔Weber Ratio=0.017

24) I=240, ΔI=3 ➔Weber Ratio=0.0166

25) I=250, ΔI=6 ➔Weber Ratio=0.024



(Added border to the last image to make it visible)