Lab4 Task1.

Marek Antoszewski

note how stretching will influence the recognition of image whether it is low or high frequency image

When it comes to low frequency image,the difference is not big, however recognizable, whenever we look at lower frequency parts of that image, we can see rings of different gray intensities, in my opinion, stretching kind of “smooths” these changes, especially in that example. When it comes to high frequency image, I barely see any difference, maybe because I’ve chosen 64 intensity levels for that report, I realized, that the less of intensities we have, the differences start to be more and more recognizable.

low frequency
original

stretched 64 and quantized

high frequency
original

stretched 64 and quantized

Task2.
describe your conclusions about images after histogram equalization.

In that case I’ve chosen 32 intensity levels, and the difference is recgonizable. We can see more levels, especially after image equalization which in my opinion, also highlights the changes. Once again the difference is more recognizable, on lower frequency image. As we all know, high frequency images have much more details, which prevents us from seeing really cosmetic changes. Only the difference in contrast is recognizable, since we equalize Image.

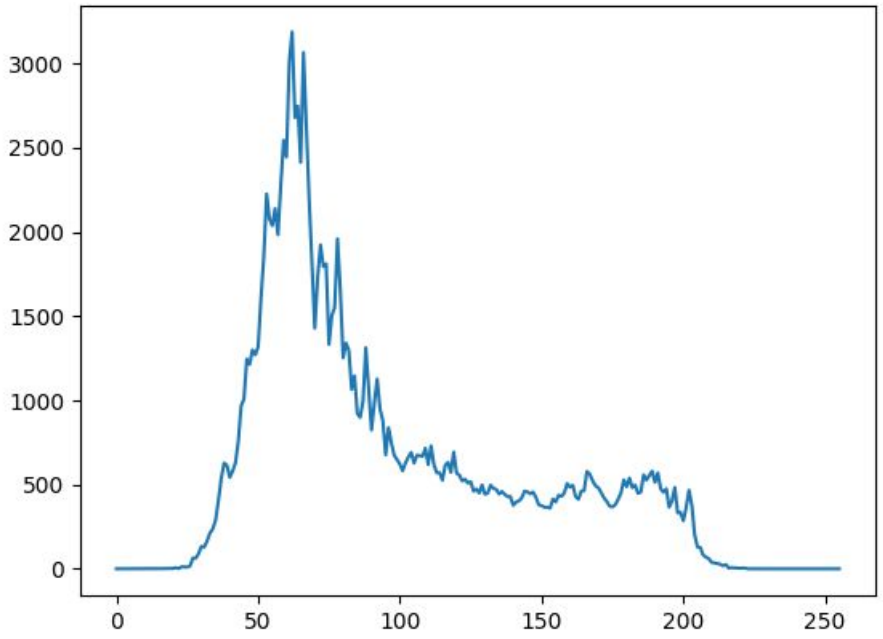
Low frequency image 32 levels of intensities
original

equalized

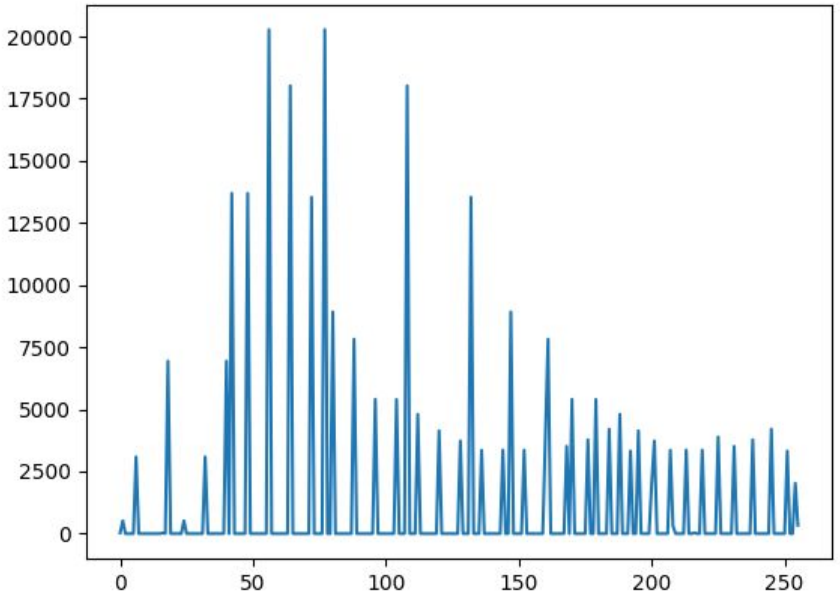
High frequency image 32 levels of intensities
original

equalized

Original histogram



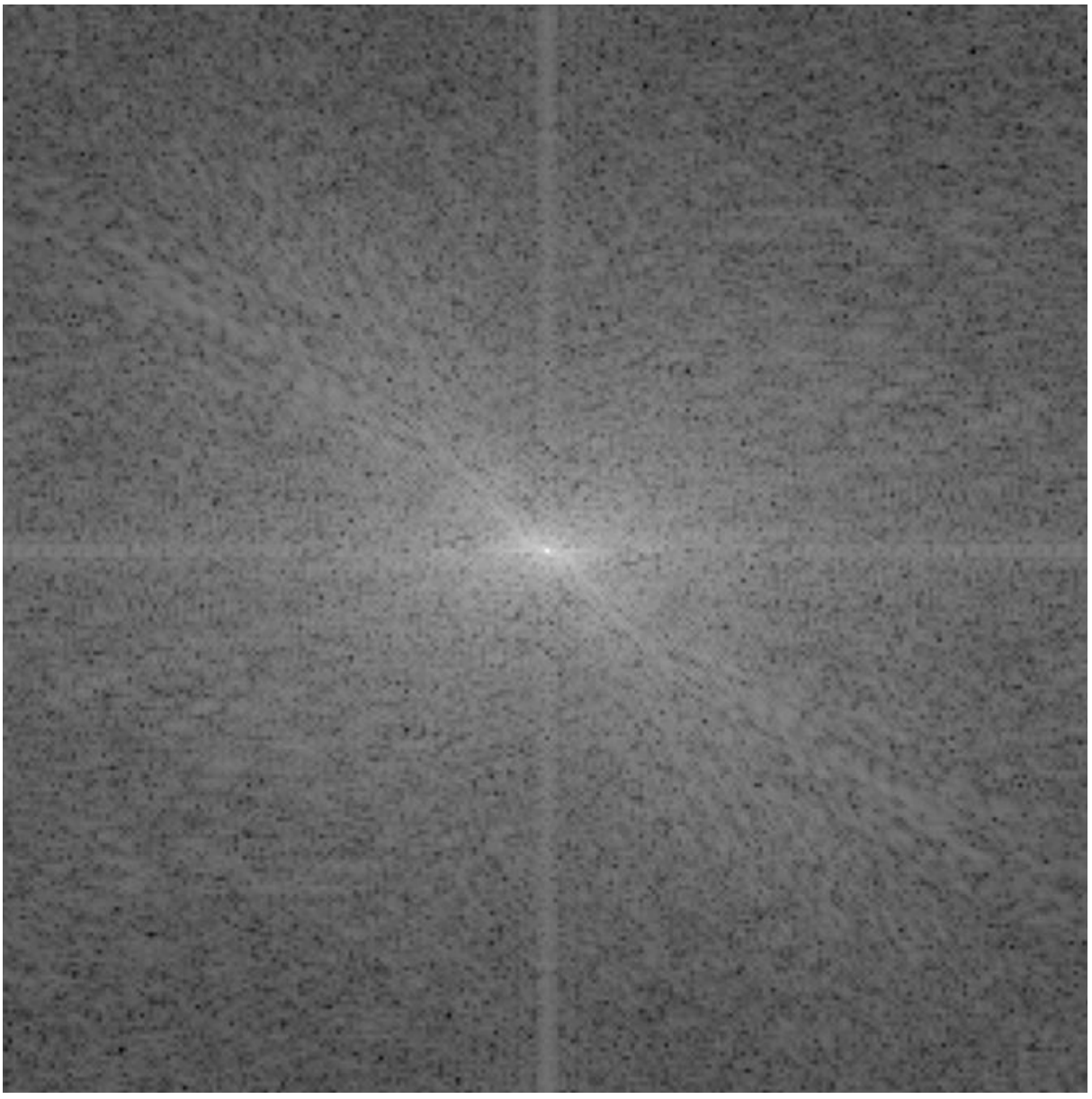
Equalized histogram for 32 intensity levels



Task3.
compare original Lena and Lena after Fourier Transformations. Note differences if any.

After inverse Discrete Fourier Transform, The image has become much more fuzzy and blurred.
Original Lena

magnitude spectrum (DFT)



Lena after new years eve (Inverse DFT)

n my opinion when we interpolate images, results are the better, the lower the frequency of image is. In less detailed images, changes are smoother, so the results of different types of interpolation are also harder to recognize.

High frequency image

Generally in my opinion when it comes to this type of images, the best result give linear interpolation, it looks the closest to original one. It is a bit “blurry”, however for high frequency elements the result is the best.

original

linear

cubic

nearest neighbour

Low frequency image

In low frequency images it is really hard to recognize any difference, especially in “lowest” frequency parts. I can see the differences only in higher frequency parts, but not in lower frequency.

original

linear

cubic

nearest neighbour

Source code crucial parts

```
img = cv2.imread('landscape.jpg',0) # reading image
cv2.imshow('original',img)# showing original image

res = cv2.resize(img,None,fx=0.5, fy=0.5, interpolation = cv2.INTER_CUBIC)# decreasing the s

resH = cv2.resize(res,None,fx=2, fy=2, interpolation = cv2.INTER_CUBIC)#increasing the size
cv2.imshow('resized cubic big',resH)#displaying corresponding image with label

res_linear = cv2.resize(img,None,fx=0.5, fy=0.5, interpolation = cv2.INTER_LINEAR) #decreasi
# cv2.imshow('resized linear ',res_linear)

res_linearH = cv2.resize(res_linear,None,fx=2, fy=2, interpolation = cv2.INTER_LINEAR)#incre
cv2.imshow('resized linear big',res_linearH)

res_nearestH = cv2.resize(img,None,fx=0.5, fy=0.5, interpolation = cv2.INTER_NEAREST)#decrea
# cv2.imshow('resized nearest',res_nearestH)

res_nearestH = cv2.resize(res_nearestH,None,fx=2, fy=2, interpolation = cv2.INTER_NEAREST)#i
cv2.imshow('resized nearest big',res_nearestH)


cv2.waitKey(0)
```

This is how I generated results for both high, and low frequency images.

Lab3 Task2.

In the following examples, one can observe, how histogram, moves from left/right, to the middle, underexposed get exposed (in my opinion gain some sharpness, due too darker tones) and overexposed images.Overexposed images look better, for us (contrast is normalized).

low contrast image

Source

equalized

High contrast image

source

equalized

High frequency

source

equalized

Low frequency

source

equalized

When it comes to high frequency images after equalization, due to sharp edges of image, changes are really visible,however, when we equalize low frequency image, changes are still visible, however not that sharp, so also not that visible.