Université de Genève

Imagerie Numérique
13X004

TP 1: Titre

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Exercice 1

(a) 100x100= 10'000 pixels 256= 2^8 = 8 bits/pixel finaly= 80'000 bits or 10'000 bytes

(b) 100x100= 10'000 pixels 4= 2^2 = 2 bits/pixel finaly= 20'000 bits or 2'500 bytes

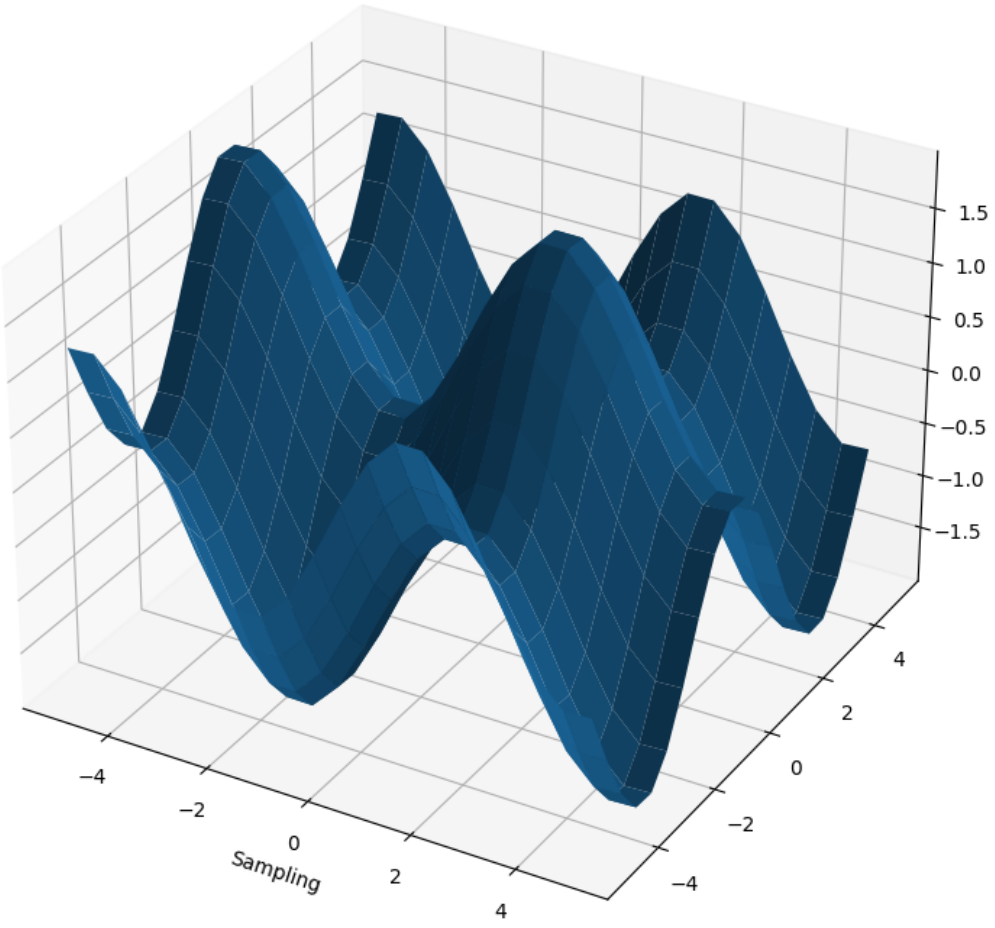
So a is four times bigger than b

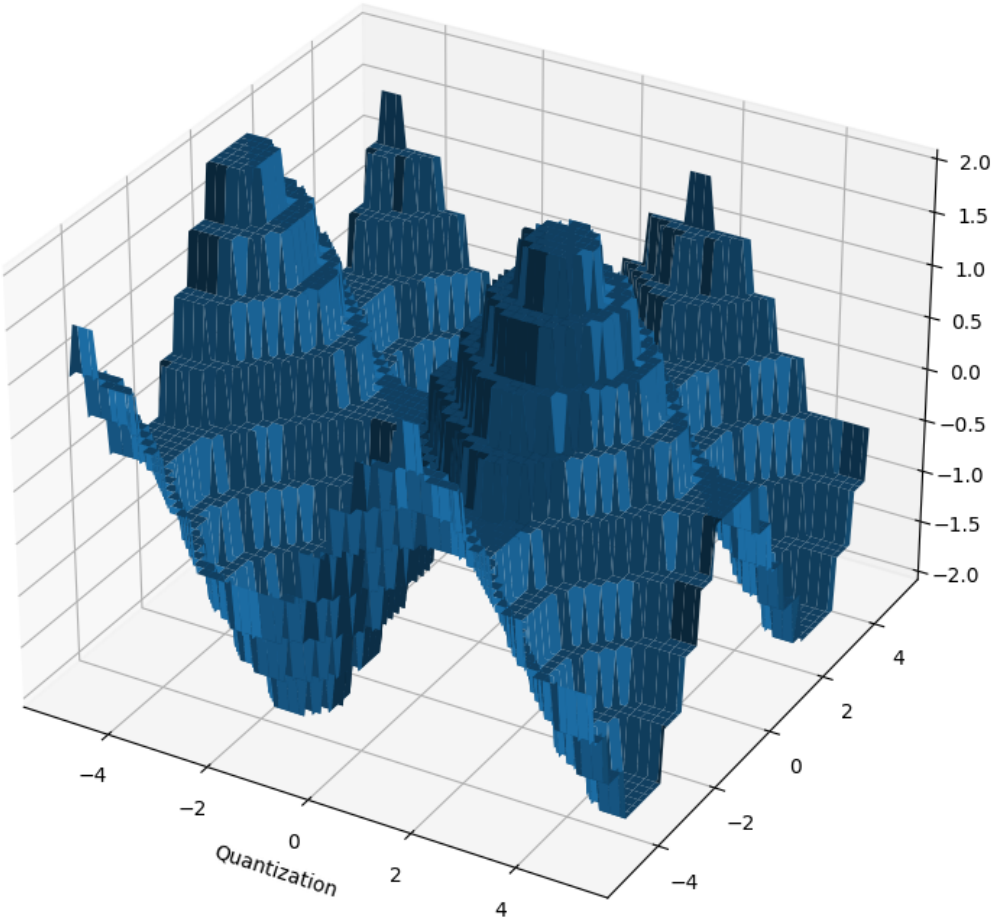
Exercice 2

Sampling and quantization are two methode of reducing the size of a (non)continuous function with a discret (co)domain. Sampling: Cut distance by a (ir)regular step (define a discret domain) Quantization: Cut by amplitude by (in)regular step (define a smaller codomain)

Exercice 3

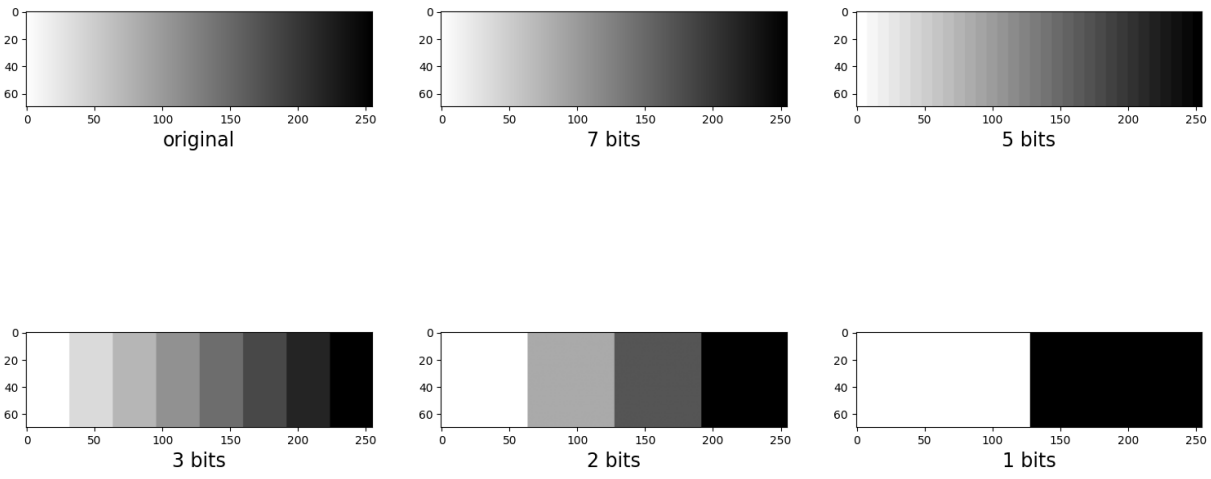
I have made a function that sample a given function (f(x,y)) with a given step. I have also made a function that make a quantization of a given function (f(x,y)) with a given step. The images are below.

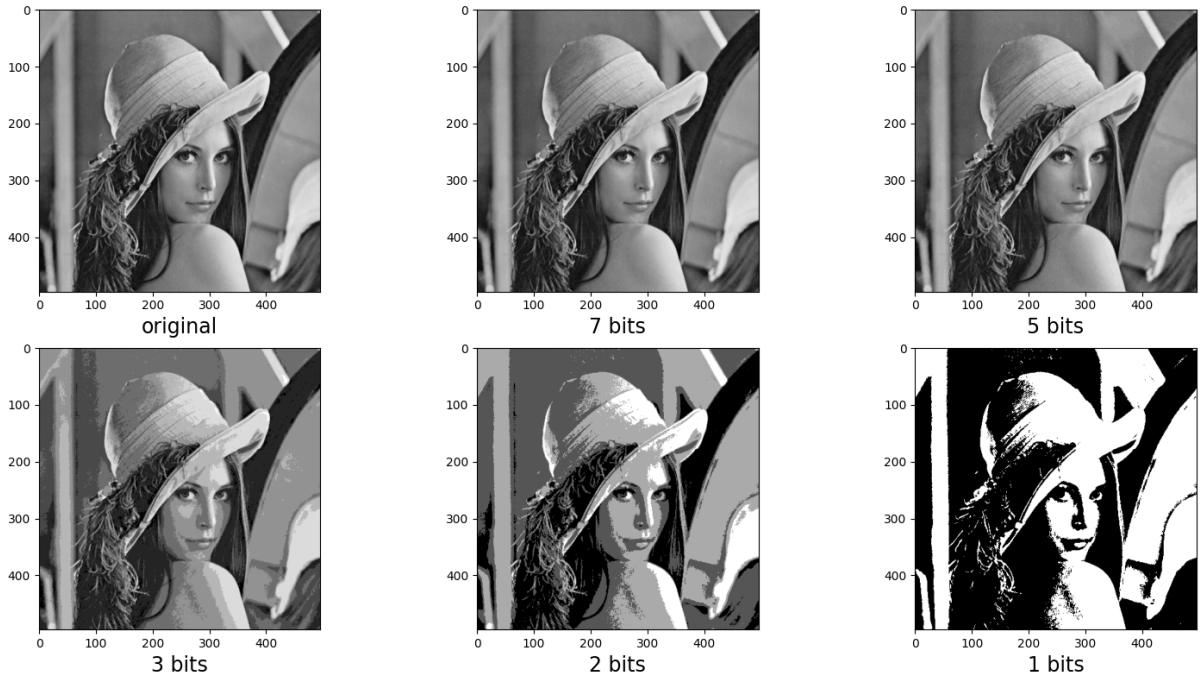




Exercice 4

I made a function that encode a given image with the amount of bit given in tne parameters. I ploted the encoding of 7, 5, 3, 2, 1 bit(s) for the grayscal gradient and lena.png (original + 5 images= 6 images)





Exercice 5

(a) I have made 10 copy of lena.png with a gaussian noise (zero-mean et sigma 25). I used for that the numpy.random.normal function (encapsulated in gaussian blur). I also made an array of them for further usage.

(b) For eache noisy image of lena.png, I made a PSNR with the original. Finally, I made the mean of all those PSNR and I found:

```
psnr mean:  11.497030549901748
```

(c) To do the frame averageing, I simply made a sum of all the noisy image (pixel per pixel) and I divided the result by 10.

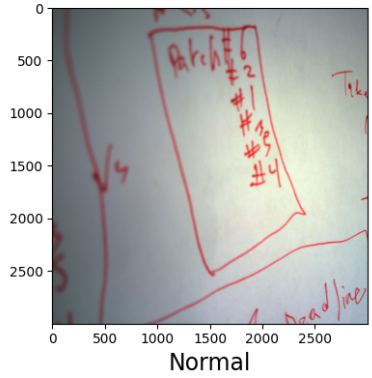
(d)

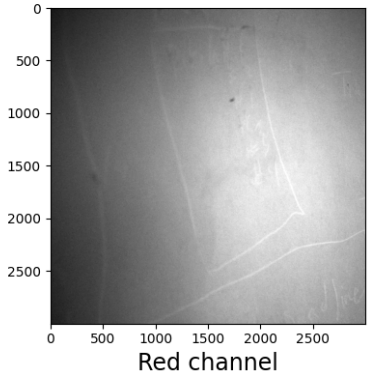
```
psnrAverage:  11.645832619939648
```

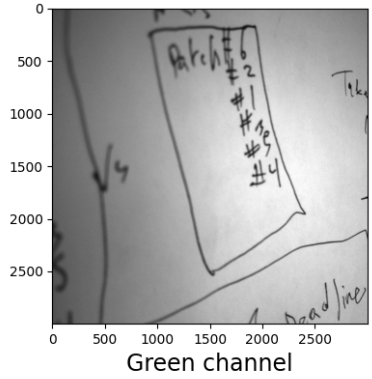
The frame averaging works when the noise is not so big.

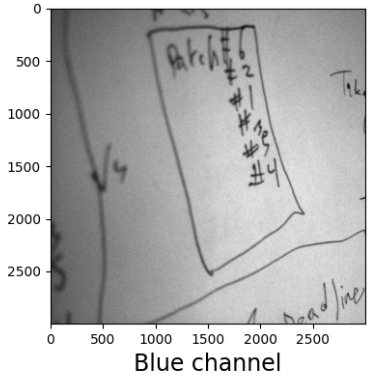
Exercice 6

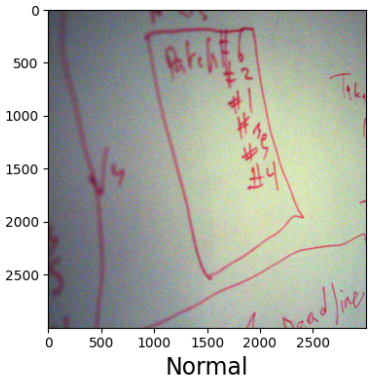
(a) I opended reference.bpm and noisy.bpm I ploted each image with his own (RGB) channels

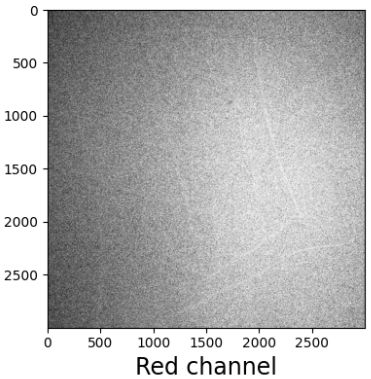


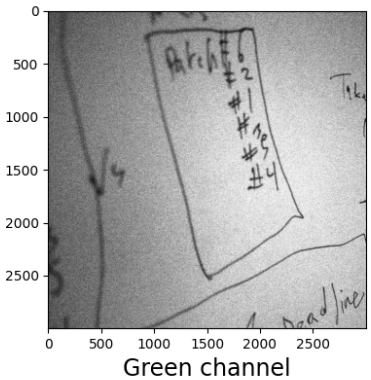


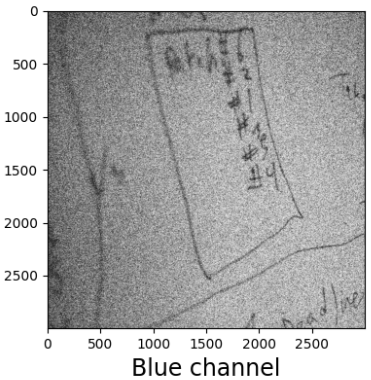










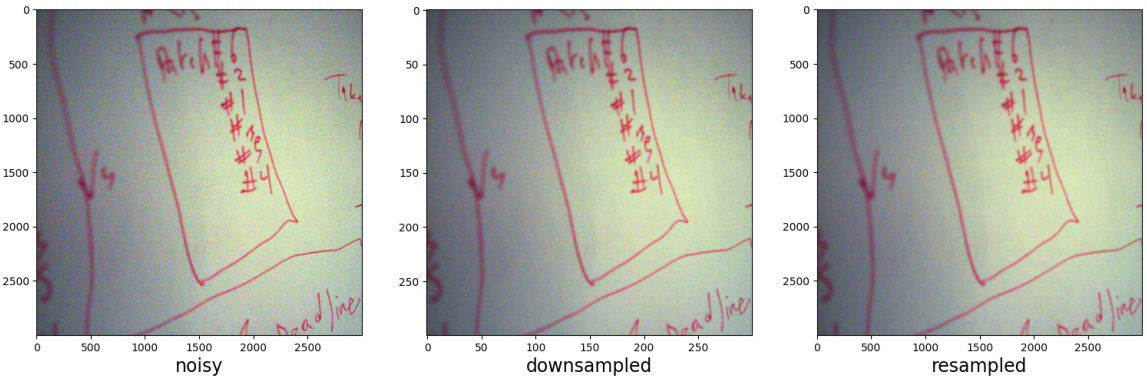


I made a PSNR with each chanel and see the total:

```
psnr red   channel:  13.278653649294078
psnr green channel:  15.935008236845567
```

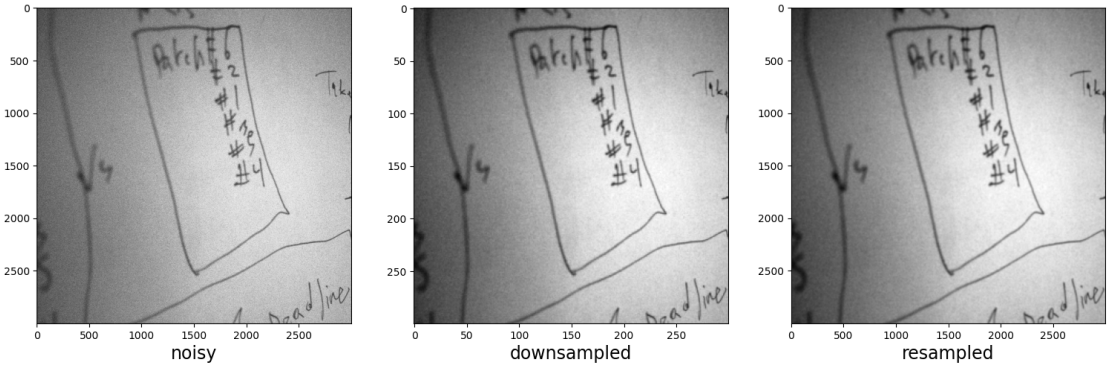
```
psnr blue  channel:  10.261868583985914
psnr total:          12.553158959644847
```

(b) I downsampled and resampled back to obtain thoses results (image and PSNR)



total color: 22.877167728588645

(c) I downsampled and resampled back to obtain thoses results (image and PSNR)



total gray: 29.228188485155208

(d) We can denoise images with the combination of mean and quantization.