CENTRO FEDERAL DE EDUCAÇÃO TECNOLÓGICA DE MINAS GERAIS

Problem Set 2 Report

Problem Set 2 from Computer Vision Course Proposed by professor Flávio Cardeal

Ramon Griffo Costa

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Introduction

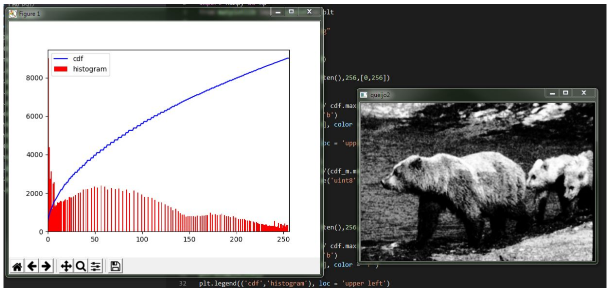
All the codes were implemented in Python 3.6 using the libraries opencv, numpy and matplotlib, the codes and images used are attached together with this report.

1)

- The code implemented loads an image and applies a blur followed by an histogram equalization, defined by the following formula:

$$g^{(r)}_{equal}(u) = \frac{G_{\max}}{Q}\sum_{w=0}^{u} h_I(w)^r \quad \text{with } Q = \sum_{w=0}^{G_{\max}} h_I(w)^r$$

- When the value of R is equal to 1 the cumulative distribution function tends to linear and the image becomes less noisy. (Image 3)
- When the value is greater than 1 the image becomes darker and the cumulative distribution function has a decreasing slope, and the image looks even less noisy. The values look more equalized. (Image 1)
- When the value is lesser than 1 the image looks brighter and the cumulative distribution function slope is increasing, and the image looks overexposed and not so clean. The values look less equalized. (Image 2)
- And for r=0 the image is all black, because the cumulative value has to be constant, so all pixels have to be black. (Image 4)



```
plt.legend(('cdf','histogram'), loc = 'upper left')
```

Image 1 - R>1

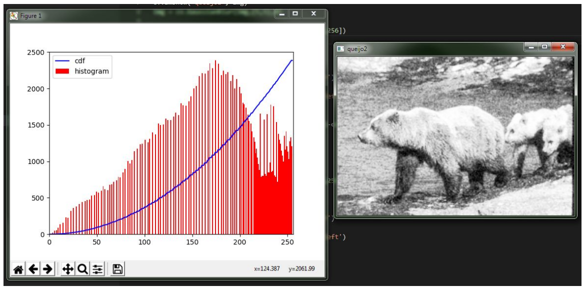


Image 2 - R<1

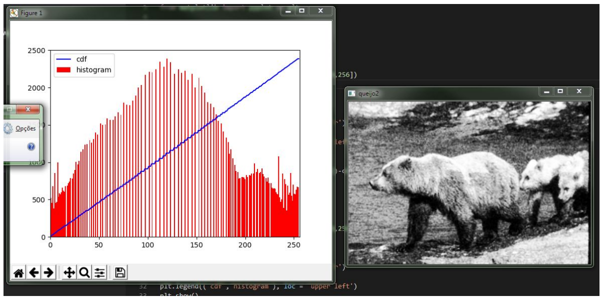


Image 3 - R=1

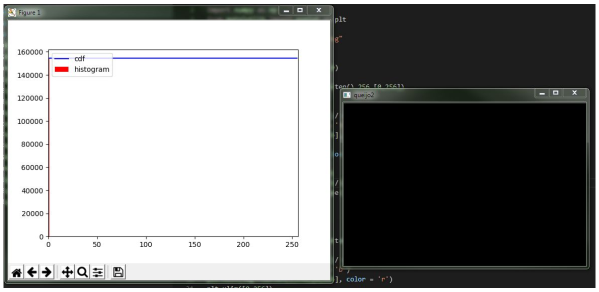
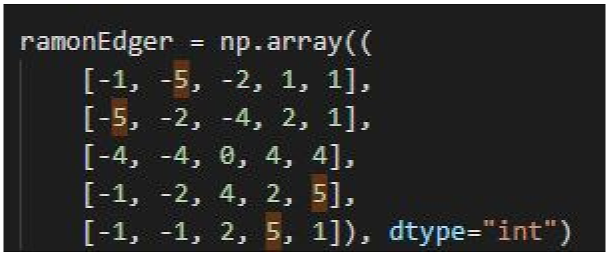


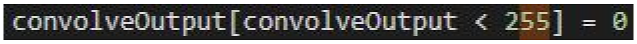
Image 4 - R=0

2)

- The code implements a convolution operation, and a specific convolution matrix to detect edges, the matrix was based in the idea of sobel operators, but in a larger matrix (5x5) and thinking in both x and y directions and was changed experimentally until a reasonable result was found, then due to lots of noise in the result image the only values shown are the ones equal to 255, the final results look quite good.



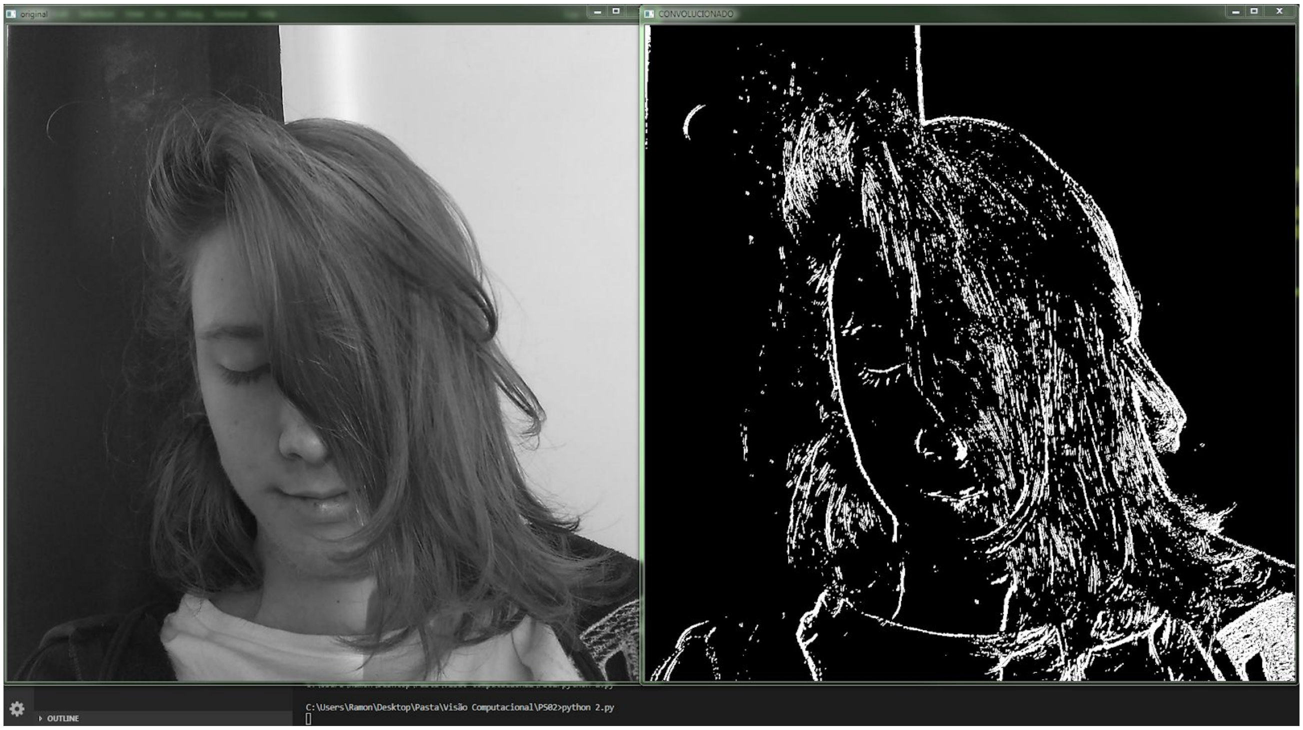
```
ramonEdger = np.array((
    [-1, -5, -2, 1, 1],
    [-5, -2, -4, 2, 1],
    [-4, -4, 0, 4, 4],
    [-1, -2, 4, 2, 5],
    [-1, -1, 2, 5, 1]), dtype="int")
```



```
convolveOutput[convolveOutput < 255] = 0
```

Image 5 - Convolution Matrix

Image 6 - Dropping all values less than 255



```
C:\Users\Ramon\Desktop\Pasta\Visão Computacional\PS02>python 2.py
```

Image 7 - Results

3)