Exercise 0 for MA-INF 2201 Computer Vision WS23/24
10.10.2023
Submission on 18.10.2023
Introduction to OpenCV

Strict rules you have to follow for all your submissions for this course:

- You are required to write code compatible with Linux, python 3.9, and opencv 4.7.
- For each exercise, we will include all the packages you are allowed to use in the template code. You are not allowed to use any other packages.
- You have to submit a code that runs and produces reasonable results.
- Do not cheat and copy the solution from anywhere. We need to see that it is your code and you understand what you are doing.

Violating any of these rules will result in getting 0 points for the corresponding sheet.

This sheet is to get used to OpenCV. Hint: Install python, opencv-python and numpy in your virtual environment (for example using `anaconda`) to avoid library conflicts on your machine.

1. Read an introduction to OpenCV and write a program that reads the image `bonn.png` and displays it using `imread` and `imshow`. *(0.5 Points)*
2. Convert the image into an intensity image using the function cvtColor and display it. *(0.5 Points)*
3. Multiply the intensity image I by 0.5 and subtract it from each color channel. Make sure that the values do not become negative, i.e. the new (R, G, B) values are (max(R - 0.5I, 0), max(G - 0.5I, 0), max(B - 0.5I, 0)). Do this by using pixel-wise operations in a nested for-loop. Display the result. Hint: OpenCV reads the images in `BGR` format in contrast to the commonly adopted `RGB` format.*(1 Point)*
4. Perform the operation above in a one-line python statement. Hint: you can use expand dims function in numpy to add additional dimension in a numpy array. *(1 Point)*
5. Extract a 16×16 image patch out of the original image centered at the middle of the image, display it, and copy the content to a random location of the image. Hint: you can use `random` python module to generate random numbers. *(1 Point)*
6. Draw 10 random rectangles and 10 random ellipses on the image using rectangle and ellipse and display it. Fill the shapes with colors of your choice. *(1 Point)*

Please write the names of your group members in the README. Note that the points from this sheet are bonus points. However, it is strongly recommended that you solve the exercises to get experience with OpenCV.