

Foreground highlighting

Goals:

- Learn how to enhance an image by applying mask compositing.
- Learn to perform simple arithmetic operations between images.
- Learn to use the GUI interface of OpenCV.
- Learn how to convert between color spaces from RGB.

Minimum requirements (up to 6 points):

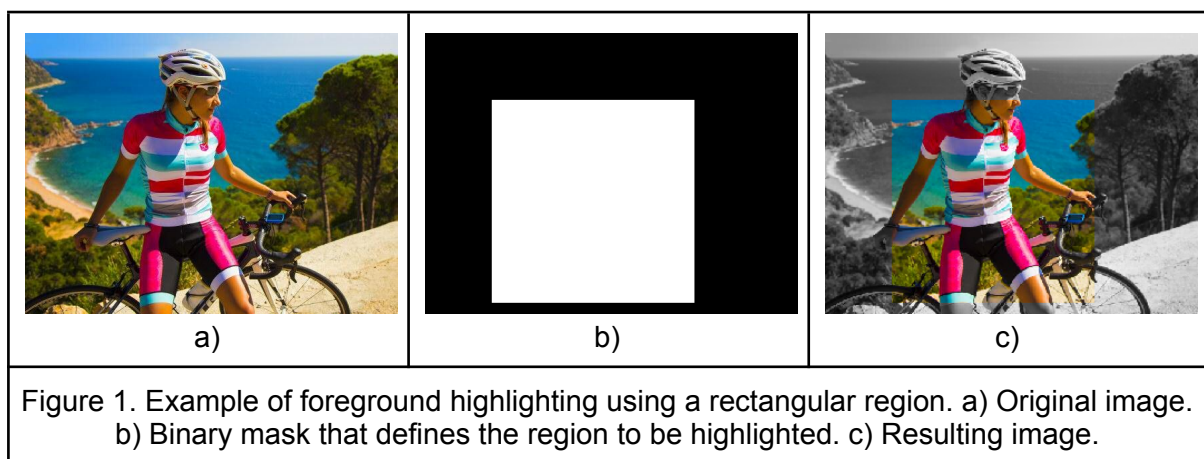
The main objective of this task is to write a program to select on an image, with the mouse, a region of interest (ROI) and generate an output image with the pixels external to the selected region in gray level. The pixels internal to the defined region are left with their original RGB values.

Once the processed image is displayed, the program will wait for a keyboard input. If the user presses 'S', it will store the processed image in a file specified by the user. However, if the user presses the ESC key, the program will end.

The enhancement operation consists of performing a bitwise operation of the form:

$$O = [I \wedge M] \vee [I_g \wedge \neg M]$$

where I is the input image, I_g is its gray level version, M is the 0/255 mask that defines the region to be enhanced and $\neg M$ its negated version (see Figure 1).



Note that you can define a rectangle on the image by their top-left corner coordinates and their bottom-right corner ones. Then, just two mouse clicks are needed.

Optional (up to 4 points):

- a) [2 points] The user can select multiple rectangular regions. The resulting mask is the union of all of them.

- b) [2 points] Instead of the standard behavior of the program, in this case, the inner part of the region is transformed to show the inverted colors (255-*I*), and the outer part shows the original RGB values. This can be selected in the command line.

Evaluation criteria.

The code is well written, structured (i.e. create functions) and compiled.	10%
A command line parser is used.	10%
It is allowed to select a rectangular region.	20%
The resulting output file is correct.	20%
OPT: Multiple rectangular regions can be defined over the same image and the result is correct.	20%
OPT: Invert colors of the image region.	20%

IMPORTANT: The grade of late deliveries will be reduced 1 point per late day.

Delivery instructions:

- The **deadline** is indicated in the Moodle task.
- No practical assignments will be accepted by email.
- The source code solving the task has to be included in a **zip file** (no other format is allowed), with the following filename pattern (avoid special symbols):
<Surname1><Surname2><FirstName>_ass01.zip (e.g. *MarinJimenezManuel_ass01.zip*) *** Not following this pattern will reduce the grade of the assignment.
- Do not include binary files (e.g. executable, obj, ...) in the zip, unless they are sample images.
- A link to a **video file defending the assignment** has to be provided in the "Comments" of the task, not later than 24h after the submission. This video cannot be longer than 10 minutes.

OpenCV resources:

- Functions to convert between color spaces:
https://docs.opencv.org/3.4.7/d8/d01/group_imgproc_color_conversions.html#ga397ae87e1288a81d2363b61574eb8cab
- Drawing functions to generate masks:
https://docs.opencv.org/3.4.7/d6/d6e/group_imgproc_draw.html

- Functions for GUI management:
https://docs.opencv.org/3.4.7/d7/dfc/group_highgui.html
- Function for writing an image cv::imwrite:
https://docs.opencv.org/3.3.0/d4/da8/group_imgcodecs.html#gabbc7ef1aa2edfaa87772f1202d67e0ce