2017

# Image smoothing and simple geometric operations in MATLAB

COMPUTER VISION – LAB 1

JOSEP FAMADAS ALSAMORA / JORDI RIU VICENTE

UNIVERSITAT DE BARCELONA

UB | Facultat de Matemàtiques i Informàtica

# Table of contents

# Table of Figures

## 1- Creating images of 3 channels (color images)

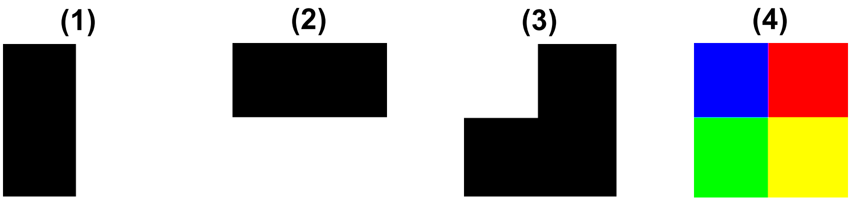


*Figure 1: 3 grayscale images and its combination*

As we can see in *Figure 1*, the fourth image is created when combining the first 3, being the number 1 the red channel, the number 2 the green channel and the number 3 the blue channel.

## 2- Displaying color images

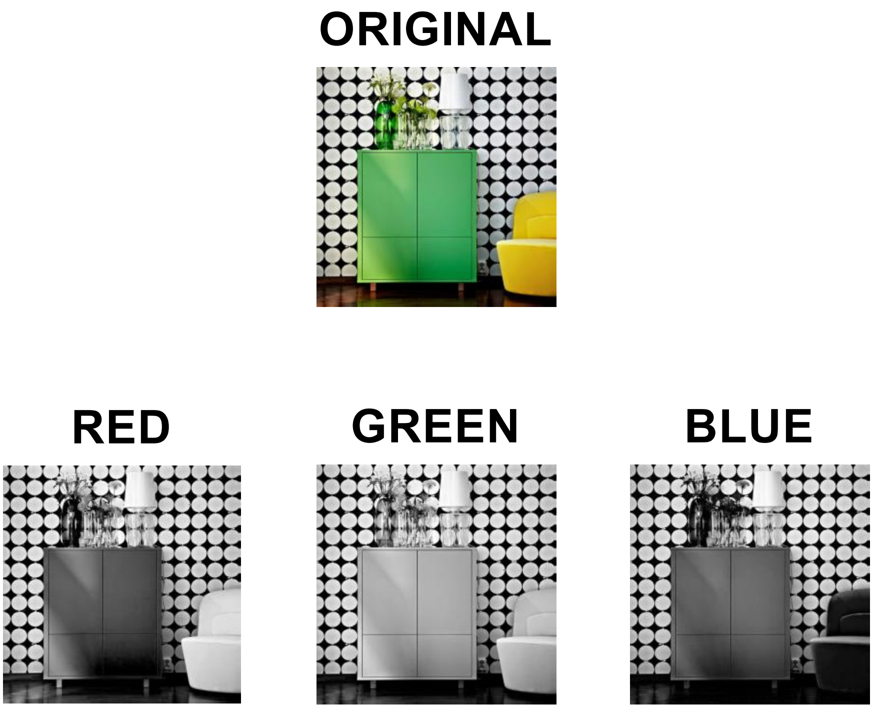


*Figure 2: Color image and its 3 RBG channels*

As we can observe in *Figure 2*, the green wardrobe is white (high intensity) in the green channel and blackish (low intensity) in the red and blue channels. The yellow item is white in the red and green channels because, as seen *Figure 3*, these two colors combined give yellow.

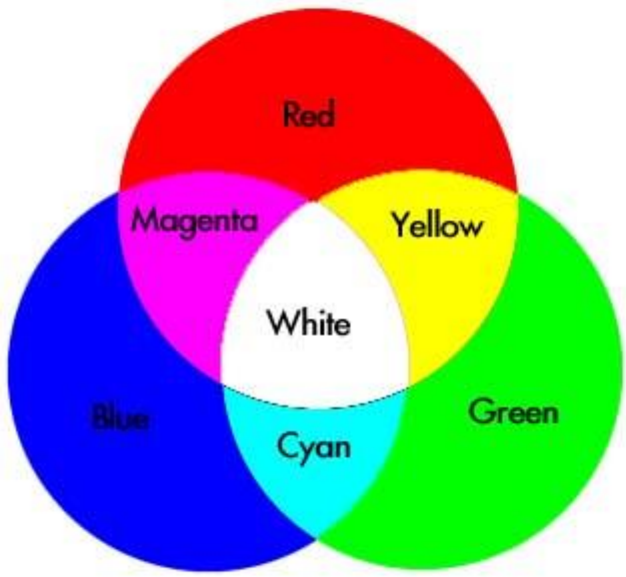


*Figure 3: RGB colors and its combinations*


*Figure 4: Image swapping the Red and Green channels*

In *Figure 4*, it can be observed that, when exchanging the red and green channels of this image the green wardrobe becomes red, but the yellow chair keeps its color because of being a combination of both channels.


*Figure 5: Same image but setting to 0 one of the RGB channels each time*

In *Figure 5* it can be appreciated that when you eliminate one of the RGB channels from an image, the whole color of the image tends to a combination of the other 2 channels. In *Figure 3* these combinations are shown:

- Cian when reducing Red channel.
- Magenta when reducing Green channel.
- Yellow when reducing Blue channel.

There are two items that do not follow the general rule:

- The wardrobe remains green except when eliminating the green channel that it becomes dark.
- The chair is yellow, but when erasing the green, it becomes fully red and the other way around.

## 3- Simple geometric operations

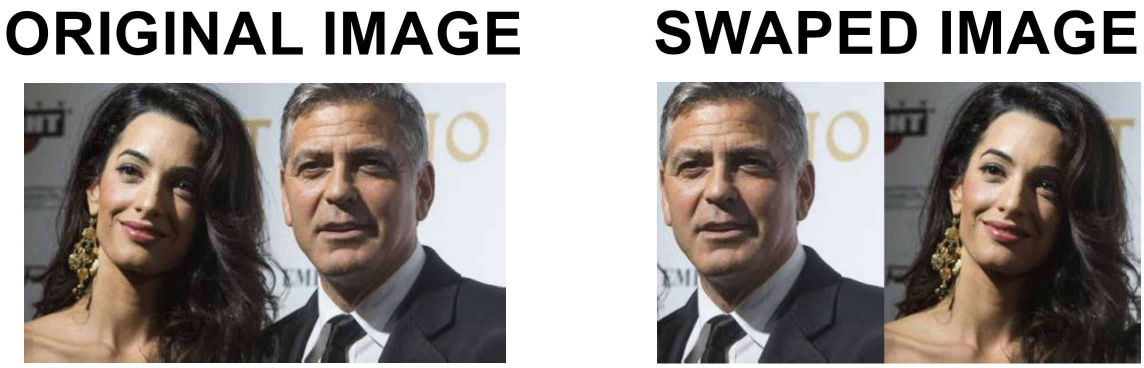


*Figure 6: Image chopped at the column 225*

## 4- Managing different size and filters


*Figure 7: Original image and resized after reducing it by a factor of 4*

As we can see in *Figure 7*, if an image is reduced and then rescaled to its original size there is a loss of information and it becomes a bit blurry.

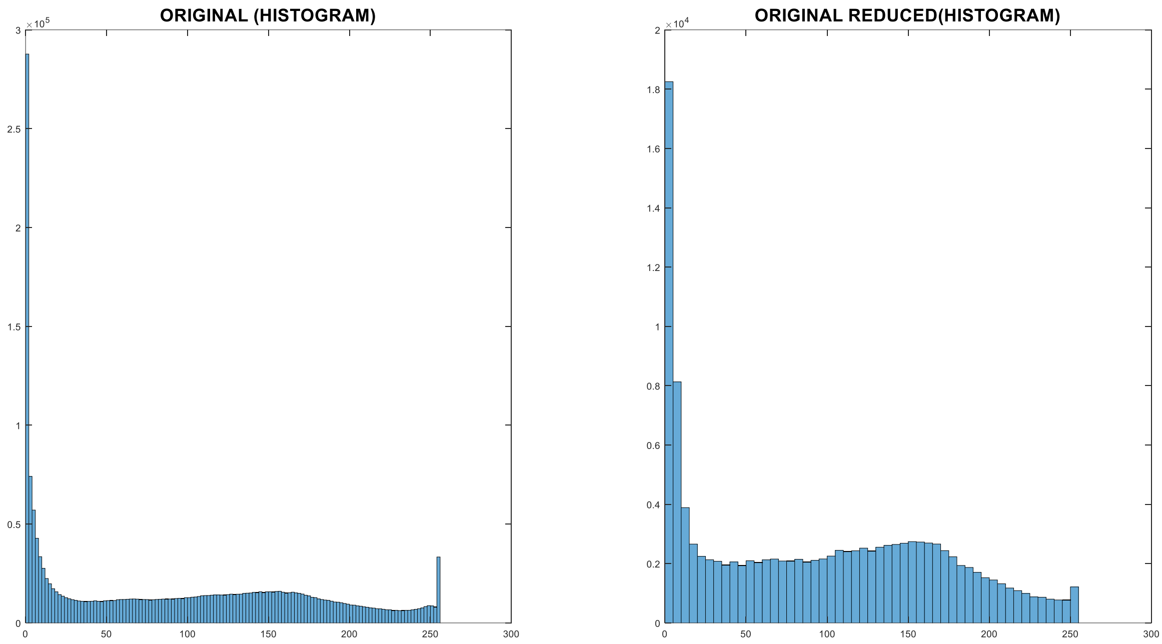


*Figure 8: Original and Reduced image histograms*

In the *Figure 8* we can appreciate that, despite the fact that there are less points, when reducing the image, the shape of the histogram is conserved.

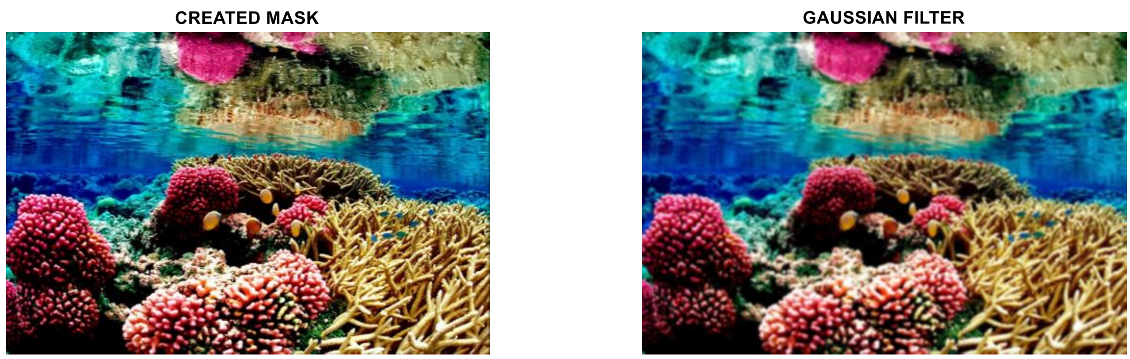


*Figure 9: Image after applying a [1 1 1] filter (left) and a gaussian filter (right)*

When applying a [1 1 1] filter the image is not as blurry as when applying the gaussian one. The filters can directly be applied on an RGB image using the function `imfilter` for a custom filter and `imgaussfilt` for a gaussian filter. The only condition for the mask is that its size has to be odd.


*Figure 10: Image after applying 1000 times a horizontal, vertical and squared mask of 1s*

*Figure 10* shows that a horizontal and vertical filter tend to produce a horizontal and vertical blurry respectively. If we want uniformity we have to use a squared mask.

## 5- Image binarization


*Figure 11: Original grayscale car image*

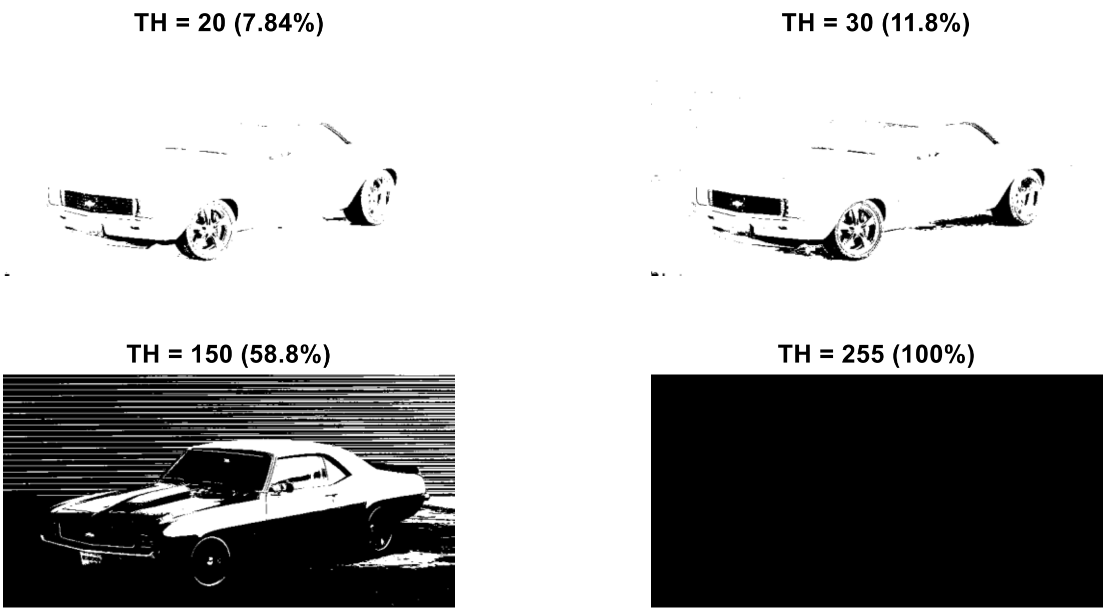


*Figure 12: Binarization with different thresholds*

As seen in *Figure 12* when the threshold is increased the image of the car starts to appear, but if the threshold is too large the car vanishes with the background. If we use a threshold of 255 which is the maximum, the image is full black.



*Figure 13: Original image multiplied by the binarization and its inverse*

In *Figure 13* we can observe that if we multiply the original image by its binarization we obtain and image in which the ‘whites’ of the binarization are left with the original car color and the ‘blacks’ are left black. It happens the other way around with the inverse of the binarization. As we can observe, none of the two methods are good here if our objective is to separate the car from its background.

# 6- Treating color images

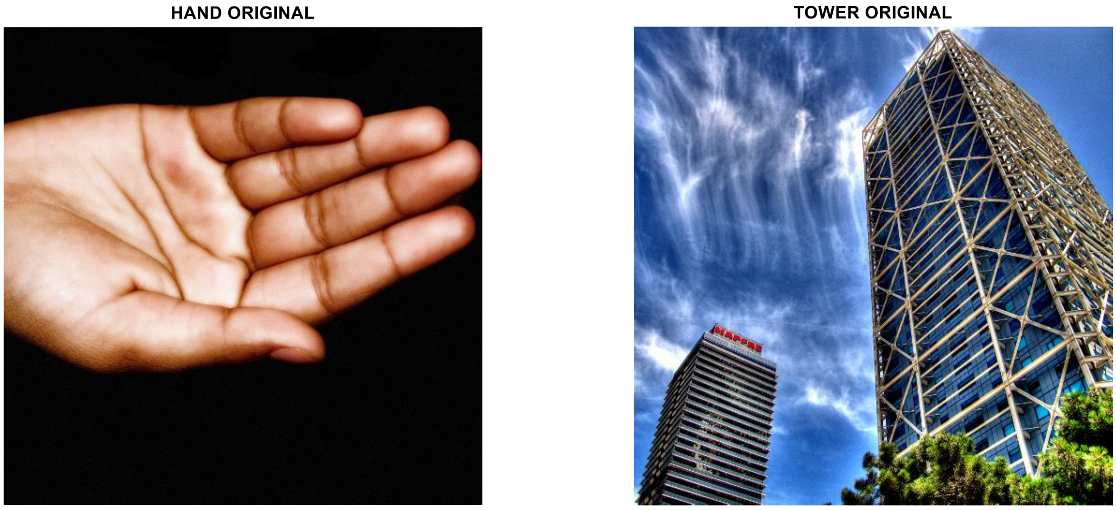


*Figure 14: Original images of the hand and the Mapfre tower*

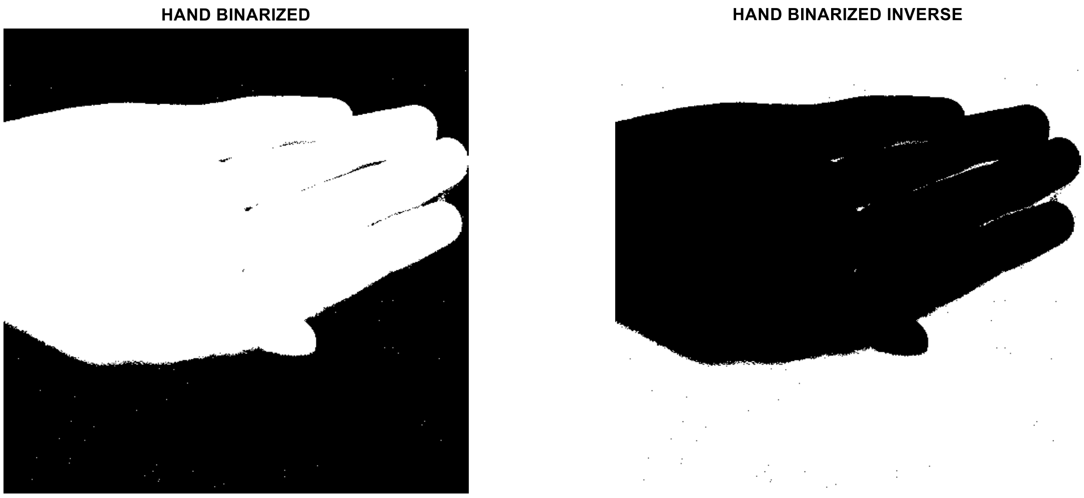


*Figure 15: Binarization of the hand image and its inverse*

## SUPPERPOSED IMAGES

*Figure 16: Final image*

The image shown in *Figure 16* is obtained by combining the images from *Figure 14* and *Figure 15*, multiplying the hand by the binarization and the tower by the inverse of the binarization and then adding the results.