Work Lab 1: Digital Images

Image Understanding

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GROUP 13:

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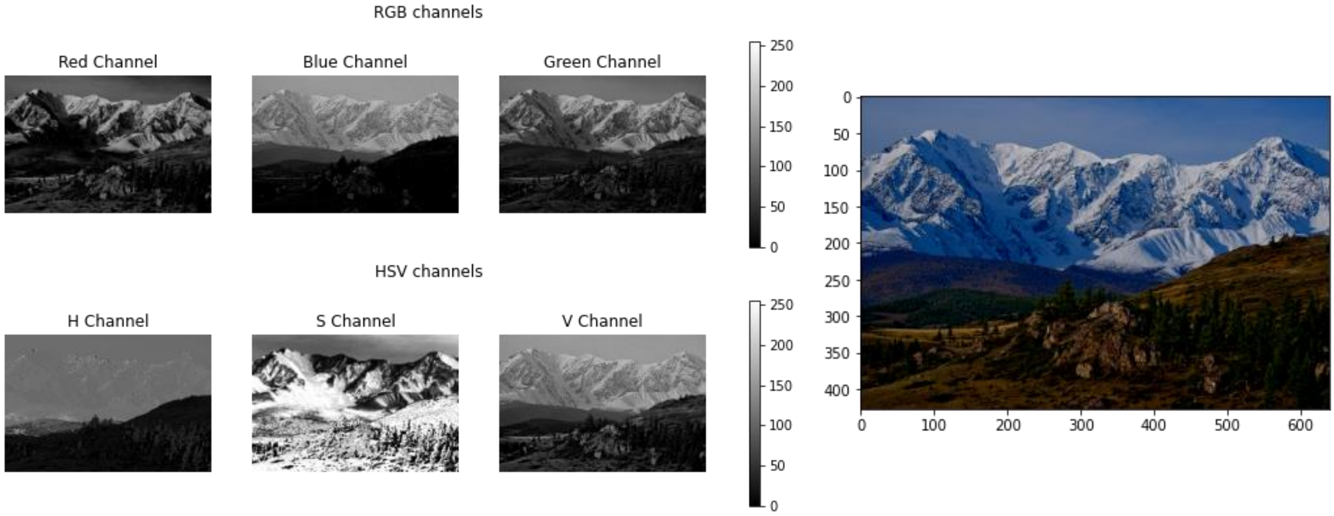
TABLE OF CONTENTS

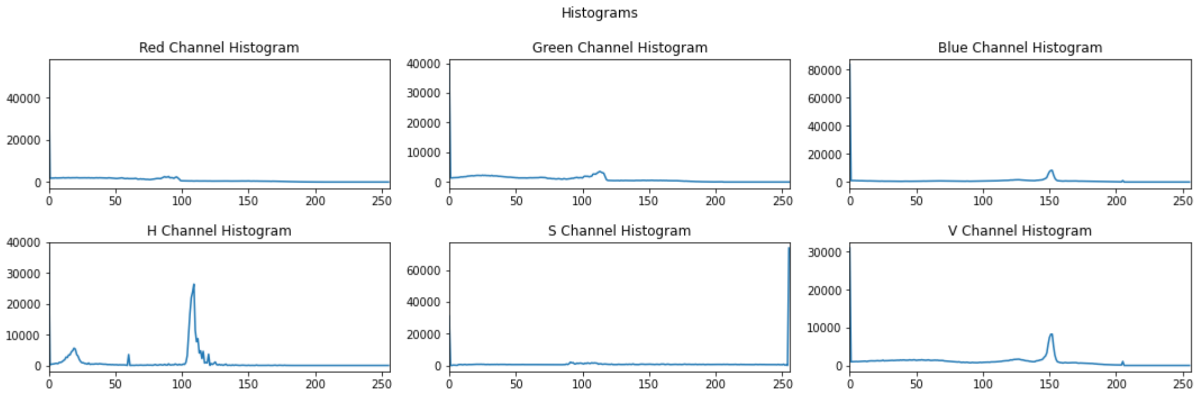
1. Statistical values from the RGB and HSV components

	R	G	B	H	S	V
Minimum	0	0	0	0	0	0
Maximum	205	205	205	179	255	205
Mean	50.97988	61.73173	76.90635	72.16227	147.09006	86.73221
Std. Deviation	47.11929	50.01201	67.04561	47.55773	92.68387	59.30830

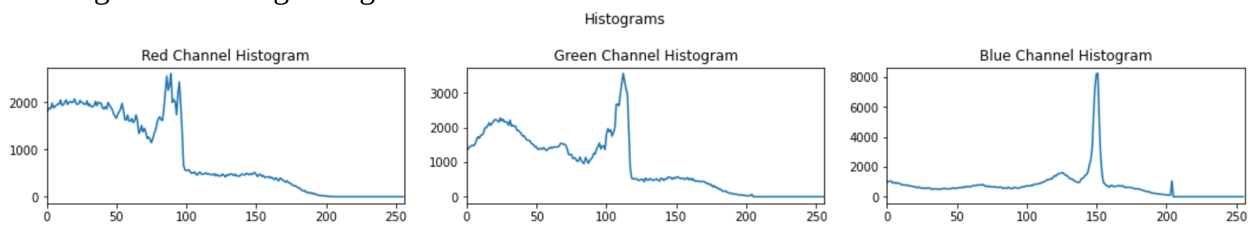
2. Relations between the color component histograms



First, when we obtained the histogram from the RGB channels, the graph showed very low values. This happened because when we modified the original image, the values from 0 to 50 became zero as a consequence of the requested subtraction operation. Moreover, this also affected the Value histogram since it represents the difference between bright and dark colors. Furthermore, this problem affects the number of zero-value pixels, creating a peak that outshines the rest of the values.

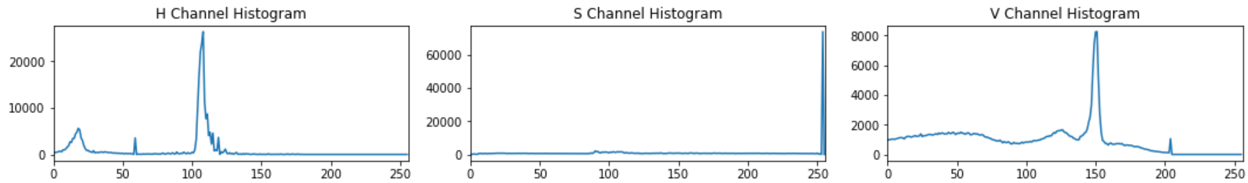


To solve the problem mentioned above, we forced the histogram to exclude the zero value, creating the following histograms:



For the RGB histograms, it is shown that the color which stands out the most is the blue one, having the highest values of the three of them. As it can be seen in the original image, this occurs because half of it is made up of white and blue pixels, corresponding to the snowed mountains and the clear sky. Additionally, for the red and green channels, it can be seen that most of their values belong to the lower half of the range, which represents the darkest ones.

This factor can be observed because the lower half of the image represents a closer snowless mountain full of trees and vegetation.

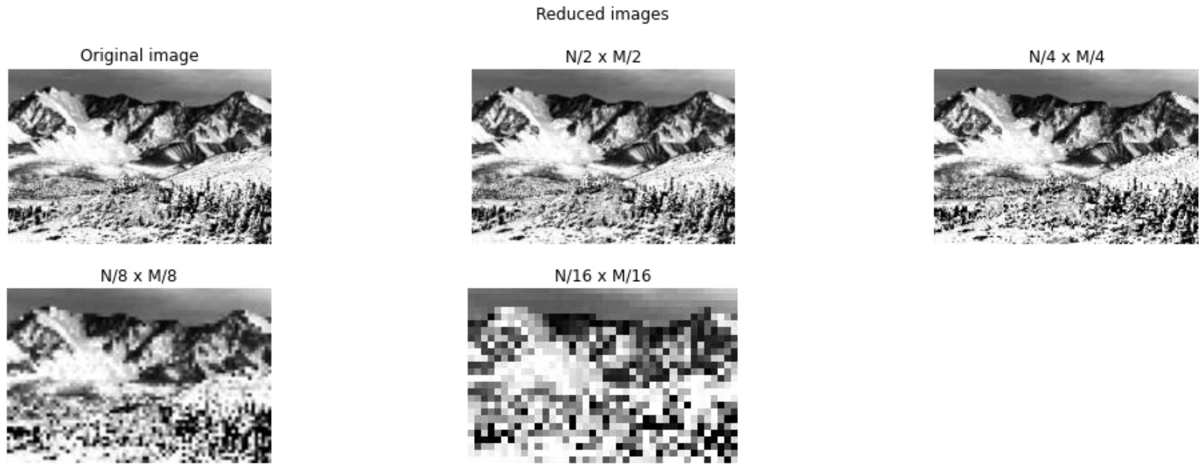


For the Hue histogram, which represents the tone of the color but with grey values, it is seen that most of the pixels belong to a similar color (blue), which is illustrated with a peak around the 110 values. However, it can also be observed a small peak around the 20 values that is associated with vegetation and snow-free mountains (red and green).

Furthermore, regarding the Saturation histogram, that describes the colorfulness of an area judged in proportion to its brightness, it can be seen that there is a huge peak (containing the majority of the pixels) in the highest value. The explanation for this event is that the image is very colorful but also significantly dark due to the requested subtraction. However, if the original histogram is observed (the one with the zero value included), a small peak on the zero value can be appreciated, corresponding to the lightest snow and the brightest sky.

Finally, according to the Value histogram, which represents the difference between bright and dark colors, it can be seen that the histogram is almost identical to the Blue histogram. This is because for the top half of the image, the snowed mountains and the clear sky contain mostly blue pixels and also the brightest ones. On the other hand, the lower half of the picture contains darker and mid-range tones of colors, which is the reason why a considerable number of values from 0 to 140 can also be observed.

3. Differences between the resized images



The process followed to perform this task is the following: first, we take the number of rows and columns of the original image and divide it by 2. After that, we apply these new dimensions to the new image. Consequently, we perform these operations to the following images, until we get a set of 5 images. As it can be seen in the images above, for each reduction applied, the image has obtained a new spatial resolution which has half of the pixels compared to the previous one. As a result, this modification affects the image visually, making its less clear and defined until the pixels that make up the image can be appreciated to the naked eye.

4. Differences between the bits-reduced images

This task consists of reducing the bits used to represent the grey values of the original image. As a consequence, the original image would have values which are comprehended between 0 and 255, assigning each tone of grey to each of the 256 possible values, being 0 the darkest color and 255 the lightest one. For the next images, the ranges would be from 0 to 15, 0 to 3 and 0 to 1 respectively. This would mean that the tones of the grey values from the original image would have been divided, resulting in images with less tones of grey, as it can be appreciated in each image. This phenomenon can be seen in the set of images, in which, for the first one there is a wide scope of grey tonalities. However, as the bits are reduced, the fade of the sky disappears, causing it to have a more stepped shape, which can be appreciated on the second and third images. On the last one, the majority of details and tonalities have disappeared, having only two tones of grey.