

Computer vision: Homework #3

Task

Given a photo, the required tasks are:

- Part 1:
 - Print the histograms of the image (R,G,B);
 - Equalize the RGB channels and show the new image;
 - Change the colour space and try to equalize a single channel. Show the results.
- Part 2:
 - De-noise the result of the last picture generated from part1;
 - The filters to try are: median, Gaussian and bilateral filters.
- Part 3:
 - Try to remove the electronic cables from the "barbecue picture" using morphological filters.

1 Histograms and equalization:

For this homework, I've decided to use “image.jpg” for every task. So, firstly I just used the given `calcHist()` function on the image, without any modification. The results are in figure 1.

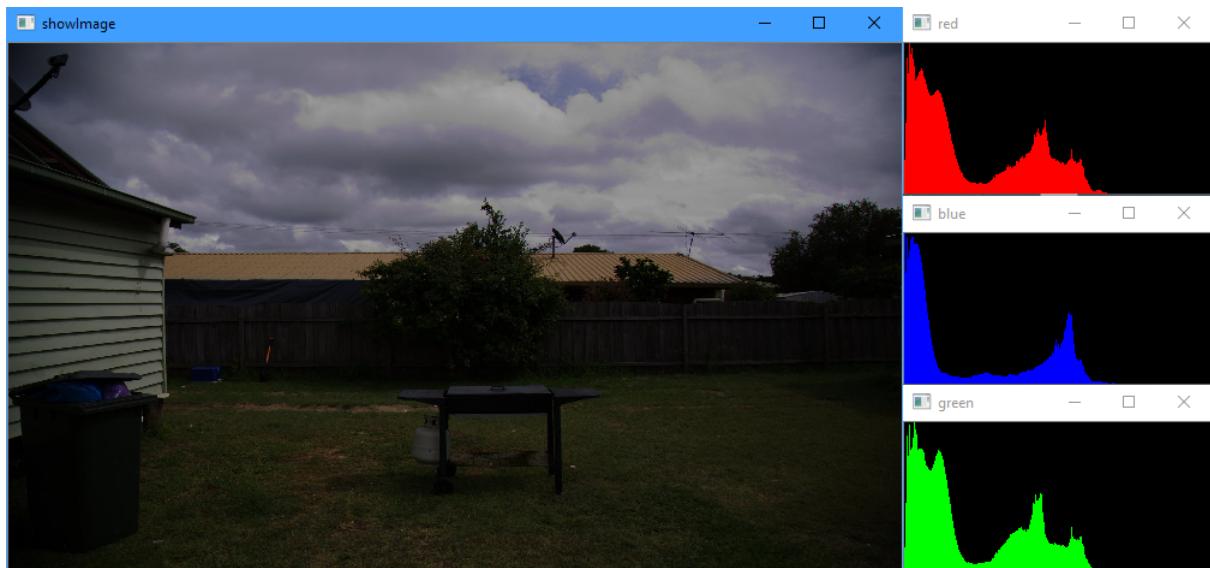


Figure 1: Original image and its RGB histograms

Then, I've equalized the red, green and blue channel, and showed the histograms once again, but with the image modified as said. The results are bad, the fence in the background appear to be blue, as we can see from Figure 2.

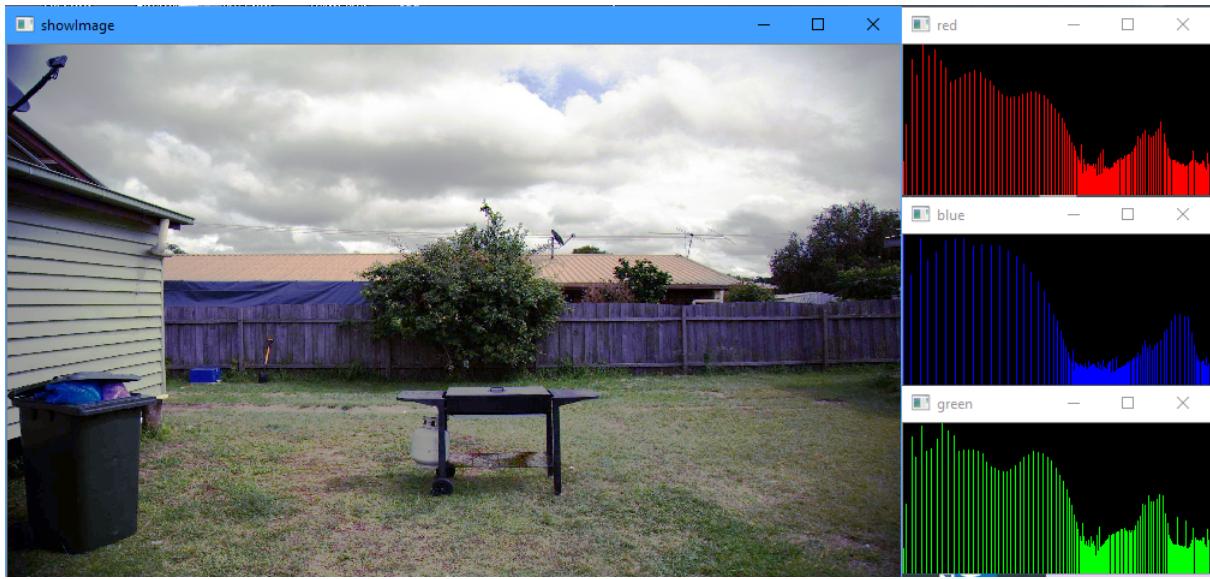


Figure 2: The image with the RGB channels equalized

To try if I could obtain a better optimization, I've converted the image to the Lab colour space and equalized only the L channel. Then, converted back the image to the RGB color space and as we can see in Figure 3, the results in terms of color correction are much better.



Figure 3: The image after the correction in the Lab colour space

2 De-noising with median, Gaussian and bilateral filters

To de-noise the picture, I've implement and tried 3 kind of filters: Gaussian, median and bilateral filter. The results are showed in figure 4, 5, 6 respectively.

The Gaussian always seems to blurry to much the image, but maybe I just can't find a proper configuration; the median filter is slow and does not help much too; finally, the bilateral filter, with the right set of parameters, makes in my opinion the best correction.

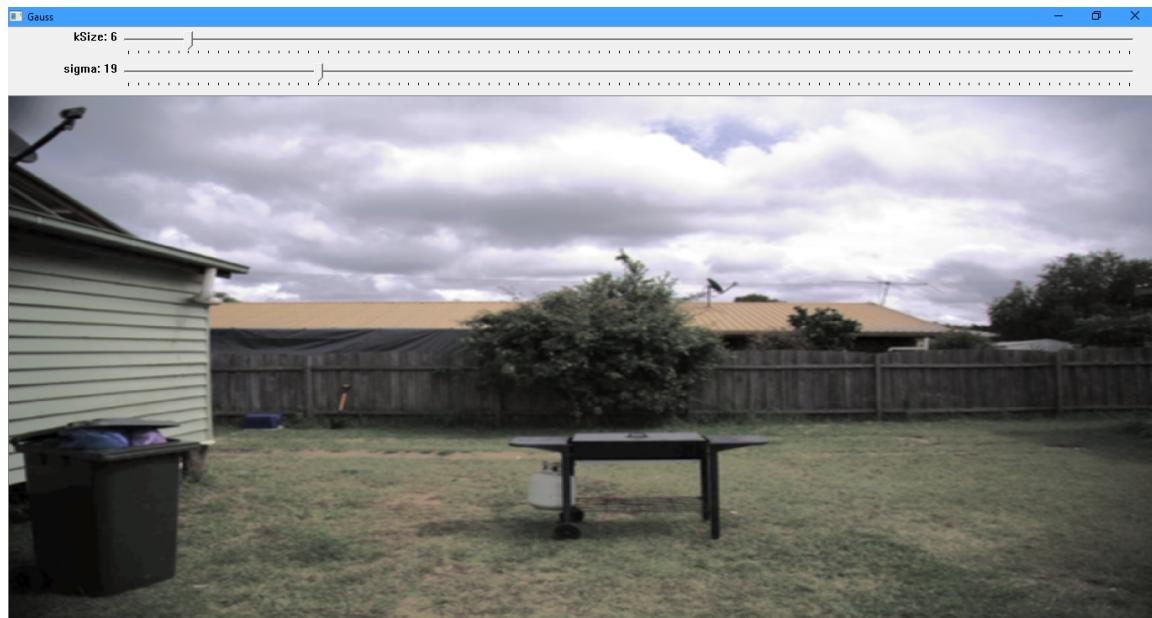


Figure 4: A gaussian filter on the image

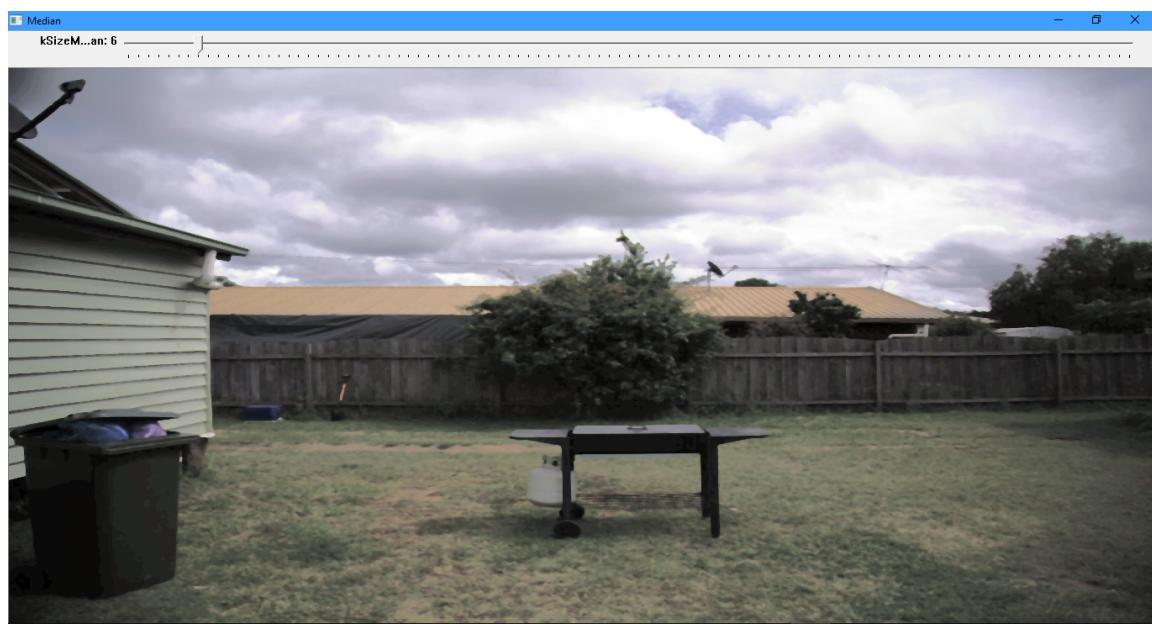


Figure 5: A median filter on the image



Figure 6: A bilateral filter on the image

3 Morphological filters

In the last task I tried to remove the cables on the background of the image with the morphological filters erosion, dilatation and a custom one I've found experimentally after reading the on-line documentation. The filters are iterated 2 times and the results are in figure 7, 8, 9 respectively.

The erosion is not effective at all; the dilatation filter removes too much and the image appear brighter; the custom filter is not perfect, but it show such an improvement, it makes it superior to the other two.

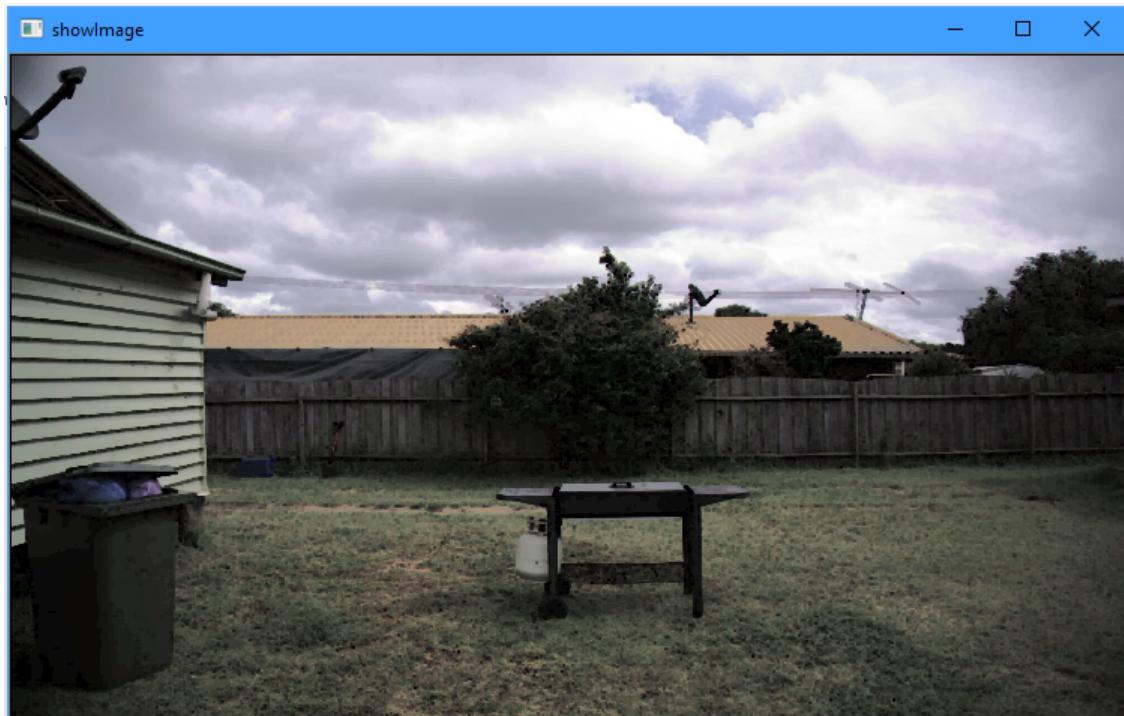


Figure 7: Effect of an erosion filter

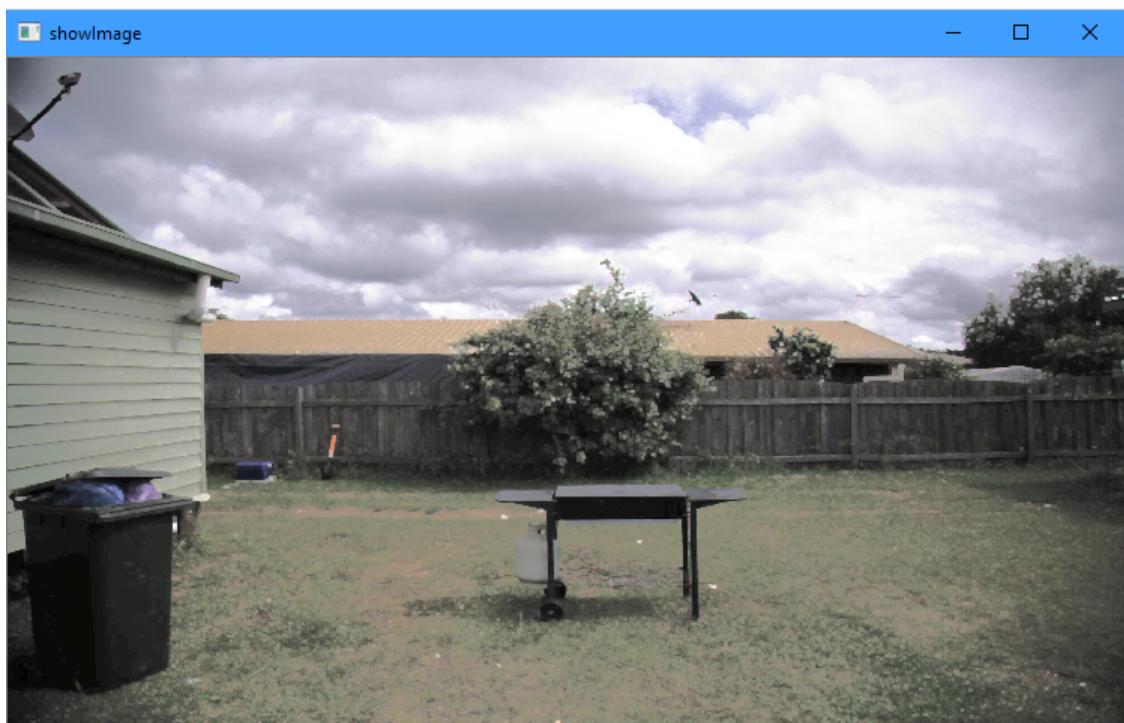


Figure 8: Effect of a dilatation filter

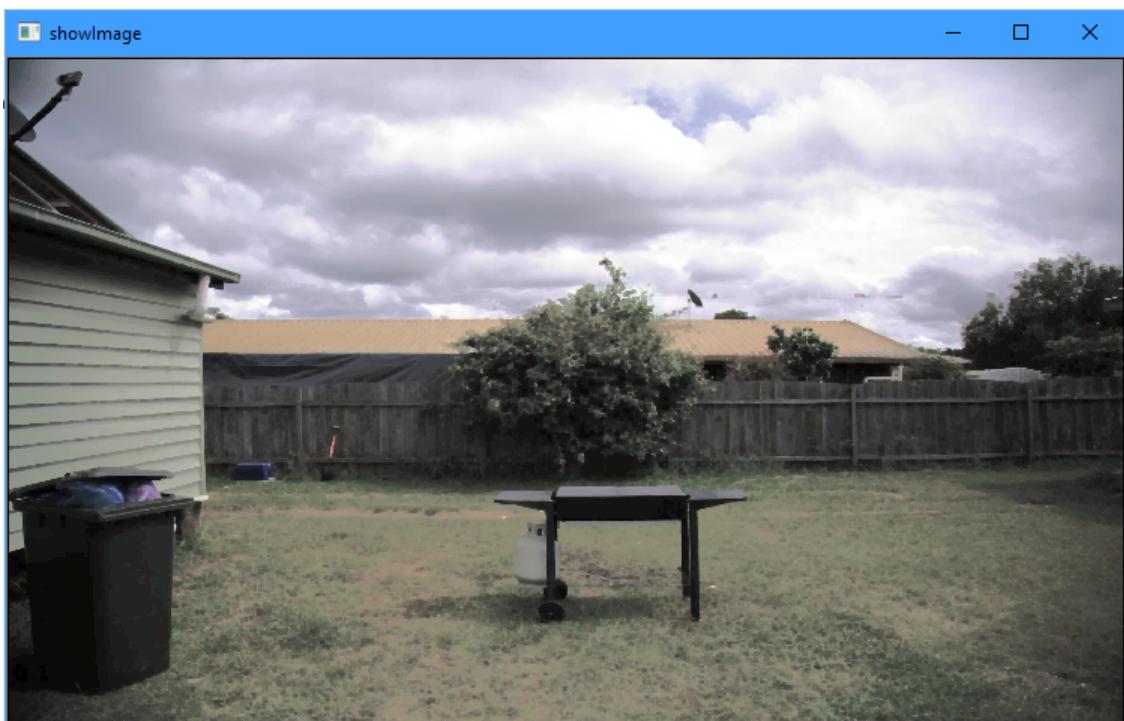


Figure 9: Effect of a custom morphological filter