

Report Lab 7

The project is organized in fifth files:

- the main;
- two header files in which there are the declarations of the functions;
- other two cpp files in which the functions are defined.

In the cpp file there are some functions, as for example, the one that allows you to detect the keypoints and compute the descriptors of the images by using the ORB method and the one that applies the brute force approach with the Hamming distance for doing features matching between two consecutive images.

In the main file, first of all, the path to each image is saved as a string in a vector using `utils::fs::glob`, then this vector is passed to a function that open each image. Next, the images are projected in a cylindrical projection using a given function. At this point, for each image the keypoints are detected and the descriptors are calculated using orb method. The keypoints and the descriptors are saved into a vector of vector of `KeyPoint` and a vector of `Mat` respectively.

After that, a for cycle starts cycling over each image and applies several operations. At the beginning, it applies a match between features of two consecutive images by using brute force approach with Hamming distance. These matches are filtered by the distance. Just the matches whose distance is less then five times the minimum distance are included in the vector of the "good matches".

Next, the keypoints of two consecutive images are converted into points and saved into two different vecto. So the Homography matrix is calculated for retrieving the mask which is used to calculate the translation over the x axis.

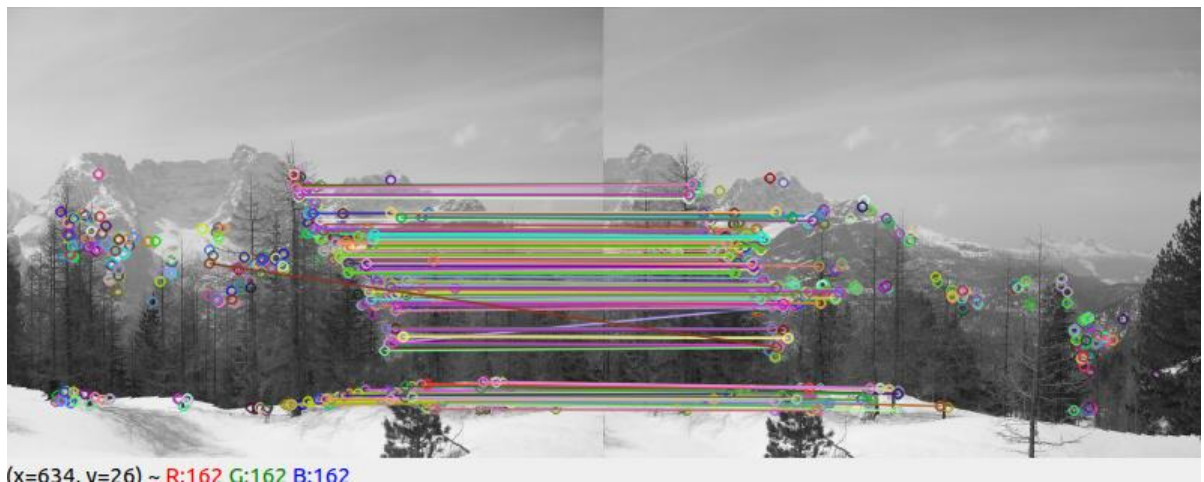
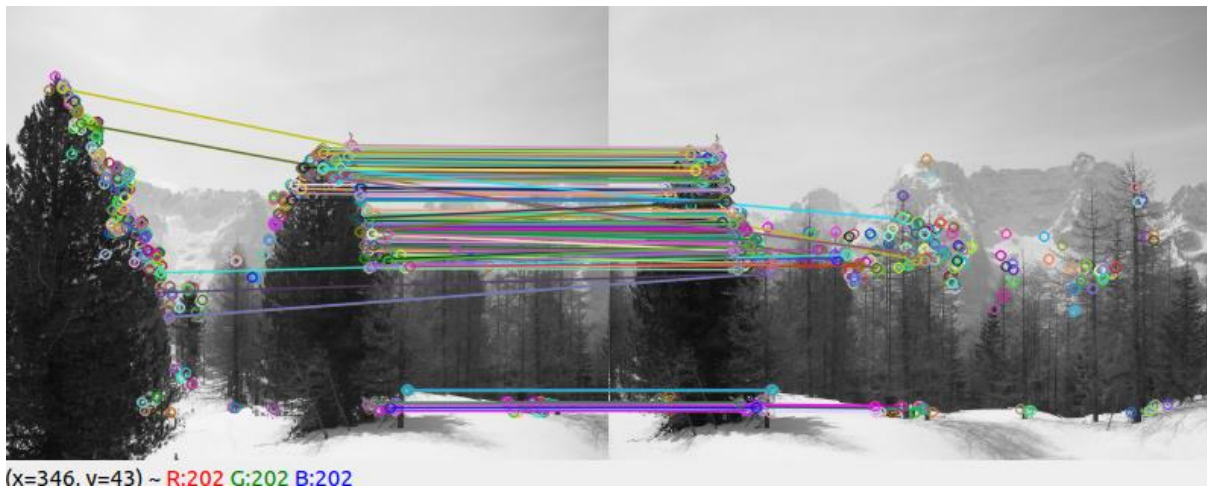
The inliers are selected from the mask and for each, the differences between the points of two consecutive images are summed for retrieving the translation. At this point, I obtained strange results for the translation and I was not able to understand what was wrong and to continue to create the panorama image.

I think that I do not understand how to calculate the translation and that after having done it, it is necessary just to sum all the translations to retrieve the width of the panorama image.

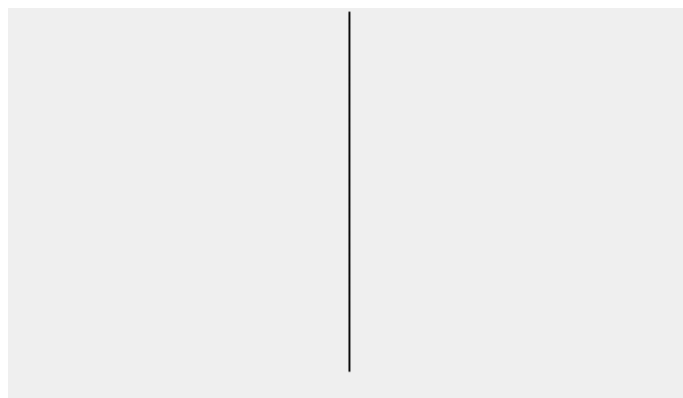
To include the images in the panorama image, I think it could be done by using a cycle that run over the final image and copying the projected images from its beginning and for a number of pixels equal to the translation of such image with the next one.

Following some images:

- example of feature matches between two consecutive images after having filtered them and by using orb for detection and brute force with Hamming distance for the matches:



- examples of mask images retrieved after having calculated the Homography matrix:



- example of translations retrieved:

```
translation X: 1.93585e-05  
translation X: 3.45362e-05  
translation X: 4.39188e-05  
translation X: 6.22627e-05  
translation X: 6.84735e-05  
translation X: 9.09028e-05  
translation X: 0.00010216  
translation X: 0.00011897  
translation X: 0.00013515  
translation X: 0.00014713  
translation X: 0.000158185  
translation X: 0.000169044  
translation X: 0.000173308  
translation X: 0.000191118  
translation X: 0.000191769  
translation X: 0.000196273  
translation X: 0.000207883  
translation X: 0.000221758  
translation X: 0.000236791  
translation X: 0.000252462  
translation X: 0.000256862  
translation X: 0.00028149
```