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LAB 5

1. INTRODUCTION

The aim of laboratory 5 is to reconstruct the panoramic image from a set of input images of a landscape.

The program is organized in two files:

- `Lab5.cpp` which contains the main function.
- `PanoramicImage.cpp` which contains the methods which perform the computations and return the panoramic image.

The header file, called `panoramic_image.h`, is also present and defines the PanoramicImage class along with its methods, and includes the OpenCV's libraries.

2. LOAD INPUT

First, the program loads the images from which to compute the panorama through the function `loadData`. The path to the directory containing the images must be provided in the command line, as well as the format of such images and the field of view of the camera with which the pictures were taken (e.g.: for the dolomites dataset, which contains PNG images with fov of 54, the command line will look something like this: "`..path..\dolomites png 54`").

3. FEATURES EXTRACTION AND MACTHING

After the data has been loaded the main function calls the method `doPanoramic`, which is the bulk of the program and where the magic happens. First of all, some transformation of the images is performed: through the function `cylindricalProj`, a planar representation of the projection of each image on a cylindrical surface is saved.

Now, features for each image are deteted using the SIFT algorithm (the results produced by ORB were less than satisfactory on most datasets). Both the keypoints and descriptors are stored in devoted arrays.

After the feature recognition, the descriptors of the keypoints of each pair of consecutive images are compared, and the best matches are kept and successively refined with a threshold.

In order to reconstruct the panoramic image, we need to find the translations between inliers of consecutive images, which is easily done by calculating the difference in the coordinates of their matching keypoints. I chose to do this both for the X and Y axles and as such translated the images vertically as well as horizontally when forming the final panorama. It's noticeable how only some points are aligned on the Y-axis, this is probably because a spherical projection (instead of the cylindrical one used) would have been needed to provide better results.

The final image is produced by selecting the correct submatrixes and filling them with the images by accounting for the calculated translations. At first, an image with more rows is created in

order to account for the vertical differences, and as such the image has many blank spaces at the top and bottom (this is best displayed in the dolomites dataset, as is shown in Picture 1). After that is filled, the image shown as output of the program is created from the biggest submatrix without blanks, which unfortunately cuts out some parts of the original images (Picture 2).

Picture 1

Picture 2