COMPUTER VISION - LAB 5

Topics: Keypoints, Descriptors and Matching
Goal: Create a panoramic image given a sequence of unstitched images.

Write a C++ class (`PanoramicImage`) which includes methods that / for:

1. Load a set of images
2. Project the images on a cylinder surface[1] using the provided static method `cylindricalProj()` of the `PanoramicUtils` class. The method requires as a parameter an angle value (in degrees) which is half of the FoV of the camera used to take the photos. The FoV of the camera is 66° (half FoV=33°) for all the provided datasets excluding the "dolomites" one for which it is 54° (half FoV=27°).
3. Extract the SIFT features from the images (if you are using OpenCV 3.x, you need the *xfeatures2d* module that is part of the *contrib* package of OpenCV, available only with installation from sources).
4. For each (consecutive) couples of images
    a. Compute the match between the different features extracted in (3). For this, OpenCV offers you the `cv::BFMatcher` class (SIFT require to use the L2 distance).
    b. Refine the matches found above by selecting the matches with distance less than *ratio * min_distance*, where *ratio* is a user-defined threshold and *min_distance* is the minimum distance found among the matches.
    c. By the fact that in the cylinder the images are linked together by a simple translation, find the translation between the images by using the refined matches. To this end, you can use the RANSAC algorithm. While OpenCV does not provide a direct RANSAC function, the set of inliers can be computed by using the `findHomography()` function, with `CV_RANSAC` as the third parameter (hint: the inliers can be retrieved by using the mask argument). Otherwise, you can implement a simplified RANSAC following the trace on the slide.
5. Using the set of translations found in (4.c). compute the final panorama merging together the input images.

[1] For interested readers in cylindrical projection, see the provided document "Cylindrical projection.pdf"

Write a program to test the previous class using some of the sample sequences provided in the "`Lab 5 data`" folder. The program should:

1. Create an instance of the `PanoramicImage` class with the images in the data folder
2. Display the result

SAMPLE OUTPUT: