

Homework report

Course: Computer Vision 2020

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Lab 5 - Keypoints, Descriptors and Matching

Inside `panoramic_image.h` you will find the `PanoramicImage` class which contains some static methods for the creation of the panoramic image, the implementation is inside `panoramic_image.cpp`. The file `panoramic_utils.h` contains a static method provided by the prof for the projection of the images in a cylindrical surface.

During program execution you will be prompted to type in the input images path and the field of view angle.

The first two steps of the homework were immediate, loading the images as done in the previous homework and projected the images on a cylindrical surface using the method provided by the prof.

Inside `PanoramicImage::detectAndMatchKeypoints` I extracted the features and the descriptors using SIFT feature detector and matched the features between the pairs of consecutive images using `BFMatcher`.

The method `PanoramicImage::computeTranslation` is then used for computing the relative translation vector between a pair of images based on the detected matches. `findHomography` is used to discard outliers, then an average of the translations between remaining matches is computed.

Finally `PanoramicImage::joinImages` is then used to stitch the images together using the computed translations to produce the final result image, the output image size is computed based on the given translations.

At the top of `panoramic_image.cpp` there are two constants `DISTANCE_RATIO_THRESHOLD` and `RANSAC_REPROJ_THRESHOLD` used to regulate the discarding of the outliers based on the distance between matches and the Ransac threshold, after trying different settings I finally kept the values 5.0 and 3.0.

Final result

After testing it on the images given by the prof, I can see that the pictures are stitched together quite well, with only some change in brightness between image boundaries.





Figure 1 - some results

After trying with and without `cylindricalProjection`, I noticed how the projection is essential to make the images correctly overlap with each other, without it, the simple translations cannot perfectly stitch together the images and a warp is needed instead. I also tried to equalize the histogram of the single images before stitching them, but I noticed a slightly better result without the equalization, the only dataset which gives better result using equalization is the “dataset_lab_19_automatic” in which the images differ a lot in brightness between them.



Figure 2 - result with equalization