CS6550 Computer Vision

Homework 4: Local Feature Matching and Image stitching

Due: 23:59 12/22/2016

Part 1. Local Feature Matching (50%)

The part is to find the matching between each of the three single-book images and the input image with all the books appeared in a cluttered scene. You need to implement the RANSAC-based object detection by matching a set of SIFT features with a Homography transformation between two images.

Use a publicly available program (the code and tutorial from the website http://www.vlfeat.org/) for SIFT interest point detection **(vl_sift function)** to extract the SIFT feature points from the 4 images **(in folder /part1_data)**. Show the matching correspondences which map interest points in each single-book image to the corresponding points in the cluttered-book image.

A. Establish point matching correspondences using nearest neighbor strategy of SIFT vectors (3 images), and filter with distance ratio testing. Please try 2 different ratio thresholds and show your point correspondence results. **(6 images)**

B. Apply the RANSAC program to separate inliers from outliers and find the best matching Homography between each single-book image and the cluttered-book image by using the SIFT features computed from problem A (The number of initial correspondences should be larger than 200, and pick proper distance ratio). You may need to try different parameter setting in RANSAC to find the best matching result. Compare and discuss the results. Visualize your results by plotting inliers and outliers of matching correspondences **(3**

images), and the original human labeled boundary of each book image and transformed human labeled boundary in the cluttered-book image **(3 images)**.

C. Show the detection result by showing the deviation vectors between the transformed feature points (from single-book image to cluttered-book image) and the corresponding feature points on the cluttered-book image **(3 images)**.

Part 2. Image Stitching (50%)

Left, Center, Right

In this part, given 3 images **(in folder /part2_data)**, try to stitch other images to the center image by calculating Homography using RANSAC based on SIFT features matches between two images (similar to Part 1). Finally, warp and blend all the images together. Follow the procedure below to finish the task.

A. Establish point matching correspondences using nearest neighbor strategy of SIFT vectors, and filter with defined (by you) distance ratio.

B. Apply the RANSAC program to separate inliers from outliers and find the best matching Homography between other images to center image. You may need to try different parameter setting in RANSAC to find the best matching result, and discuss how the parameter setting affect you stitching results?

C. Apply the Homography to transform other images to the center image. Negative coordinates may appear, please shift the coordinates and determine the stitched image boundary properly. Warp each image (left and right) through backward warping.

D. Apply alpha blending **(set alpha = 0.5)** on the overlapping regions to fuse the images. Show the final stitched result **(1 image)**.

Reminder

- Functions like imfuse, imwarp, estimateGeometricTransform, vision.AlphaBlender are prohibited
- Your code should work correctly.
- Report format can be Word, PowerPoint, and others that can describe your work and result clearly.
- Please compress your code, result images and report in the file named HW4_{Student-ID}.zip and upload it to iLMS. Before 12/22(Thr.) 23:59.
- Your package should contain a README file about your execution instruction.
- If you encounter any problem, please feel free to contact us, post questions or discussions on iLMS.