Assignment 1 – Feature detection and matching

This assignment accounts for 15% of the total mark.

In this assignment, you will learn how to apply feature detection and matching algorithms. Feature detection and matching are usually the first steps in most computer vision systems. This assignment will enable you to learn how to apply the algorithms in real images and you will develop understanding and techniques required to apply these algorithms. The following instructions will guide you through the necessary process in order to develop detection and matching algorithm.

Submission

1. Working code in Matlab

2. No more than 10-pages (including abstract and references) report

3. Deadline: 27/04/2561, late submission incurs 10% penalty

Instruction

1. Download the code from http://www.vlfeat.org/download.html and follow instructions from http://www.vlfeat.org/install-matlab.html to set this code up in Matlab in your local machine

2. Once installed, go through the following tutorial http://www.vlfeat.org/overview/sift.html to learn how to use SIFT features and descriptors

3. Download datasets called *Image Matching: Graffiti* from https://www.robots.ox.ac.uk/~vgg/data/data-aff.html

4. Write a script to load images from the folder called ~/graff (you can use any images) to extract SIFT features and descriptors from a chosen pair of images

5. Display extract features and descriptors in the chosen images, with scales and orientation parameters

6. Implement a function for the Nearest Neighbour algorithm to find putative matches from extracted features

7. Implement a function for the Nearest Neighbour algorithm with ratio test to find putative matches (Use Lowe's paper as a guideline)

8. Apply Ransac algorithm to filter out outlier matches and find a homography between each pair of images in ~/graff

9. For each of image pairs, apply the found homographies to rectify images

10. Plot the number of putative matches for each pair of images in Matlab

11. Plot the number of inliers and the number of times Ransac algorithm runs for each of images

12. For other images in the data sets, apply step 4 and 5, apply functions from 6-8, and repeat step 9 to 11.

13. On ~/graff dataset, try with Ransac 8 point algorithm to find a transformation between a pair of images and rectify the images using the found transformation.

14. Try to two other feature detectors and descriptors of your choice from www.vlfeat.org on ~/graff dataset

Report

1. A short summary of the fundamental of all feature detections and matching algorithms

2. A summary of implement algirithm functions

3. Results and discussions of all the plots, and discuss the implication of using different detectors and descriptors for difference datasets, discuss the implication of using Nearest neighbour and ratio test, discuss the implication of using Ransac homography and Ransanc 8-point algorithms