MCA Assignment 1: Image Retrieval

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1   Color Correlogram

Maximum Precision: 0.109

Minimum Precision: 0.057

Average Precision: 0.078

Maximum Recall: 0.970

Minimum Recall: 0.474

Average Recall: 0.670

F1 Score: 0.024

% of Good Queries: 38.29%

% of Ok Queries: 38.45%

% of Junk Queries: 23.24%

Average Time Per Query: 207 seconds

Analysis of Results.   As the results suggest the precision and recall achieved by this approach is low due to the fact that color correlogram majorly focuses on the pixel-wise color intensities (some importance to spatial coordinates as well) and doesn't make use of any kind of key-points (points, blobs, edges or ridges) present in the image.

The most essential information of the image is present in interest points in an image and therefore, methods that do not compute them and do matching based on them is bound to perform poorly in image based retrieval.

I quantified the colors using binning by dividing the 256x256x256 space into 26x26x26 space. I also tried an approach where I reduced number of quantization levels by k-means clustering that in turned reduced accuracy but also reduced the inference time. So, in order to achieve a higher accuracy I used this approach and did not make use of clustering.

2 Scale Invariant Blob Detection (LoG)

STEPS:

- Conversion to gray scale and resizing of image.

- Create LoG kernels of various filter sizes and convolve them with the image.

- Non-max suppression: Suppress all keypoints obtained that are not the maximum in its neighborhood - out of 26 pixels (8 in same plane, 9 above and 9 below).

- Remove all blobs that are overlapping.

Some Examples of Images with Blobs:
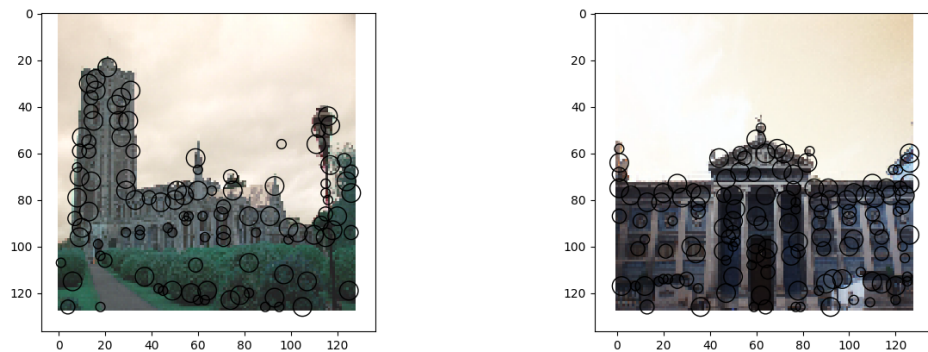
(a) Examples for Blob Detection

The json file with the extracted features for all query images is attached herewith.
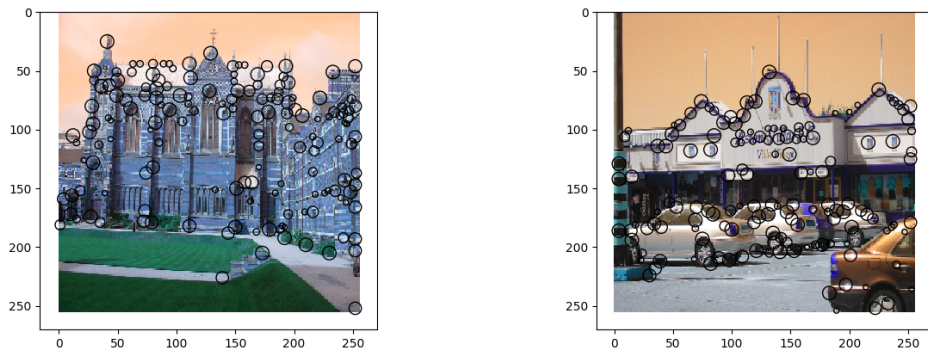
3 SURF: Speed Up Robust Features

STEPS:

- Resize and conversion to gray scale.

- Create integral image.

- Compute the determinant of Hessian applied to the image.

- Non-max suppression using using peak_local_max constraining the maximum number of extremas to be some fixed number.

- Remove all blobs that are overlapping

Some Examples of Images with Blobs:

(a) Examples for SURF

The json file with the extracted features for all query images is attached herewith.

NOTE: The images and train (database_cc also in part (a)) folder must be placed in the same folder as the scripts (src here) in order for the code to run.