Bag of words and Homography matrix

Yash Ubale[1]
2014csb1040@iitrpr.ac.in

[1] Department of Computer Science,
IIT Ropar

[2] Computer Vison,
CSL468

1 Bag of words

1.1 Algorithm

1. Read all training and test images.
2. Extract Harris points and HOG features around all the Harris points of both training and test images respectively. HOG feature size will be 36x1 for one image because we are considering 3x3 patch around the Harris point.
3. Now apply K-means clustering for all the features of training images (K-means on 308825 features in out case). K is chosen to be 250. Withing cluster distance is found out for different Ks and a graph is plotted. 1000 number of iterations are chosen.
4. Now for all the test images get the features extracted in step 2 and then check for all features in one particular image to which cluster they belong (find out their distance from all the centroids and store a 250x1 vector for every feature). Combine these features of one particular image by taking inverse of individual vectors because lesser the distance greater the probability.
5. Combine the features as described in point 4. for training images as well , thus we create histogram for both training and test images individually.
6. Now compare every histogram of test image with every histogram of training image and find the smallest Euclidian distance between the histograms.
7. Now you have got the training image with which a given test image has the smallest distance with. Get the label of that training image and compare it with the label of the test image, if they are same then the computed label is correct.
8. Confusion matrix is also calculated and can be seen in the workspace of Matlab.

1.2 Observation

1. Accuracy of 51.67% was obtained.

1.3 Results

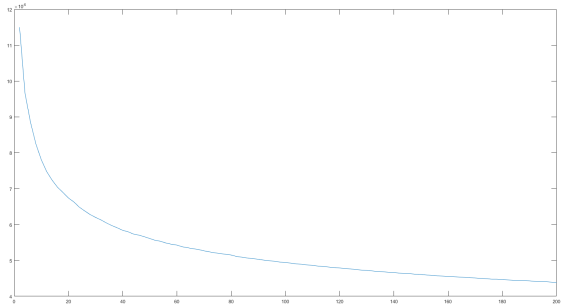

Figure 1: Plot of total cluster distance vs k (k-means algorithm)

338	8	57	78	74	13	114	5	37	6
19	653	41	62	19	1	33	2	4	0
69	34	288	109	166	14	137	8	35	6
102	49	89	356	92	6	132	1	38	11
48	18	145	88	258	5	118	4	67	10
21	0	17	10	5	514	7	150	101	89
107	30	119	92	117	14	214	0	35	8
13	1	4	2	4	121	2	535	31	96
59	4	32	37	60	55	45	23	407	46
4	1	4	7	6	38	16	61	33	538

Figure 2: Confusion matrix for first 8002 test examples

2 Homography Matrix

2.1 Algorithm

1. Annotate points (corresponding points should be noted properly).
2. Using appropriate conversion and SVD decomposition and choosing eigen vector corresponding to highest eigen value, we can compute the homography matrix.