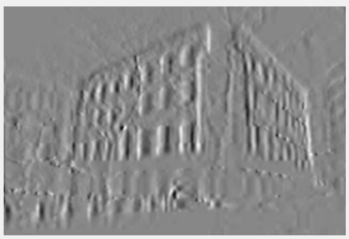
1.1 1st row: all Gaussian which remove high frequency components from image. 2nd row : all Laplacian: take the second derivative and remove the low frequency components. 3rd row:all gradient in x. 4th row :all gradient in y.

1.2 The CIE lab color space contains three channels, L which means the lightness and a,b chaneels which means the green-red and yellow-blue color components. We use lab because it can perform better on luminosity conserving and contrast enhancing which means better performance on distinguishing different features on histograms. I notice that the Gaussian filter with bigger standard deviation can make the images more blurry.

(1). Original image

(2) L filter Response

(3) a filter Response



(4) b filter Response

1.3 Three Corner Detection

harris

random

harris

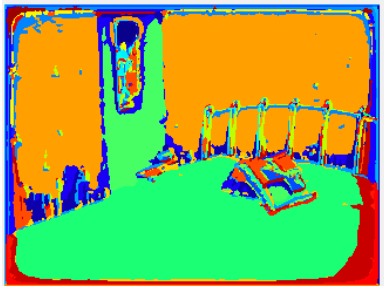
random

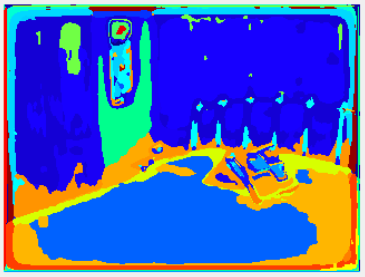

harris


random

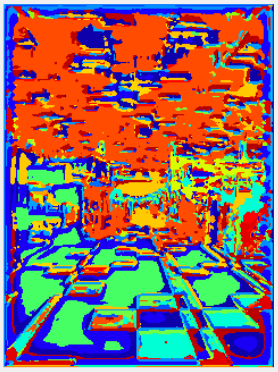
2.1

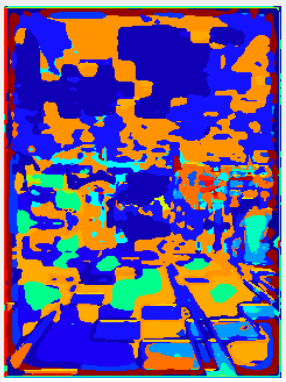

2.1.1 Origin1


2.1.2 HarriswordMap1

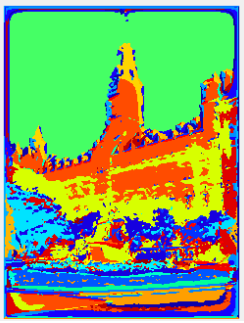

2.1.3 RandomwordMap1

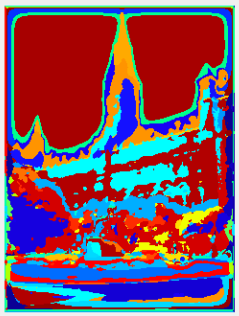

2.1.4 Origin2


2.1.5 HarriswordMap2


2.1.6 RandomwordMap2


2.1.7 Origin3


2.1.8 HarriswordMap3


2.1.9 RandomwordMap3

I think the visual words are approximately capturing the semantic meanings. I think Harris word maps perform better because they seem to more accurately output the same types of features in same color.

3.2

CchHarris

8x8 double

	1	2	3	4	5	6	7	8
1	14	4	3	2	0	0	2	5
2	3	9	4	2	3	4	0	0
3	1	4	11	3	3	1	3	0
4	0	0	0	7	0	2	1	0
5	0	1	2	0	11	1	2	0
6	0	1	0	1	0	6	1	0
7	0	1	0	3	3	4	9	0
8	2	0	0	2	0	2	2	15

3.2.1 Harris chisq classification

CchRandom

8x8 double

	1	2	3	4	5	6	7	8
1	12	4	4	1	0	3	3	3
2	1	9	5	0	2	1	1	0
3	4	4	11	3	3	3	3	0
4	0	0	0	7	1	0	3	3
5	0	2	0	0	10	2	2	0
6	0	1	0	4	0	6	0	0
7	0	0	0	5	4	2	5	1
8	3	0	0	0	0	3	3	13

3.2.2 Random chisq classification

CeuHarris

8x8 double

	1	2	3	4	5	6	7	8
1	9	5	6	2	1	3	5	6
2	3	10	3	0	3	1	1	1
3	3	2	9	2	4	1	1	0
4	1	0	1	5	2	3	4	1
5	0	1	1	1	9	0	0	0
6	0	1	0	2	0	8	3	0
7	1	1	0	5	1	3	5	0
8	3	0	0	3	0	1	1	12

3.2.3 Harris eu classification

CeuRandom

8x8 double

	1	2	3	4	5	6	7	8
1	11	6	5	2	1	3	2	3
2	1	10	5	1	2	2	2	1
3	3	2	7	1	2	1	2	0
4	2	0	0	12	2	3	4	3
5	0	1	3	0	9	1	0	0
6	0	1	0	1	0	5	0	0
7	1	0	0	3	3	2	6	0
8	2	0	0	0	1	3	4	13

3.2.4 Random eu classification

My Harris chisq classification accuracy is 51.25%. My Random chisq classification accuracy is 45.625%. My Harris eu classification accuracy is 41.875%. My Random eu classification accuracy is 45.625%.

It seems with chisq classification Harris performs better, however, with eu classification Random performs better. What surprised me is that the accuracy is slower than I thought. The reason I think is that may be the number of points (which is alpha in this assignment) I choose is too small. And I think the reason why sometimes Random performs better than Harris is that sometimes the determination feature is not all corner points.

From my testing result, it seems that chisq distance performs better. Let's say we compare two histograms H1 and H2. With eu distance, we have same weight for case1:H1[1]=0.011, H2[1]=0.001 and case2:H1[1] = 0.1, H2[1] = 0.11. However, it's not reasonable to have the same weight for these two cases. And in chisq distance, we can differ the weight of these two cases. So chisq is better to compare histograms.