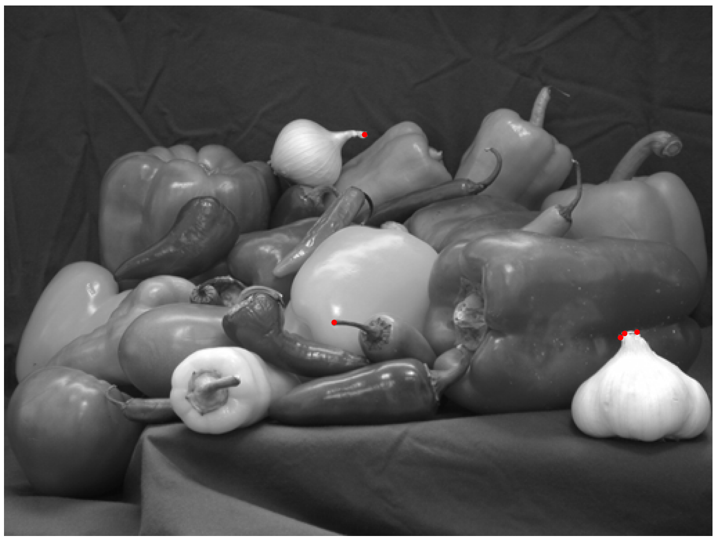
Monday, February 18, 2019

ECE 515_HW2

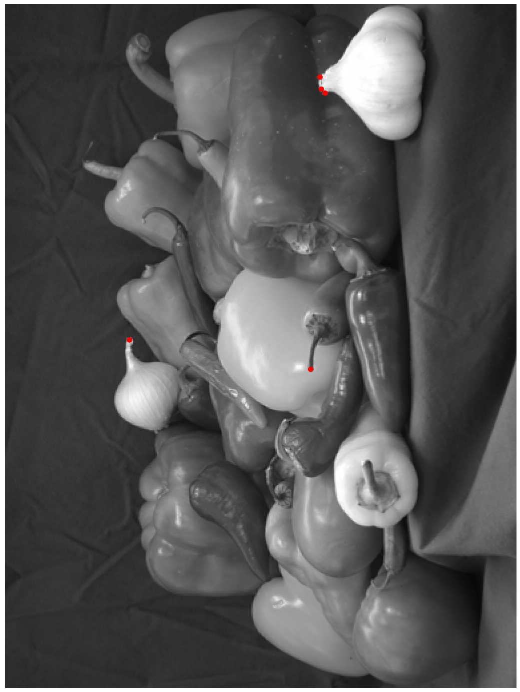
3.b QUESTION: What are the top five R values with corresponding row, col for the grayscale converted image 'peppers.png' with the following input 'myHCdetector(I, 2,0.01,5). List these out in your report pdf.



The top five R values with corresponding row, col.

row	col	R
241	446	2.3462e+09
237	458	1.5722e+09
94	261	1.5463e+09
238	449	1.3351e+09
230	239	1.0266e+09

3.c QUESTION: What are the top five R values with corresponding row, col? How do they compare to the non-rotated case? Is this expected?



The top five R values with corresponding row, col.

Row	Col	R
67	241	2.3462e+09
55	237	1.5722e+09
252	94	1.5463e+09
64	238	1.3351e+09
274	230	1.0266e+09

How do they compare to the non-rotated case? Is this expected?

The top five R values are totally the same. The priorly corresponding row values are equal to the column values after rotation. At each pixel, the summation of the priorly corresponding column and the row value after rotation is 513.

Yes, this is expected. The length of the image is 512, which is 513 minus 1. After rotation, the strength of the image hasn't changed but the corresponding site of the pixel have changed.

3.d ANSWER: What are the two observed execution times? What can you say about the difference? Is it expected?

In the prior R calculation method, the elapsed time is 0.778725 seconds.

When using the eigenvalues to calculate R, the elapsed time is 0.010079 seconds.

Using the eigenvalues to calculate R will cost much less time than the prior method.

Yes, it is expected. Using eigenvalues to calculate the Det and Tr of the matrix will save much time compared to the prior method.

4. Read the SIFT paper, "Distinctive Image Features from Scale-Invariant Keypoints", D. Lowe, IJCV, 2004. Now ANSWER the following questions:

a. What are two reasons to use DoG versus Laplacian?

It is more efficient to compute DoG function.

DoG function provides a close approximation to the scale-normalized Laplacian of Gaussian.

b. According to Figure 3, the number of scales per Octave reaches a repeatability maximum at what value? So why use anything greater than this?

In Figure 3 the highest repeatability is obtained at 3 scales per octave.

When the number of scales per octave increases, the number of key points will rises. Since the success of item recognization is depends on quantity of correct matches. It is optimal to use larger number in many case.

c. For the sigma value in prior smoothing, what value did D. Lowe choose? Why? What figure supports this?

D.Lowe chose sigma = 1.6.

Because sigma = 1.6 can provides close to optimal repeatability with acceptable cost of computation.

Figure 4.

d. According to Figure 8, what are a good choice for the number of orientations in each histogram and the nxn size? Why?

8 orientations in each histogram with a 4*4 descriptor is a good choice.

According to Figure 8, correct matches continues to increase until the size is 4*4. A 4*4 descriptor with 8 orientations performs better than lower dimensional descriptor.

e. For sensitivity to affine change, at what degree does the matching location and scale fall below 80% (see Figure 9)?

At 50 degree the matching fall below 80%.

f. According to D. Lowe, and Figure 11, choosing a distance ratio greater than 0.8 eliminates what percentage of false matches?

It eliminates 90% of false matches.