CV-682, Homework-2, part 3 solutions

SOLUTION 1:

To calculate the values of a 7-element Gaussian filter kernel, we need to first find the value of sigma (σ) using the relationship between the size of the filter (n) and σ:

As the given kernel is 7-element gaussian filter kernel, we have n = 7. Now the value of sigma will be :

6*sigma - 1 = n, we have n=7. Substituting the value of n n the equation we get

=> sigma = 8/6 => 1.33

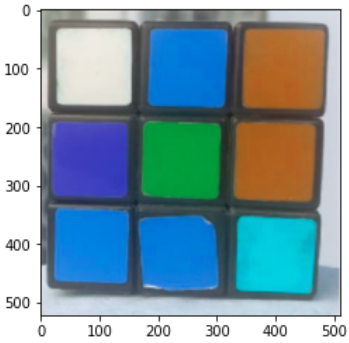
Using the gaussian formula => (1/ squareroot(2*pi*(sigma**2)) and * e**(-(x**2)/2*(sigma**2)) ;

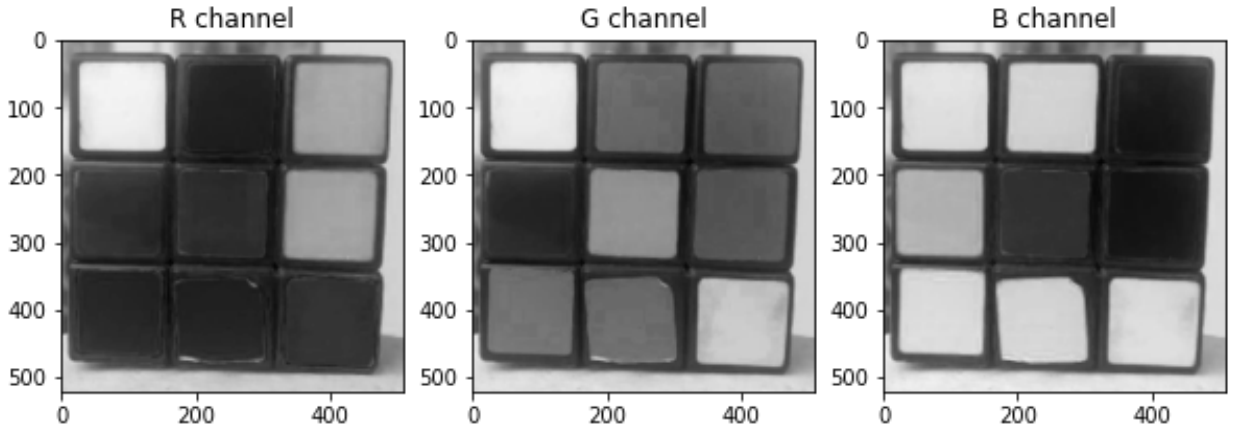
We substitute the values of sigma = 1.3333 and x values ranging from (-3,3) => 7 values.

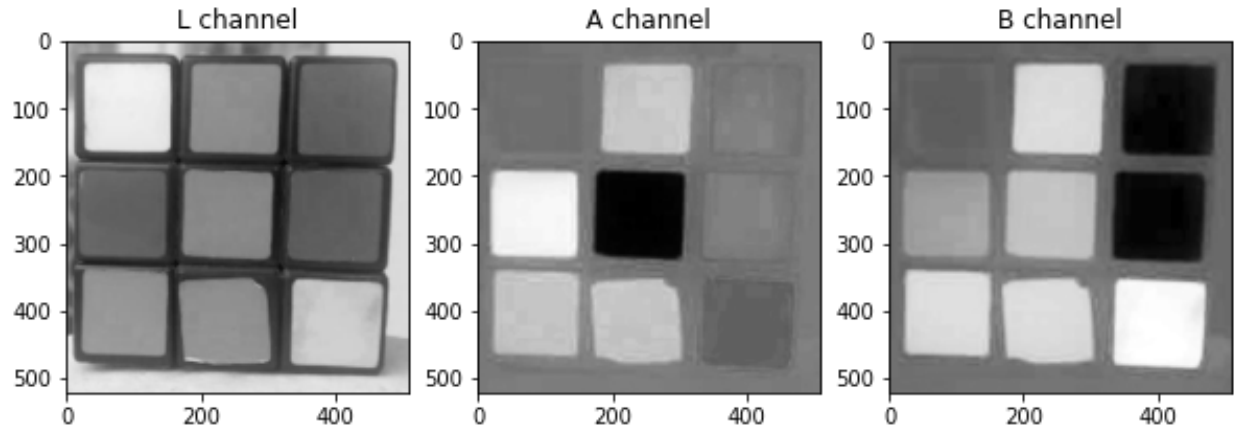
The final values are 0.004, 0.054, 0.242, 0.398, 0.242, 0.054, 0.004

SOLUTION 2:

For first image:







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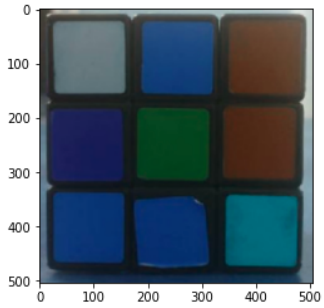
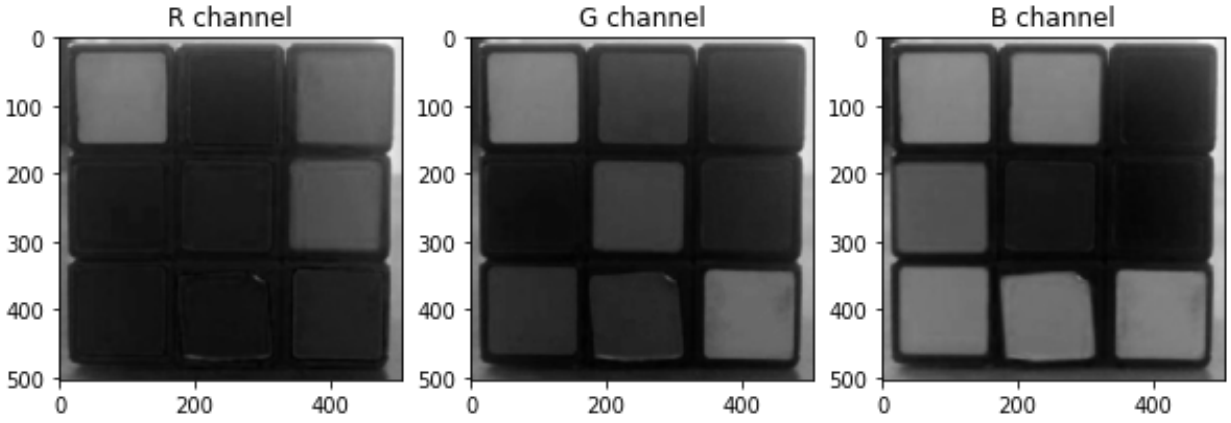
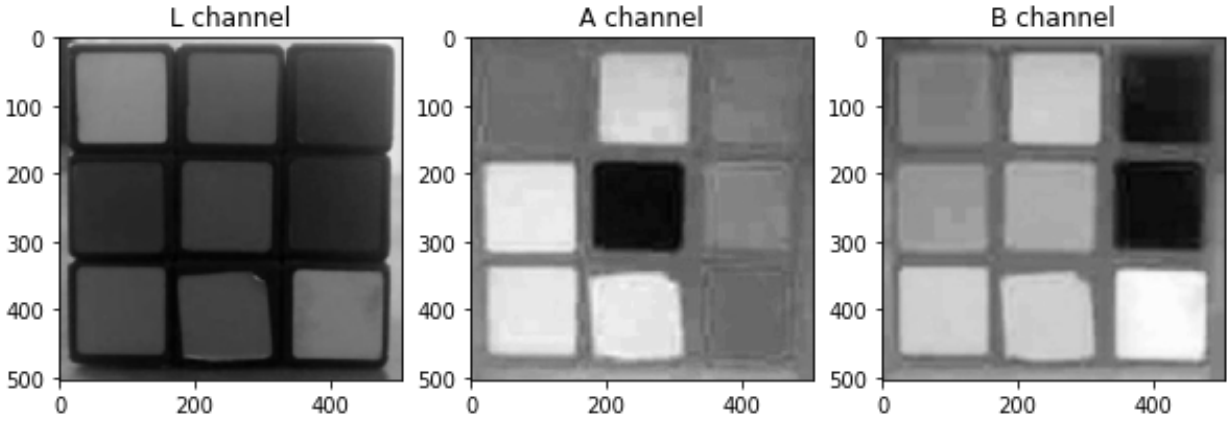
For second image:







Conclusion:

Lab color space is more better and accurate than rgb. As it is clear that both the input images consist of same objects with different lighting illumination factors on them, we can see that Lab can separate the illuminance change better than rgb space. The disadvantage of rgb space is it treats all the color coordinates under same equal space, so it may not work best under different lighting conditions.

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SOLUTION 3:

In image and signal processing, filter smoothing is done to reduce the noise and produce the best quality of the image, image smoothing process is carried out by altering all the pixel values with according to its neighboring pixel values. When designing a filter it is important to sum all the weights to 1, because normalization ensures that the output image signal will have the same energy as the input signal, if the filter weights doesn't sum up to 1, the produced output image could be either too dark or bright.

SOLUTION 4:

Answer:
$$\begin{matrix} -1 & -1 & -1 \\ -1 & 4 & -1 \\ -1 & -1 & -1 \end{matrix}$$

SOLUTION 5:

The main properties of the matrix M derived for corner detector are;

(1). If the current input image patch is a corner, then it is clear that there is change in derivates in both x and y directions. Hence the diagonal entries of the matrix here will be comparatively large.

(2). Also, non diagonal entries of the matrix will be small because they represent the correlation between horizontal and vertical derivatives.

(3). According to the assumed size of the window, the value entries will be changed. For example, if the window is big, more weights are considered and the smoothing is intense. Hence the result is blurred image.