EEE-6512 Image Processing and Computer Version

Homework #2

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2-4 Prob. What are the actual names of three types of cones, which are colloquially called red, green, and blue?

Solution: The three types of cones are namely L-. M-, and S-cones, which are respond to long-, middle, and short wave-length light.[1]

2-9 Prob. Match each term on the left with the lighting condition on the right.

Solution: Scotopic Vision – Starlight

Mesopic Vision – Moonlight

Photopic Vision - Sunlight[1]

2-10 Prob. Cones do not work in the dark, because they are not sensitive enough. What about the converse: Do rods produce meaningful signals in everyday well-lit conditions? Why or why not?

Solution: No, rods do not produce meaningful signals in everyday well-lit conditions. Under this condition, the rods could become “saturated” and stop work. It needs to take some minutes for cones to recover the function and restore the normal vision.

2-22 Prob. Describe the essential elements of a pinhole camera.

Solution: The essential elements are the image plane and a center of projection (Light rays from the source reflect off the surface of an object in the scene, travel through the focal point).[1]

2-24 Prob. Which has a longer wavelength, radio waves or X-rays? Which is more dangerous, and why?

Solution: The wavelength of radio waves is longer. X-rays are more dangerous, because frequency is inversely related to the wavelength, and the energy is proportional to the frequency. Therefore, X-rays has a shorter wavelength, which means that its energy is more than radio waves’. [1]

一些文字和图片的手机截图

描述已自动生成

图示

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文本, 信件

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Coding Section

Myhist:

Output image:

Use the command: output = myhist(imread('gramStainPos.png')), so the output image is the following:

图表, 直方图

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Use the command: output = myhist(imread('gramStainNeg.png')), so the output image is the following:

图表, 直方图

描述已自动生成

Use the command: output = myhist(imread('gramStainMix.png')), so the output image is the following:

图表, 直方图

描述已自动生成

programming question: myhist image inferences

From the histogram of the image, we know that if the pixel value is closed to 0, it means darkness. Instead, if the pixel value is closed to 255, it means the brightness. From the picture provided by the question, we know that the positive cell seems dark.

Ans: As the pixel values located between 0 and 50, the y-label (which means the numbers of each single value) is high, so there are many dark spots. The color of positive bacteria is dark, so that means that there are much positive bacteria in the image. As for the peak around 200, there may be the noise.

In the image gramStainNeg.png, as the pixel values located between 150 and 200, the y-label (which means the numbers of each single value) is high. The color of negative bacteria is bright, so that means that there are much negative bacteria in the image.

In the image gramStainMIx.png, the image seems to be added from gramStainNeg and gramStainMix. The peak values exist from both 0-50 and 150-200, so there are many negative and positive bacteria in the image.

Myquantize:

Output image:

Use the command: output = output = myquantize(imread('avengers.png'),quant\_num), so the output image is the following:

Quant\_num = 4

图片包含 照片, 男人, 人们, 对着

描述已自动生成

Quant\_num = 8

图片包含 户外, 照片, 一群, 站

描述已自动生成

Quant\_num = 32

图片包含 照片, 户外, 站, 一群

描述已自动生成

Quant\_num = 128

图片包含 照片, 户外, 一群, 男人

描述已自动生成

Analyze:

When the quan\_num is small, the difference between the original one the processed one can be more obvious. You can see that when the quan\_num is big like 128, the difference can be small. I think that the smaller number of gray levels are, the more details the processed image can lose,

Explanation of my code:

文本, 信件

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The function I establish use two input: an image matrix and a scalar variable: quant\_num.

Firstly, we should transform the input matrix into double type. And then, it is the most important one. We should first get the interval and use the floor function to get the lower bound of all the values of the matrix. (For example, all the values in one interval should be set into the point on the lower bound). Then, we should let the interval multiply the result after floor function. Finally, we get the integer value.

Reference

[1] B. H. Brown, R. H. Smallwood, D. C. Barber, P. V Lawford, and D. R. Hose, *Image processing and analysis*. 2004.