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ECE 5470

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Homework 1

1. When you enter a dark theater on a bright day, it takes an appreciable interval of time before you can see well enough to find an empty seat. Which of the computational processes of the human visual system explained in the Gonzales and Woods textbook are at play in the situation and how?
   1. What is at play in this situation is what is known as brightness adaptation, where the eye accomplishes a large variation in dynamic range by changing its overall sensitivity, transitioning usages between cones and rods depending on the amount of ambient light. At each adaptation level there is also a subjective brightness range much smaller than the overall adaptation range but allows simultaneous viewing of both darks and lights.
2. A CCD camera chip of dimensions 7x7 mm and having 1024x1024 pixel elements is focuses on a square, at an area located 500mm away. The focal length of the camera is 20 mm. How many line pairs per mm will this camera be able to resolve?
   1. Also the size of the square is 175mm x 175mm
3. High definition television (HDTVI) generates images with a resolution of 1920 horizontal TV pixels and each field being 1/60th of a second in duration. The width-to-height aspect ratio of the images is 16: 9. A company has designed an image capture system that generates digital images from HDTV images. Each pixel in the images has 24 bits of intensity resolution, 8 bits each for a red, a green, and a blue image. These three “primary” images from a color image.
   1. How many bytes would it take to store 2 hours HDTV program without compression?
4. Write a code capable of zooming and shrinking an image by pixel replication. Assume that the desired zoom/shrink factors are integers. You may ignore aliasing effects.
   1. Download Fig-1-3.tif and use your program to shrink the 675x886 pixels image from 300dpi to 100dpi. Use your program to zoom the image in (b) back to 300dpi. Explain the reasons for their differences.

Code:



Output:



1. Write a code to change image intensity level. You need to download Im-1-4.tif.
2. Use your code to change intensity level from 256 level to 128 level. Use your code to change intensity level from 256 level to 32 level

Code:



Output:



1. Explain their differences.
   1. The difference between the 128 level and 32 level is less different types of greys, due to only having 128 or 32 levels between 0 – black, and 128/32 – white, which means that every level has a larger difference from the previous level. In this exact image, this is not very noticeable, even with the 5-bit quantization (32 levels).
2. Download Im-1-5a.tif and Im-1-5a.tif
   1. Write your code to find the difference between Im-1-5a.tif and Im-1-5b.tif. Write your own code to enhance different

Code:



Output:

