CS3570 Introduction to Multimedia

Homework #1

Due: 11:59pm, 3/30/2015

1. Demosaicing (30%)

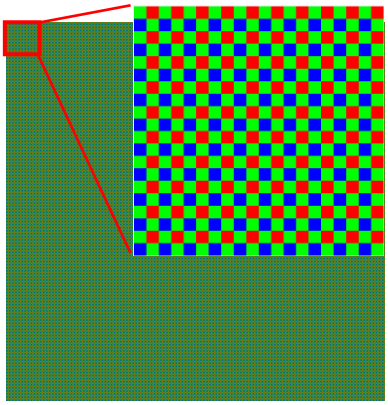
(a) 'BFCatvengers.png' is an image filtered by Bayer color filter ('BayerFilter.bmp'). Write a color interpolation (demosaicing) function to recover the RGB color image by using the nearest neighbor algorithm.

(b) Show the absolute color differences between the result of (a) and the original image 'Catvengers.png'. Compute the PSNR of the color interpolation result in (a).

Note : You CANNOT use the MATLAB functions 'demosaic'

BFCatvengers.png

Catvengers.png



2. Dithering (30%)

Perform the following dithering techniques to transfer a gray scale image into a binary image on the attached image and one image taken/downloaded by yourself to best demonstrate the effect of the dithering technique. Compare the results with the following two methods listed in (a) and (b) below and discuss what you observe.

(a) Thresholding

(b) Error diffusion dithering with two provided masks (given below)

※Requirements:

(1) Pick the threshold value in problem (a) by yourself and discuss why you chose it.

(2) You can use different images for the different techniques to show better effect. And you can use built-in function rgb2gray to convert your image from color to gray scale.

Masks of error diffusion dithering

Mask #1

$$\frac{1}{16}\begin{bmatrix} - & \# & 7 \\ 3 & 5 & 1 \end{bmatrix}$$

Mask #2

$$\frac{1}{48}\begin{bmatrix} - & - & \# & 7 & 5 \\ 3 & 5 & 7 & 5 & 3 \\ 1 & 3 & 5 & 3 & 1 \end{bmatrix}$$

3. Interpolation (40%)

Write the image interpolation function to upsample image “Catvengers_gray” to 4 times the original width and height. Implement the following two different interpolation methods and show the 4X (both x and y directions) upsampled image. (You should not use Matlab built-in functions imresize)

(a) Nearest-neighbor (NN) interpolation

(b) Bilinear interpolation

(c) Compare results from (a) & (b). Discuss what you observe.