Supplement to Chapter 3 of *The Science of Digital Media* – Digital Image Processing

Worksheet – Digital Imaging > Image Dithering[1]

Before completing this worksheet, you should view the on-line interactive tutorial "Dithering." This tutorial can be accessed at the website for *The Science of Digital Media*.

1. Explain how random dithering (also called noise dithering) is done on a grayscale image.

2. The pixel values for a 6 x 6 portion of a grayscale image are given below. You are going to apply pattern dithering to these pixels. The first step is scaling the values so that they are between 0 and 9. Compute the scaled values and put them in the blank table below.

176	190	195	67	60	55
178	188	180	69	50	52
182	188	100	75	52	50
182	180	100	75	52	52
182	179	98	75	52	45
170	160	90	29	25	24

5. The next step in pattern dithering is to apply the pattern. Use the pattern below:

1	7	4
5	8	3
6	2	9

What are the pixel values after applying the pattern mask? Insert them into the table below.

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3. Now let's try error diffusion dithering. Use the same pixel values.

176	190	195	67	60	55
178	188	180	69	50	52
182	188	100	75	52	50
182	180	100	75	52	52
182	179	98	75	52	45
170	160	90	29	25	24

and apply the mask below to the six values in the upper left corner. Let *pix(i,j)* denote the pixel value in position (*i,j*) of the table. The upper six values would be *pix(0,0)*, *pix(0,1)*, *pix(0,2)*, *pix(1,0)*, *pix(1,1)*, and *pix(1,2)*. Compute the values that result from applying the mask to these pixels. Show your work.

mask:

	p	7
3	5	1

176			67	60	55
			69	50	52
182	188	100	75	52	50
182	180	100	75	52	52
182	179	98	75	52	45
170	160	90	29	25	24

4. Now compute the error-diffused values for *pix(0,1)*, *pix(0,2)*, *pix(0,3)*, *pix(1,1)*, *pix(1,2)*, and *pix(1,3)*. Show your work.

				60	55
				50	52
182	188	100	75	52	50
182	180	100	75	52	52
182	179	98	75	52	45
170	160	90	29	25	24