Math 155, Spring, Vese

Homework assignment # 6

Due on Wednesday, June 9 (no deadline extension)

[1] Suppose that, instead of using quadrilaterals, you use triangular regions in Section 5.11 to establish a geometric spatial transformation and gray-level interpolation. What would be the equations analogous to equations (5.11-5), (5.11-6), and (5.11-7) for triangular regions ?

[2] Color Edge Detection

Download the color image of Lena Fig6.38a.jpg. Compute at each interior point (x, y) the "value of the rate of change" given by $F(\theta)$ (see Section 6.7.3). Thus obtain an edge map of the image by plotting $F(\theta)$, as in Figure 6.46 (b).

- At every interior point (x, y), use the following central approximations to the 1st order partial derivatives:

$$\frac{\partial f(x,y)}{\partial x} \approx (f(x+1,y) - f(x-1,y))/2,$$

$$\frac{\partial f(x,y)}{\partial y} \approx (f(x,y+1) - f(x,y-1))/2.$$

- Use as usual the "imread" Matlab command

f=imread('Fig6.38a.jpg');

[M N P]=size(f);

This will produce a vector-valued function f of dimensions $M = 512$, $N = 512$, and $P = 3$ (the red channel is given by $f(i, j, 1)$, the green channel by $f(i, j, 2)$ and the blue channel by $f(i, j, 3)$, with $i = 1, ..., M$ and $j = 1, ..., N$ being the spatial dimensions of the color image).

- Do not include in your calculations the boundary points, for simplicity.

[3] Give the main steps of edge finding using the zero-crossings of the Laplacian of Gaussian (as in Example 10.5).

Implement and apply this method to the angiogram image from Figure 10.15(a), as in example 10.5 (do not compare with the Sobel gradient).