Homework 2 : Due February 28, 2011

CS 778 / 578

February 16, 2011

Submit all Matlab code and a report containing all requested images via ecampus.

1 Segmentation using active contours

A template is provided which gives the framework for this assignment. Included in the template is code which will load the 'abct' abdominal CT image, and initialize the curve inside of the liver. You may use more points to represent the curve if the speed of execution is adequate. Pick parameters α, β, γ and design the external energy so that the liver is segmented.

Incorporate a balloon inflation force (described and referenced in the notes) which propagates the curve in the outward normal direction. Code which computes the normal is provided. Compute the speed in the normal direction using the equation

$$f = \frac{1}{1 + (||\nabla I||/K)^e} - \epsilon. \tag{1}$$

Select appropriate values for K, the exponent e and the offset ϵ.

You will also need to define appropriate finite difference matrices, and the matrix A as described in the template.

Submit a figure showing the curve on top the image in the final converged state.

Describe your energy functional in the report. You may use functions from the 'Snakes' paper, or functions from another paper, a function of your own design, or a combination. However, it is possible to achieve an acceptable segmentation using the inflation force described about and partially implemented in the template.

2 If you are registered for CS 778

2.1 Subdivision

Incorporate a subdivision scheme to increase the number of points in your curve during the evolution. Use the midpoint subdivision 3 times during the curve evolution process. The midpoint subdivision scheme involves doubling the number of points in the curve by inserting new points halfway between each adjacent pair of points in the curve.

The function Subdivide(x,y) has been provided in the template. For full credit define the appropriate matrix S to perform the subdivision.