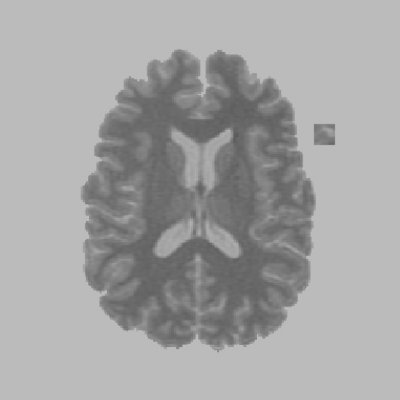
**HSM187 Coursework**

**Reliability and validity of segmentation**

What is main concern with segment area from the image using level set method? Comment on reliability of the level set method on following images and explain your answer with underlying mathematics.



(a)



(b)

Image Analysis Exercise:

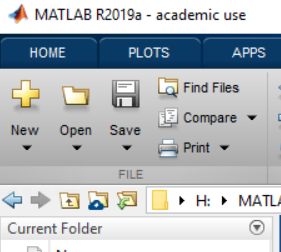
Following code is an example of level set method. It starts with creating circular contour. However, you must keep LevelSet.m and UpwindGrad.m files into same folder as the following file. You are required to modify following code to create an initial square contour. The following lines are useful in achieving them.

r = (size(I,1))-ctr(1)/3;

and

phi2 = max( abs(X-ctr(1)), abs(Y-ctr(2)) ) - r;

You just have to place these lines in right place in the following code and run it in Matlab. You have to copy modified code using “new script” in Matlab.



Make sure that the new script names “segment\_brain.m”. Save this file in MATLAB folder along with other two files and all images which are available on the campusmoodle (image analysis data).

%kp

% =====================

% % -- LEVELSET method --

% =====================

%

close all;

% Read in the image

I = imread('brain.jpg');

I = double(I(:,:,1) );

% Initialization of Active Contour

% Build the initial embedding function, phi, which helps levet set to zero.

% This is an upward-opening cone sunken down 180 so that its

% radius at the zero level set is 180 pixels.

% [2] for sensible phi

% Could also use a paraboloid. Also, could blur this initial

% phi....

ctr = floor((size(I)+1) /2.3);

[X Y] = meshgrid((1:size(I,1))-ctr(1), (1:size(I,2))-ctr(2));

phi = realsqrt(X.^2 + Y.^2) - 180;

% [1] Call the Levelset function

figure(1);

phi\_final = LevelSet(I,phi);

% [1] Display final results

figure(1);

imshow(I, []);

hold on;

contour(phi\_final,[0 0],'y','LineWidth',2);

hold off;

figure(2);

surf(phi\_final, 'LineStyle', 'none');

colormap jet;

caxisauto;

Task 2:

Use image file “A2\_UCL” instead of the “brain” file and run the level set code successfully.

Task 3.

Modify the following lines in “UpwindGrad.m” to use forward differencing (drf and dcf) only. Grab the resulting images of “brain” and include in the report. Modify following lines again and use only backward differencing (drb and dcb) and run again. Grab the resulting images of “brain” and include in the report.

Dr\_plus = max(drf,0) + min(drb,0);

Dr\_minus = min(drf,0) + max(drb,0);

% [1]

Dc\_plus = max(dcf,0) + min(dcb,0);

Dc\_minus = min(dcf,0) + max(dcb,0);

The report should include

* Modified codes and resulting images
* Introduction on level set method
* Method of using level set method
* Key comments on suitability of method for types of images (MRI, CT etc) and its effectiveness in finding the anomalies in the human anatomy. Critically review literature to show at least three examples of the method used in biomedical image analysis.