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global I_Raw I_Information I_Detect

% Read & Display dicom format file
[path,~] = imgetfile();
I_Raw = dicomread(path);
figure('Name', 'Original', 'NumberTitle', 'off');
subplot(2,4,1);imshow(I_Raw,[]);title("Input MRI Brain Image");
I_Raw = rgb2gray(I_Raw);
I_Information = dicominfo(path);

% Convert image into binarize form
I_Filter = imbinarize(I_Raw,'adaptive','Sensitivity',0.59);
subplot(2,4,2);imshow(I_Filter);title("Binarize Image");

% Remove Noise After applying 5x5 median filter
I_Filter = medfilt2(I_Filter, [5,5]);
subplot(2,4,3);imshow(I_Filter);title("Remove Noise");

% Fill gaps in image using imclose funtion & disk-shaped structue element.
SE_Filter = strel('disk',2);
I_Filter = imclose(I_Filter,SE_Filter);
subplot(2,4,4);imshow(I_Filter);title("Morphological Image");

% Creating an Elliptical mask
X_Size = size(I_Raw, 2);
Y_Size = size(I_Raw, 1);
X_Center = X_Size/2;
Y_Center = Y_Size/2;
X_Radius = X_Center - 20;
Y_Radius = Y_Center - 30;

[Col,Row] = meshgrid(1:X_Size,1:Y_Size);

Mask = ((Row - Y_Center).^2 ./ Y_Radius^2 ) + ((Col - X_Center).^2 ./ X_Radius^2 ) <= 1;

% Apply Elliptical Mask
I_Detect = logical(I_Filter .* Mask);
%I_Detect = logical(I_Filter);
subplot(2,4,8);imshow(I_Detect);title("Appying Elliptical mask");

% Extracts all connected components where the area of the objects is in the [700 4000]
I_Detect = bwareafilt(I_Detect,[700 4000]);

subplot(2,4,7);imshow(I_Detect);title("Isolated Tumor Image");

% Fill small gaps in isolated image using imclose funtion & disk-shaped structuring element.
SE_Detect = strel('disk',6);
I_Detect = imclose(I_Detect,SE_Detect);
subplot(2,4,6);imshow(I_Detect);title("Morphological Tumor Image");

% Draw outline around tumor

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subplot(2,4,5);imshow(I_Raw,[]);title("MRI With Outlined Tumor");

hold on
I_Idx = bwboundaries(I_Detect, 'noholes');
for k = 1:length(I_Idx)
    boundry = I_Idx{k};
    plot(boundry(:,2),boundry(:,1),'y','linewidth',1.5 )
end
hold off

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