IVA SEMINAR

LEVEL SET SEGMENTATION OF TUMOR DETECTION

MAHALAKSHMI S 205229118


```
%% Input

s=imread('br.PNG');
figure;
imshow(s);
title('Input image','FontSize',20);

%% Filter or preprocessing image

num_iter = 10;
delta_t = 1/7;
kappa = 15;
option = 2;
disp('Preprocessing image please wait . . .');
inp = anisodiff(s,num_iter,delta_t,kappa,option);
inp = uint8(inp);

inp=imresize(inp,[256,256]);
if size(inp,3)>1
 inp=rgb2gray(inp);
end
```

```
%% Binarization

sout=imresize(inp,[256,256]);
t0=60;
th=t0+((max(inp(:))+min(inp(:)))./2);
for i=1:1:size(inp,1)
 for j=1:1:size(inp,2)
 if inp(i,j)>th
 sout(i,j)=1;
 else
 sout(i,j)=0;
 end
 end
end


%% Morphological Operation

label=bwlabel(sout);
stats=regionprops(logical(sout),'Solidity','Area','BoundingBox');
density=[stats.Solidity];
area=[stats.Area];
high_dense_area=density>0.6;
max_area=max(area(high_dense_area));
tumor_label=find(area==max_area);
tumor=ismember(label,tumor_label);

%% Bounding box

box = stats(tumor_label);
wantedBox = box.BoundingBox;

%% Getting Tumor Outline - image filling, eroding, subtracting
% erosion the walls by a few pixels

dilationAmount = 5;
```

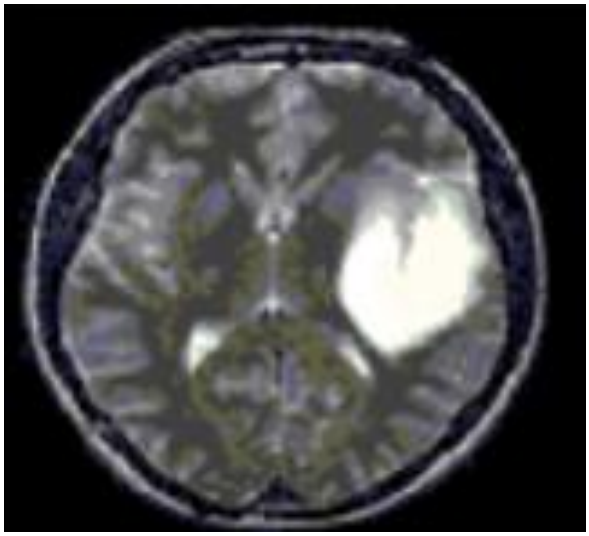
```
rad = floor(dilationAmount);
[r,c] = size(tumor);
filledImage = imfill(tumor, 'holes');
for i=1:r
 for j=1:c
 x1=i-rad;
 x2=i+rad;
 y1=j-rad;
 y2=j+rad;
 if x1<1
 x1=1;
 end
 if x2>r
 x2=r;
 end
 if y1<1
 y1=1;
 end
 if y2>c
 y2=c;
 end
 erodedImage(i,j) = min(min(filledImage(x1:x2,y1:y2)));
 end
end

%% subtracting eroded image from original BW image
tumorOutline=tumor;
tumorOutline(erodedImage)=0;

%% Level Set Segmentation
switch flag

    case 1

Img=imread('b.jpg');
Img=double(Img(:,:,2));
title('100 iterations')
```

```
nu=0.01*255*255;
sigma = 6;
iter_outer=200;
iter_inner=150;
n =[50;90];  m=[30;90];

    case 2

Img=double(Img(:,:,2));
title('200 iterations')
nu=0.01*255*255;
sigma = 35;   % or 20
iter_outer=150;
iter_inner=120;
n =[400;200];  m=[142;247];

    case 3

Img=double(Img(:,:,2));
title('300 iterations')
nu=0.1*255*255;
sigma = 12;     % or 6
iter_outer=100;
iter_inner=100;
n =[176;245];  m=[59;114];

    case 4
Img=double(Img(:,:,2));
title('400 iterations')
nu=0.1*255*255;
sigma = 35;
iter_outer=100;
iter_inner=70;
n =[204;70];  m=[25;207];

    case 5
```

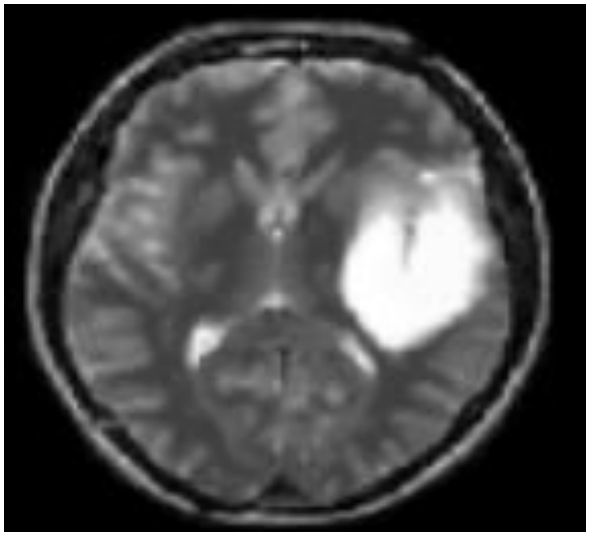
```
Img=double(Img(:,:,2));
title('500 iterations')
nu=0.1*255*255;
sigma = 12;
iter_outer=100;
iter_inner=150;
n =[190;117];  m=[71;135];

    case 6

Img=double(Img(:,:,1));
title('Final contour, 617 iterations')
nu=0.01*255*255;
sigma = 12;
iter_outer=100;
iter_inner=150;
n =[130;209];  m=[140;49];

%% Inserting the outline in filtered image in green color

rgb = inp(:,:,[1 1 1]);
red = rgb(:,:,1);
red(tumorOutline)=255;
green = rgb(:,:,2);
green(tumorOutline)=0;
blue = rgb(:,:,3);
blue(tumorOutline)=0;
tumorOutlineInserted(:,:,1) = red;
tumorOutlineInserted(:,:,2) = green;
tumorOutlineInserted(:,:,3) = blue;

%% Display Together

set(0,'defaultfigureposition',[20 60 1500 700])
figure
subplot(2,3,1);imshow(s);title('Input image','FontSize',20);
subplot(2,3,1);title('Input image','FontSize',20);
```

```
subplot(2,3,2);title('Filtered image','FontSize',20);
subplot(2,3,3);title('Bounding Box','FontSize',20);
subplot(2,3,4);title('Tumor alone','FontSize',20);
subplot(2,3,5);title('Tumor Outline','FontSize',20);
subplot(2,3,6);title('Detected Tumor','FontSize',20);
subplot(2,3,2);imshow(inp);title('Filtered image','FontSize',20);
subplot(2,3,3);imshow(inp);title('Bounding Box','FontSize',20);
hold on;rectangle('Position',wantedBox,'EdgeColor','y');hold off;
subplot(2,3,4);imshow(tumor);title('Tumor alone','FontSize',20);
subplot(2,3,5);imshow(tumorOutline);title('Tumor
Outline','FontSize',20);
subplot(2,3,7);imshow(img);title('100 iterations','FontSize',20);
subplot(2,3,8);imshow(img);title('200 iterations','FontSize',20);
subplot(2,3,9);imshow(img);title('300 iterations','FontSize',20);
subplot(2,3,10);imshow(img);title('400 iterations','FontSize',20);
subplot(2,3,11);imshow(img);title('500 iterations','FontSize',20);
subplot(2,3,12);imshow(img);title('Final contour, 617
iterations','FontSize',20);
subplot(2,3,13);imshow(tumorOutlineInserted);title('Detected
Tumor','FontSize',20);
```

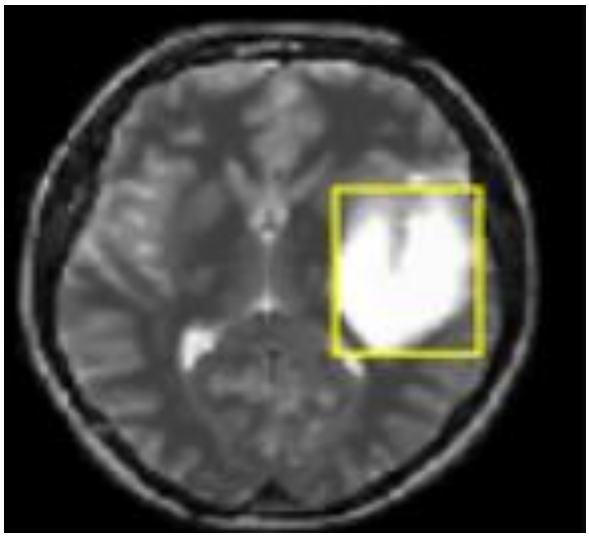
INPUT IMAGE:



Filtered Image:

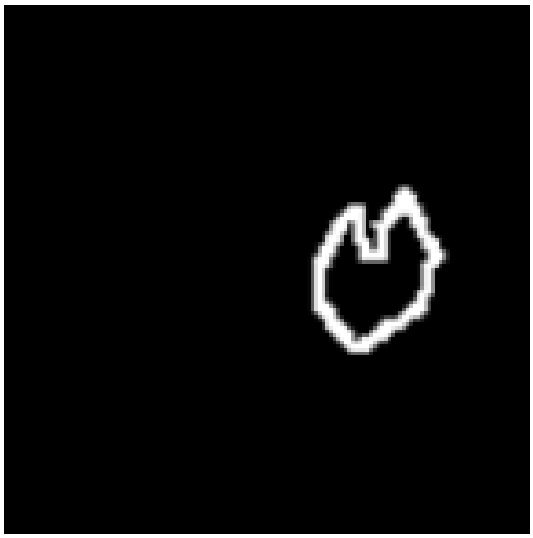


Bounding Box:

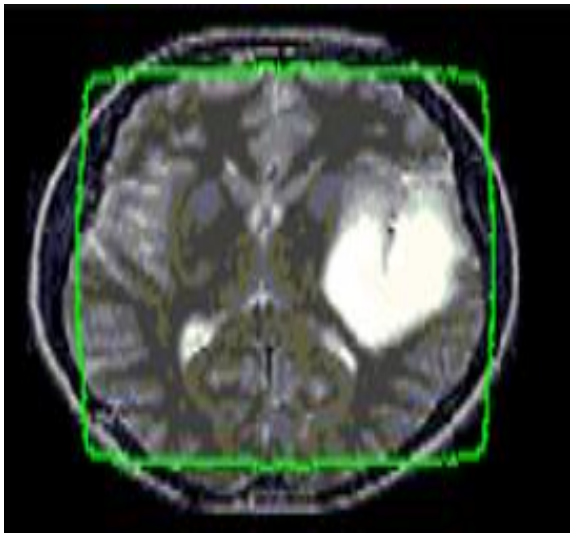


Tumor Alone:

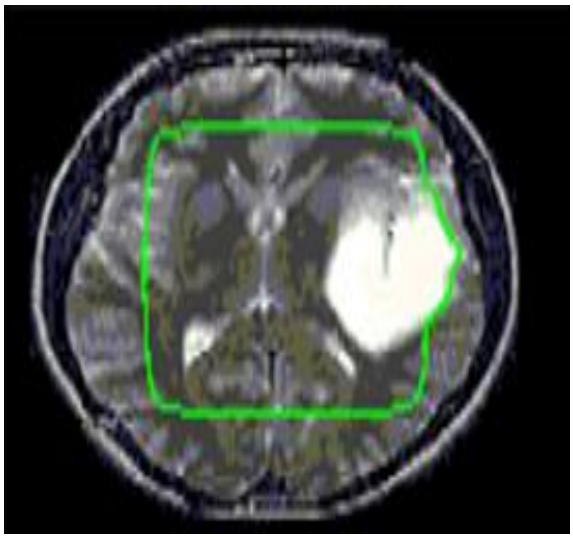
Tumor Outline:



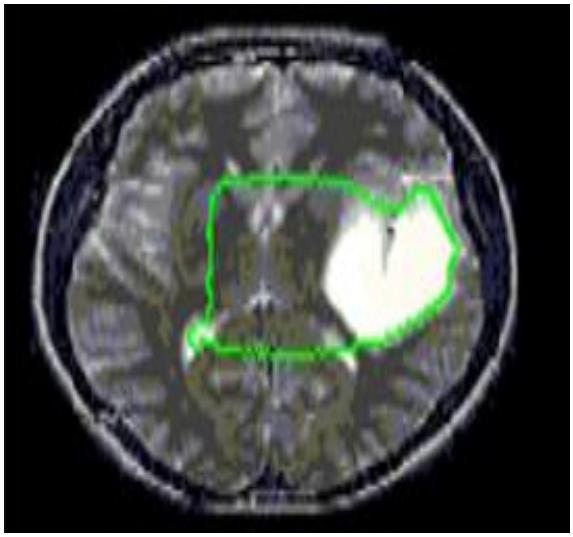
100 iterations:



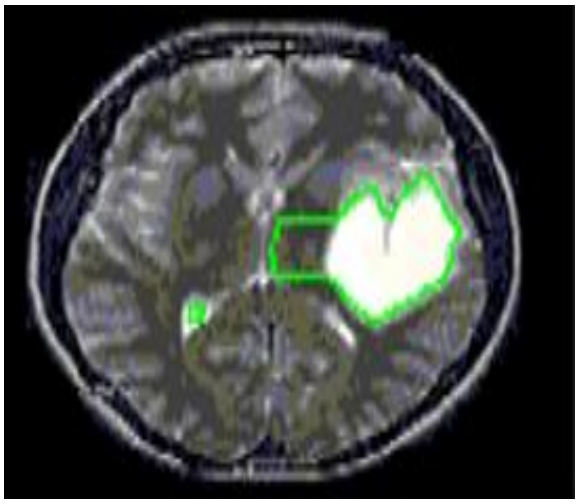
200 iterations:



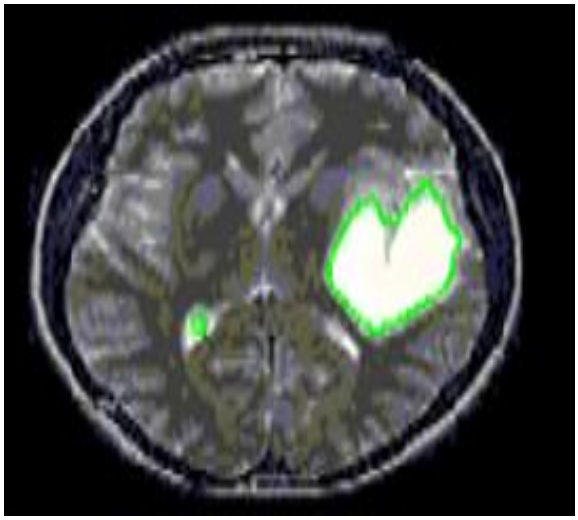
300 iterations:



400 iterations:



500 iterations:



617 iterations:

Tumor Detection