

```
clc
close all
clear all
```

Input

```
[I,path]=uigetfile('*.jpg','select a input image');
str=strcat(path,I);
s=imread(str);

figure;
imshow(s);
title('Input image','FontSize',20);
```

Filter

```
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
figure;
imshow(inp);
title('Filtered image','FontSize',20);
```

thresholding

```
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);

if max_area>100
    figure;
    imshow(tumor)
    title('tumor alone','FontSize',20);
else
    h = msgbox('No Tumor!!','status');
    %disp('no tumor');
    return;
end

```

Bounding box

```

box = stats(tumor_label);
wantedBox = box.BoundingBox;
figure
imshow(inp);
title('Bounding Box','FontSize',20);
hold on;
rectangle('Position',wantedBox,'EdgeColor','y');
hold off;

```

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
figure

```

```
imshow(erodedImage);  
title('eroded image', 'FontSize', 20);
```

subtracting eroded image from original BW image

```
tumorOutline=tumor;  
tumorOutline(erodedImage)=0;
```

```
figure;  
imshow(tumorOutline);  
title('Tumor Outline', 'FontSize', 20);
```

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;
```

```
figure  
imshow(tumorOutlineInserted);  
title('Detected Tumor', 'FontSize', 20);
```

Display Together

```
figure  
subplot(231);imshow(s);title('Input image', 'FontSize', 20);  
subplot(232);imshow(inp);title('Filtered image', 'FontSize', 20);  
  
subplot(233);imshow(inp);title('Bounding Box', 'FontSize', 20);  
hold on;rectangle('Position', wantedBox, 'EdgeColor', 'y');hold off;
```

```
subplot(234);imshow(tumor);title('tumor alone', 'FontSize', 20);  
subplot(235);imshow(tumorOutline);title('Tumor Outline', 'FontSize', 20);  
subplot(236);imshow(tumorOutlineInserted);title('Detected Tumor', 'FontSize', 20);
```