UTM

UNIVERSITI TEKNOLOGI MALAYSIA

SCSV3213 - 01 FUNDAMENTAL OF IMAGE PROCESSING
DR. MD SAH HJ SALAM

ASSIGNMENT 3: IMAGE RESTORATION/ ENHANCEMENT

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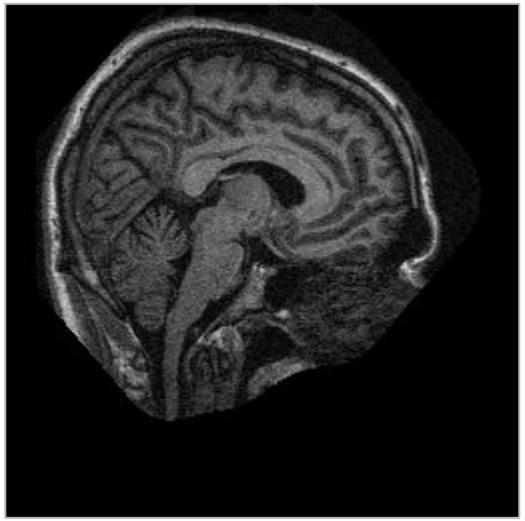
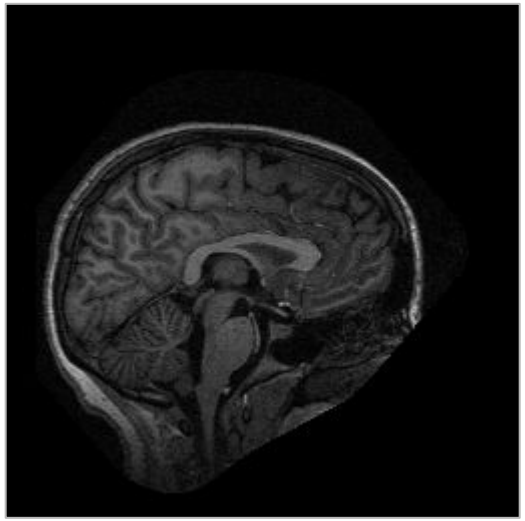
Two medical images

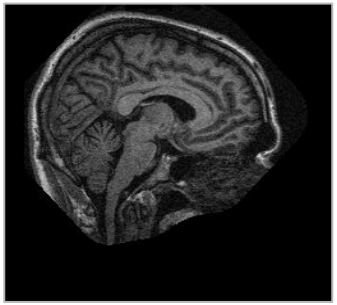


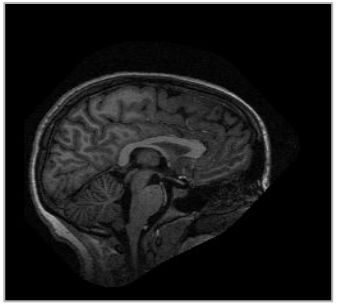
OAS1_0018_MR1_mpr-1_anon_sag_66



OAS1_0014_MR1_mpr-3_anon_sag_66

PROBLEM





The image given to be used for this assignment 3 is about medical images. As we all know, the outcome of biomedical imaging technology whether ultrasound, MRI or CT scans are always with grayscale.

Here, the application of image processing may be used for medicinal uses to diagnose disease from images.

In order to accomplish this objective, image processing methods must be implemented by image restoration or enhancement. For this assignment, I will apply some of the filters that have been learned in class to the medical images I have selected to achieve the best results for analyzing the images

FLOW CHART

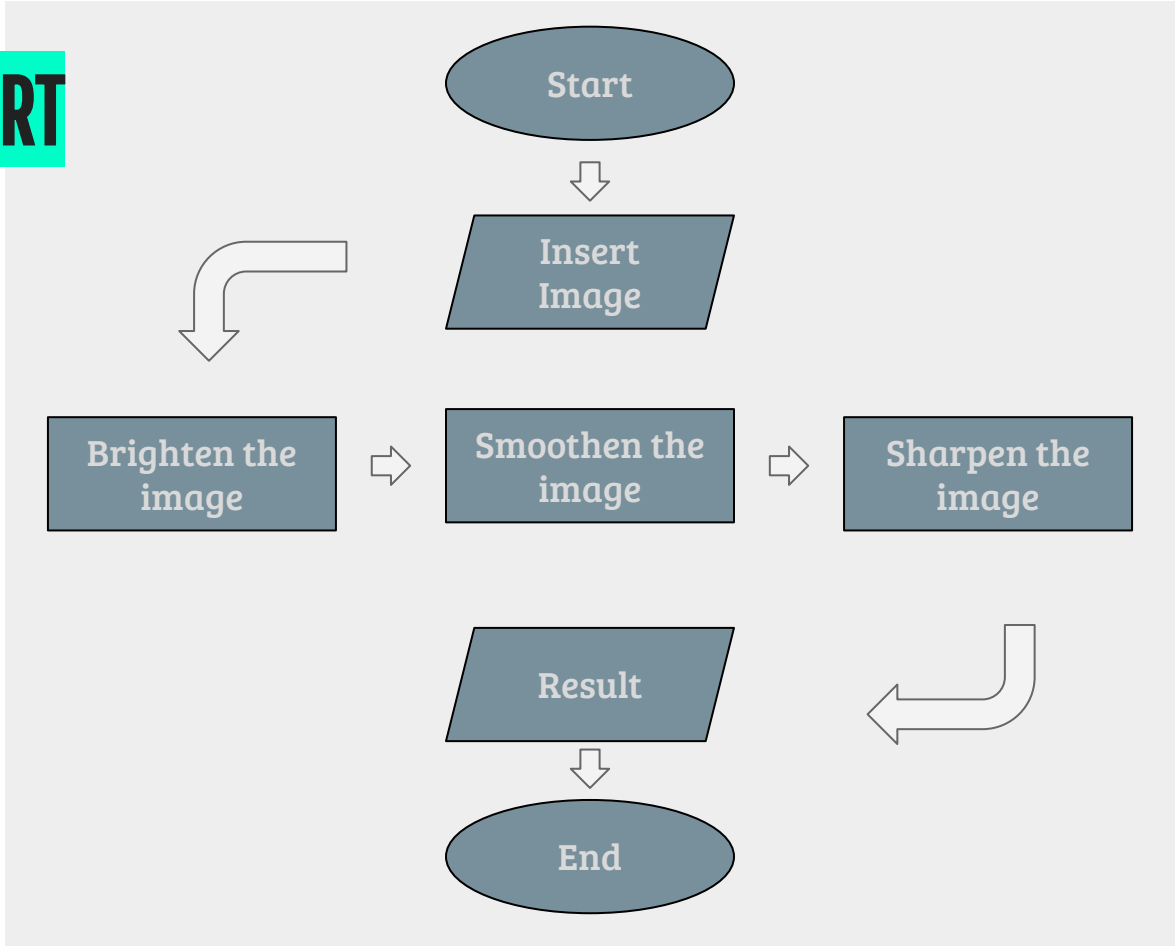
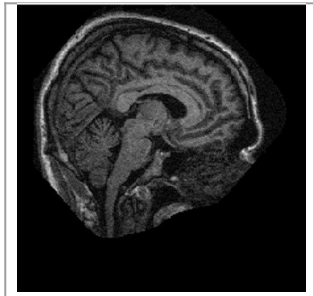
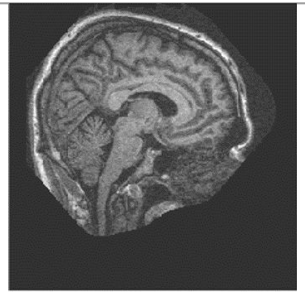
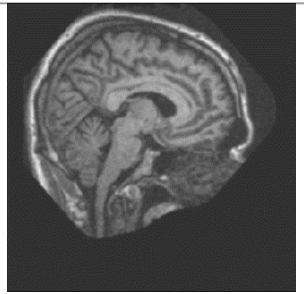
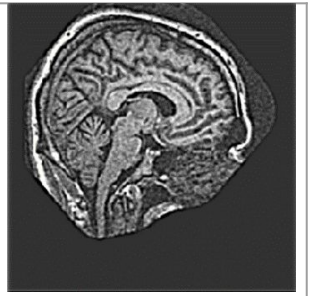

Start
Insert Image
Brighten the image
Smoothen the image
Sharpen the image
Result
End

IMAGE 1

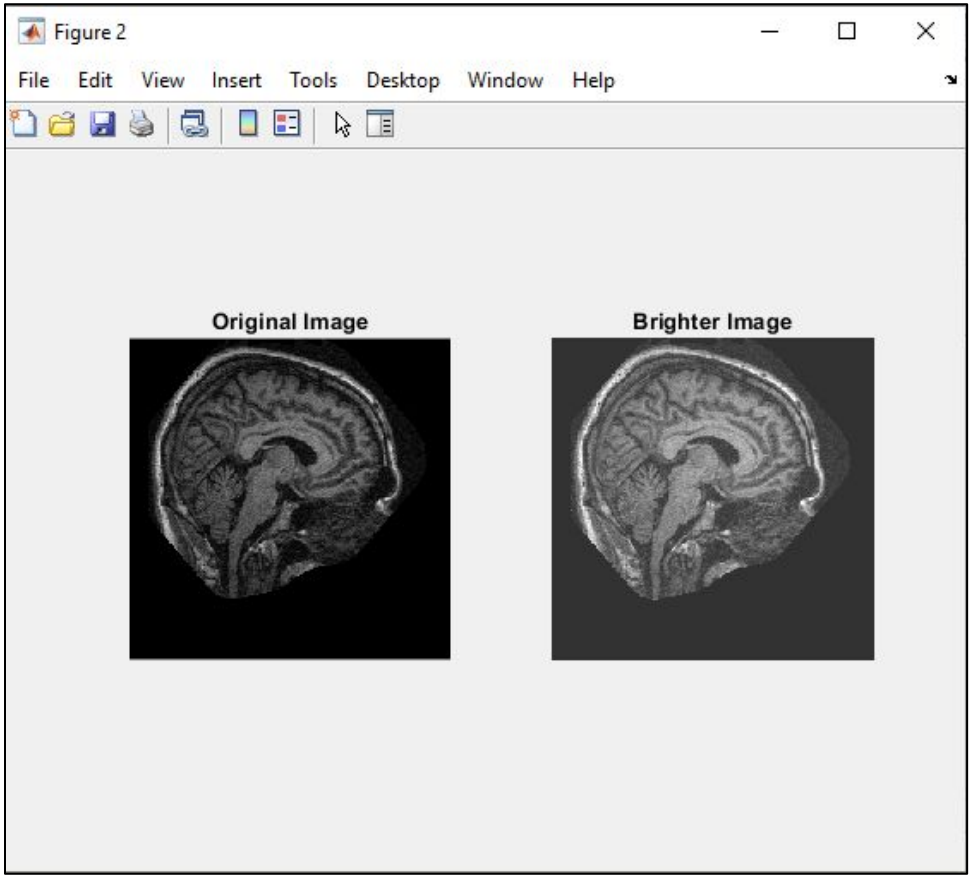
RESTORATION / ENCHANCEMENT

Process flow of the solution

			
Firstly, the **imread** function is used to read the selected image to the workspace.	To brighten the image, the **imadd** function is used to add an intensity value of 50 to the image.	**imfilter** uses a gaussian filter to smooth the image to remove noise from the image.	Sharpen the image using the **imsharpen** function to overcome the blurry.

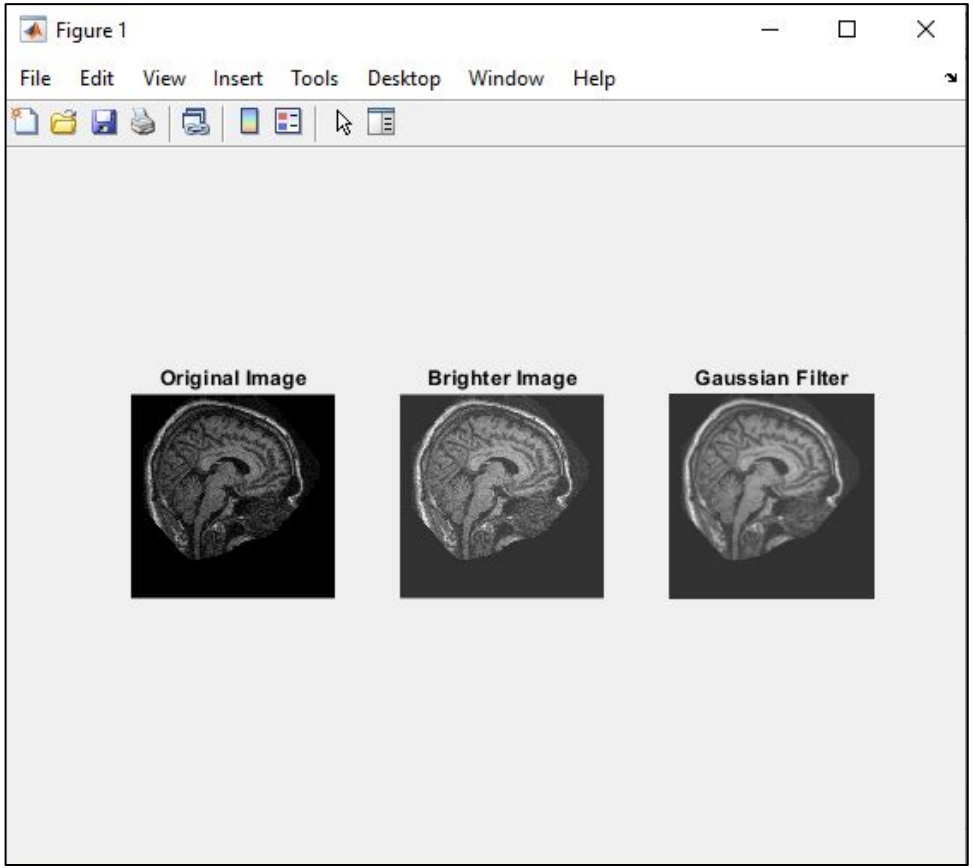
Explanation of the process

From the images provided for assignment 3, I used the **imadd** function to add a little brightness to the images provided. After adding a little brightness to the image there will be a little noise in the image. So, to reduce noise on the image, I use a low pass filter that can smooth the image using a gaussian filter. To use gaussian filter **fn = fspecial ('gaussian', [3 3], 1);** used together with the default value of hsize and using the sigma value of 1. **C = imfilter (B, fn);** the **imfilter** function addresses the filters that need to be applied in the image. And the result will produce a smooth image. After that, imsharpen is used to sharpen the image so that the image becomes clear. **D = imsharpen (C, 'Radius', 1.5, 'Total', 5);** the number of radius 1.5 controls the measurement of the area around the pixels that will be affected by the sharpening and the amount is for the strength of the formation effect on the image.



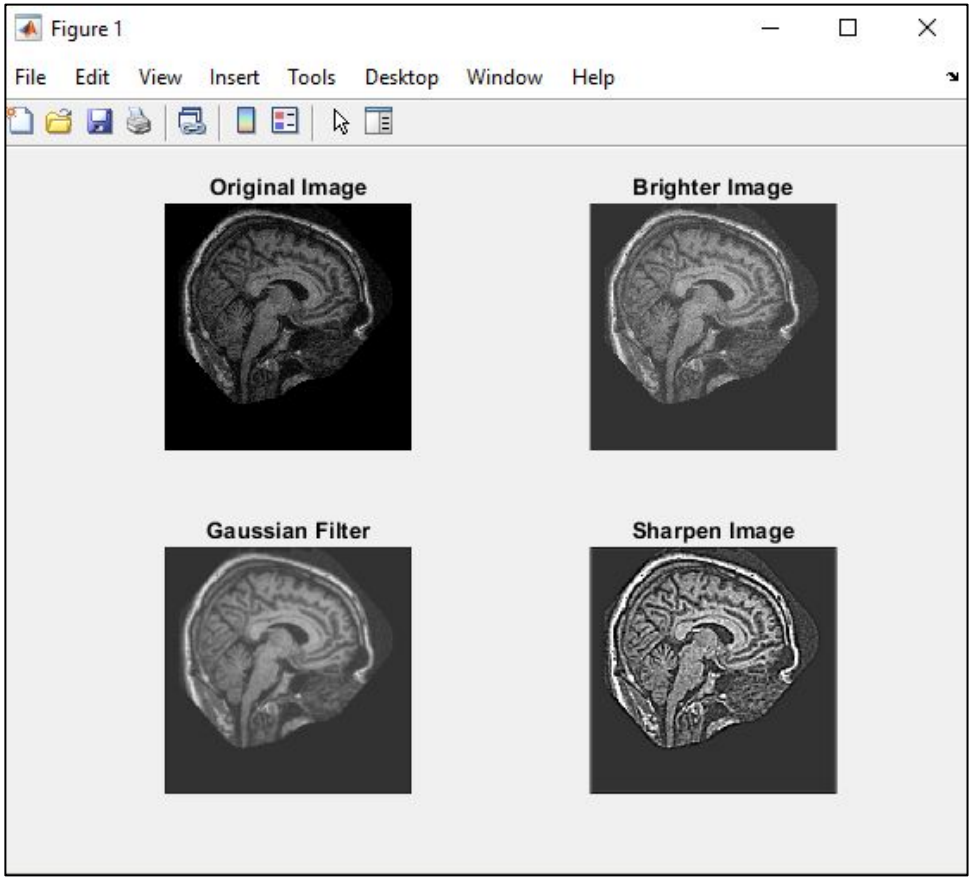
STEP 1 - BRIGHTEN

```
A = imread('OAS1_0018_MR1_mpr-1_anon_sag_66.gif');

% ----brighten----
B = imadd(A,50);
figure
subplot(1,2,1), imshow(A), title('Original Image');
subplot(1,2,2), imshow(B), title('Brighter Image');
```



STEP 2 - SMOOTHEN

```
A = imread('OAS1_0018_MR1_mpr-1_anon_sag_66.gif');

% ----brighten----
B = imadd(A,50);
figure
subplot(1,3,1), imshow(A), title('Original Image');
subplot(1,3,2), imshow(B), title('Brighter Image');

% ----smoothen----
fn = fspecial('gaussian', [3 3], 1);
C = imfilter(B,fn);
subplot(1,3,3), imshow(C), title('Gaussian Filter');
```



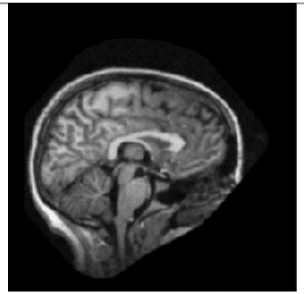
STEP 3 - SHARPEN

```
A = imread('OAS1_0018_MR1_mpr-1_anon_sag_66.gif');

% ----brighten----
B = imadd(A,50);
figure
subplot(1,2,1), imshow(A), title('Original Image');
subplot(1,2,2), imshow(B), title('Brighter Image');

% ----smoothen----
fn = fspecial('gaussian', [3 3], 1); % hsize =
default
C = imfilter(B,fn);
subplot(2,2,3), imshow(C), title('Gaussian Filter');

% ----sharpen----
D = imsharpen(C, 'Radius',1.5,'Amount',5);
subplot(2,2,4), imshow(D), title('Sharpen Image');
```

IMAGE 2

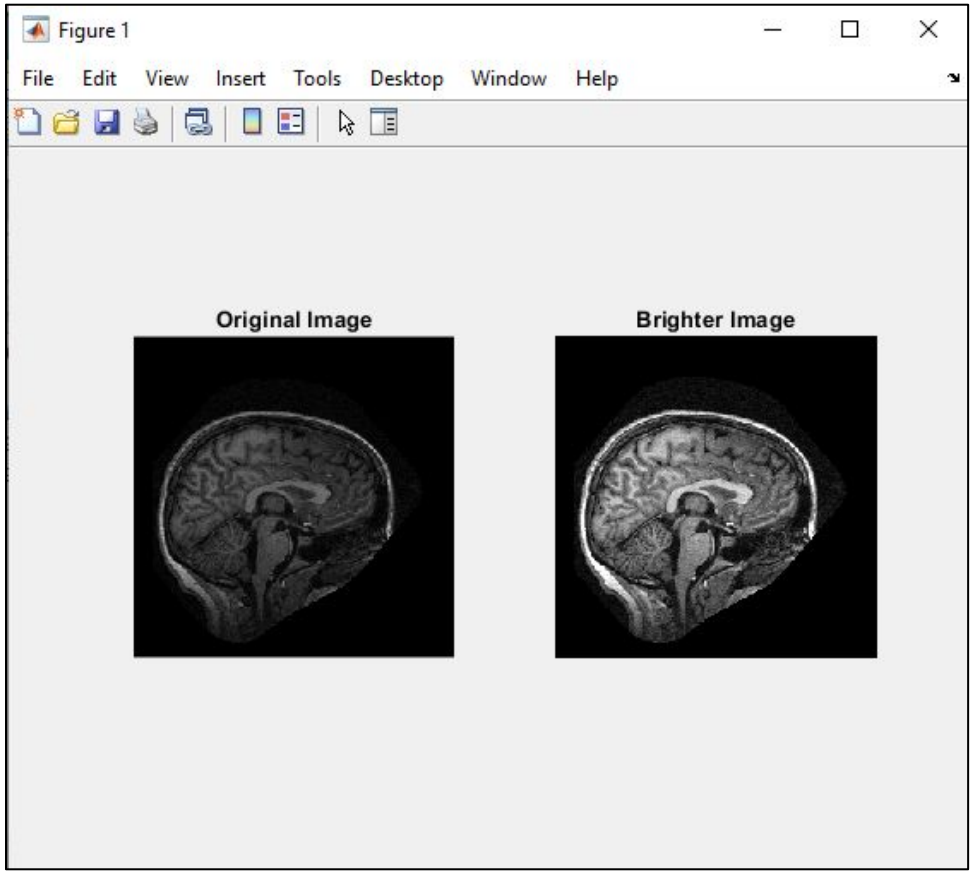
RESTORATION / ENCHANCEMENT

Process flow of the solution

			
Firstly, the **imread** function is used to read the selected image to the workspace	Function of **immultiply** are used to brighten the image for clear vision.	**imfilter** uses a gaussian filter to smooth the image to remove noise from the image.	**imadjust** function to adjust image contrast and **stretchlim** is used to set the limit

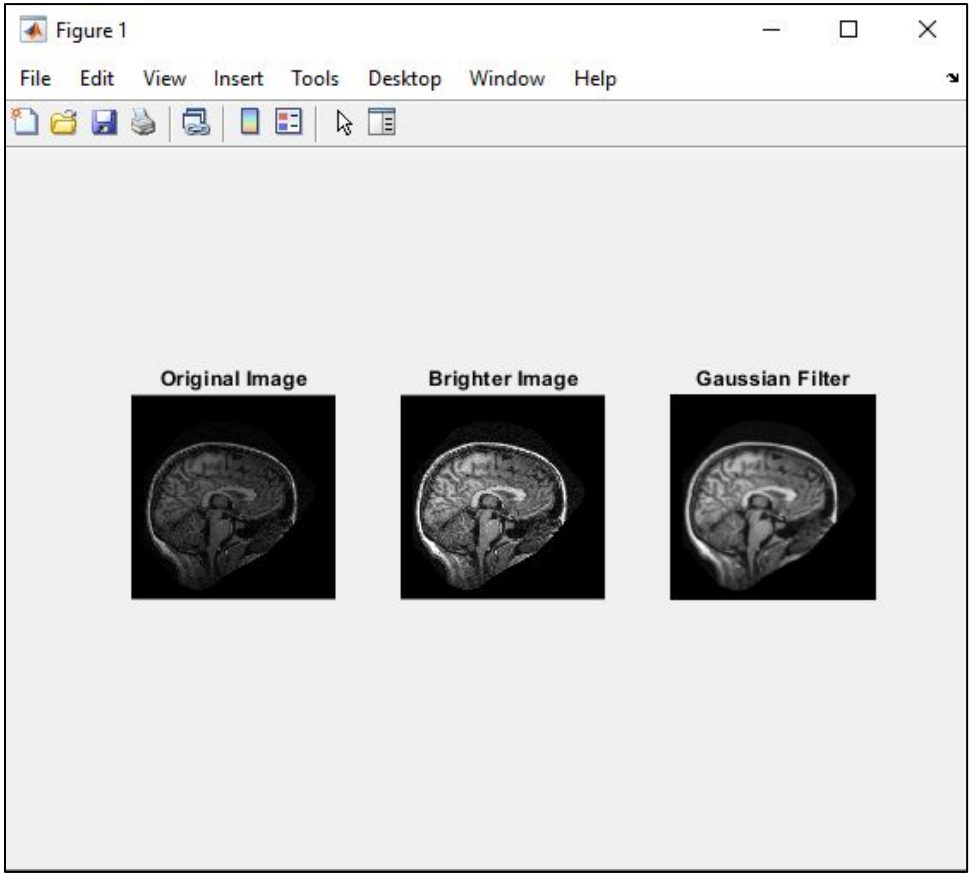
Explanation of the process

As for second image I use, **Y = immultiply(X, 2);** and I find that the darker background is not effect by the filter like using **imadd**. Then after adding a little brightness to the image there will be a little noise found in the image as previous. So, to reduce noise on the image, we use a low pass filter that can smooth the image using a gaussian filter. To use gaussian filter **fn_gau = fspecial ('gaussian', [5 5], 1);** used together with the default value of hsize and using the sigma value of 1. **Z = imfilter (Y, fn_gau);** the imfilter function addresses the filters that need to be applied in the image. And the result will produce a smooth image. Then I used a different method for this image, using imadjust to adjust the contrast to the set limit using stretchlim **W = imadjust (Z, stretchlim (Z), [0 0.1]);** After that, **I_sharp = imsubtract (X, W);** used to subtract from the original to trace its edges. Finally, **I_sharp_adj = imadjust (I_sharp);** is being used to sharp the image to overcome blur and make the image clear to detect.



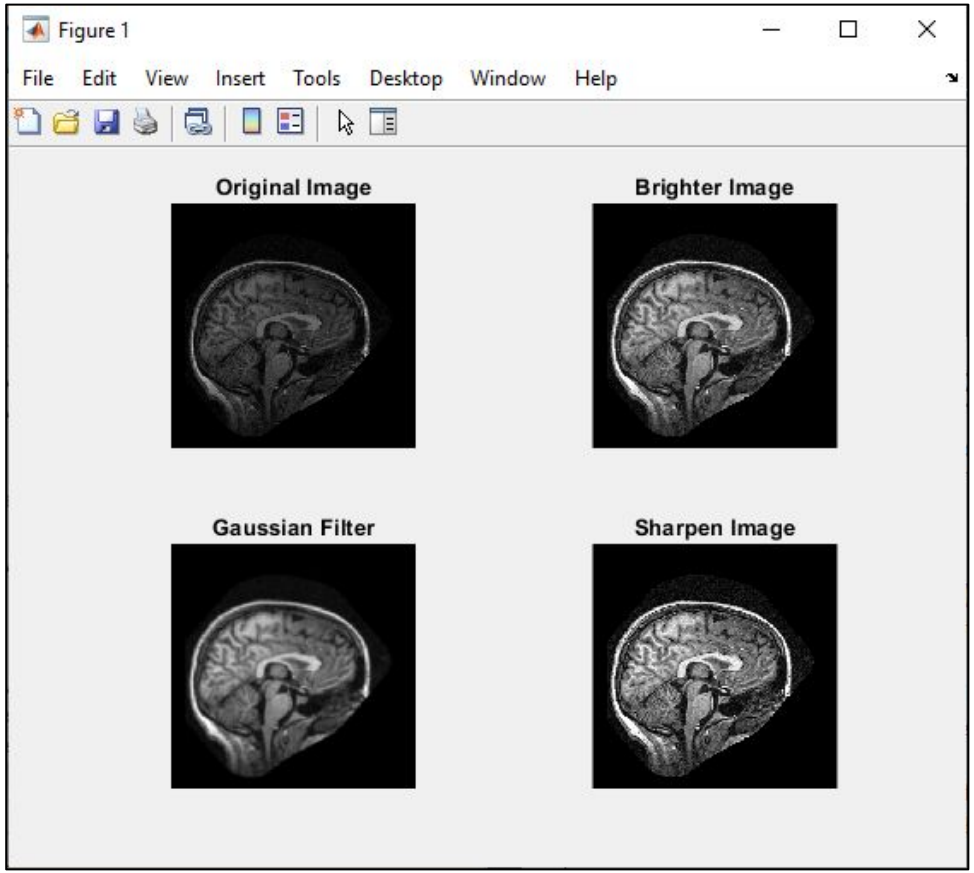
STEP 1 - BRIGHTEN

```
X = imread("OAS1_0014_MR1_mpr-3_anon_sag_66.gif");

% ----brighten----
Y = immultiply(X,2);
subplot(1,2,1), imshow(X), title('Original Image');
subplot(1,2,2), imshow(Y), title('Brighter Image');
```



STEP 2 - SMOOTHEN

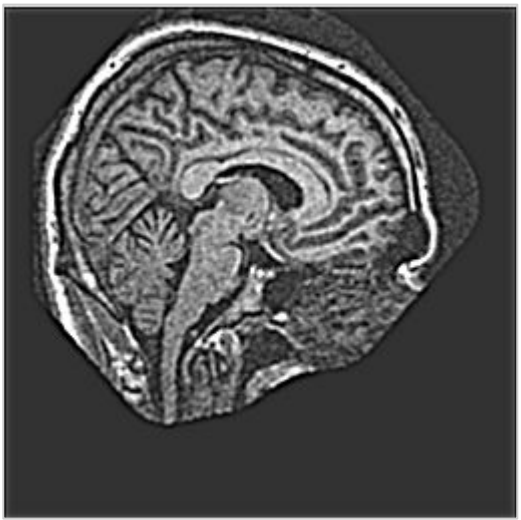
```
X = imread("OAS1_0014_MR1_mpr-3_anon_sag_66.gif");

% ----brighten----
Y = immultiply(X,2);
subplot(1,3,1), imshow(X), title('Original Image');
subplot(1,3,2), imshow(Y), title('Brighter Image');

% ----smoothen----
fn_gau = fspecial('gaussian', [5 5], 1);
Z = imfilter(Y,fn_gau);
subplot(1,3,3), imshow(Z), title('Gaussian Filter');
```

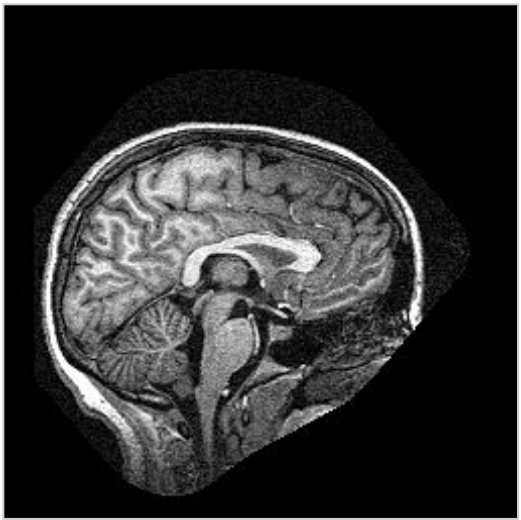


STEP 3 - SHARPEN

```
X = imread("OAS1_0014_MR1_mpr-3_anon_sag_66.gif");

% ----brighten----
Y = immultiply(X,2);
subplot(2,2,1), imshow(X), title('Original Image');
subplot(2,2,2), imshow(Y), title('Brighter Image');

% ----smoothen----
fn_gau = fspecial('gaussian', [5 5], 1);
Z = imfilter(Y,fn_gau);
subplot(2,2,3), imshow(Z), title('Gaussian Filter');

% ----sharpen----
W = imadjust(Z,stretchlim(Z),[0 0.1]);
I_sharp = imsubtract(X,W);
I_sharp_adj = imadjust(I_sharp);
subplot(2,2,4), imshow(I_sharp_adj), title('Sharpen
Image');
```

Image results





This is the result of both images after applying the brightness filter, smoothing and sharpening until the detail of the image is clear. Both pictures have different method approaches and the methods used with the right method are better than the left for picture restoration or enhancement.

THANK YOU