

# **SEMESTER PROJECT REPORT**

## **TITLE:**

**Application of DSP in image filtering and processing**

## **Submitted By:**

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# Application of DSP in image filtering and processing in MATLAB

## Overview:

In this project we are creating four filters for our images. Images are signals with special characteristics. First, we are converting RGB image into grayscale image. It helps in simplifying algorithms and as well eliminates the complexities related to computational requirements. It makes room for easier learning for those who are new to image processing. Second, we are applying noise to grayscale image. Third, we filtered the noise from the noisy image. Fourth we are applying high pass filter on our image.

## Introduction:

The main target of filters is, however, to reduce the noise around characters in the image. Thereby, we will create four nonlinear efficient image filters.

- The first filter converts the RGB image into greyscale.
- The second filter is to apply noise on the image such as "gaussian noise" or "salt and pepper" noise.
- The third filter is to filter the noise from the noisy image
- The third image filter is high pass filter to filter out the high frequencies present on the greyscale image.

## Working:

The project first read the RGB image uploaded by the user then we convert the RGB image into grayscale using the command `rgb2gray()`, This command converts any RGB image. Then we apply noise such as "gaussian noise", "salt & pepper noise" and "speckle noise" on the grayscale image using the command `imnoise()`. The amount of noise can be adjusted by changing the value of variance. Then we apply median pass filter on the noisy image. The median pass filter removes the noise from the noisy image and make the image smoother. The median pass filter can also be controlled for how much noise should be filtered by changing the values of M & N. After filtering noise from the noisy image, we apply high pass filter on the grayscale image to pass out the high frequencies from the grayscale image.

After summing-up all the above points we can say that this filter convert the RGB image in to grayscale, then applying noise on the image and then filtering the applying noise from the image to make the images smoother, After that the image is passing through the high pass filter to passing the high frequencies and removing the low frequencies.

## MATLAB Code:

```
clc
close all
clear all

%%%% READ IMAGE %%%%

I = imread('penguin.jpg'); % read image
figure()
imshow(I); % show image
title('Original Image');

%%%% CONVERT RGB IMAGE TO GRAY SCALE IMAGE %%%%

J1 = rgb2gray(I); %convert rgb image to gray
figure()
imshow(J1); % show gray scale image
title('Gray Scale Image');

%%%% APPLYING NOISE TO GRAY SCALE IMAGE %%%%

% noiseimg = imnoise(J1,'gaussian',0,0.02); % Add gaussian noise
% noiseimg = imnoise(J1,'salt & pepper',0.2); % Add salt & pepper noise
noiseimg = imnoise(J1,'speckle',0.05); % Add speckle noise
figure()
imshow(noiseimg); % show gray scale image
title('Noisy Image');

%%%% APPLYING MEDIAN FILTER TO NOISY IMAGE %%%%

M = 4;
N = 4;
filterimg = medfilt2(noiseimg,[M,N]);
figure()
imshow(filterimg); % show median filtered image
title(['Median Filtered Image',num2str(M),'x',num2str(N)]);

%%%% APPLYING HIGH PASS FILTER %%%%

h1 = [1 -1 1; -1 1 -1; 1 -2 1];
% h1 = [1 -2 1; -1 -1 -1; 1 -1 1];
hpfimg = conv2(double(noiseimg), double(h1));
figure()
imshow(hpfimg); % show HPF image
title('High Pass Filtered Image');
```

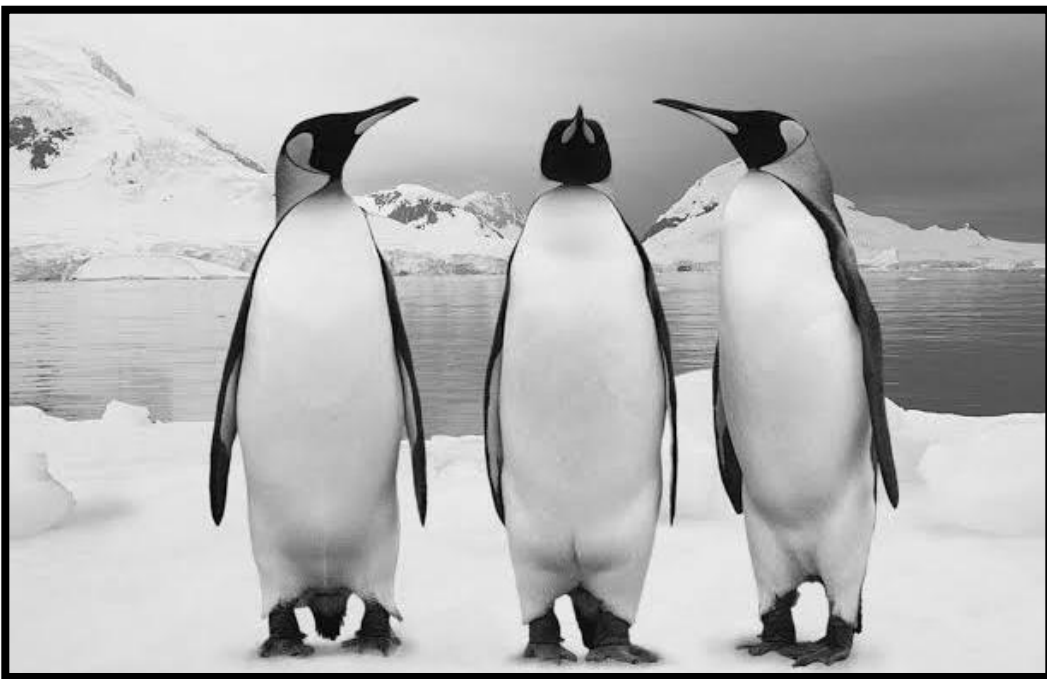
## Results:

- Step 1: Uploading RGB image



*Figure 1*

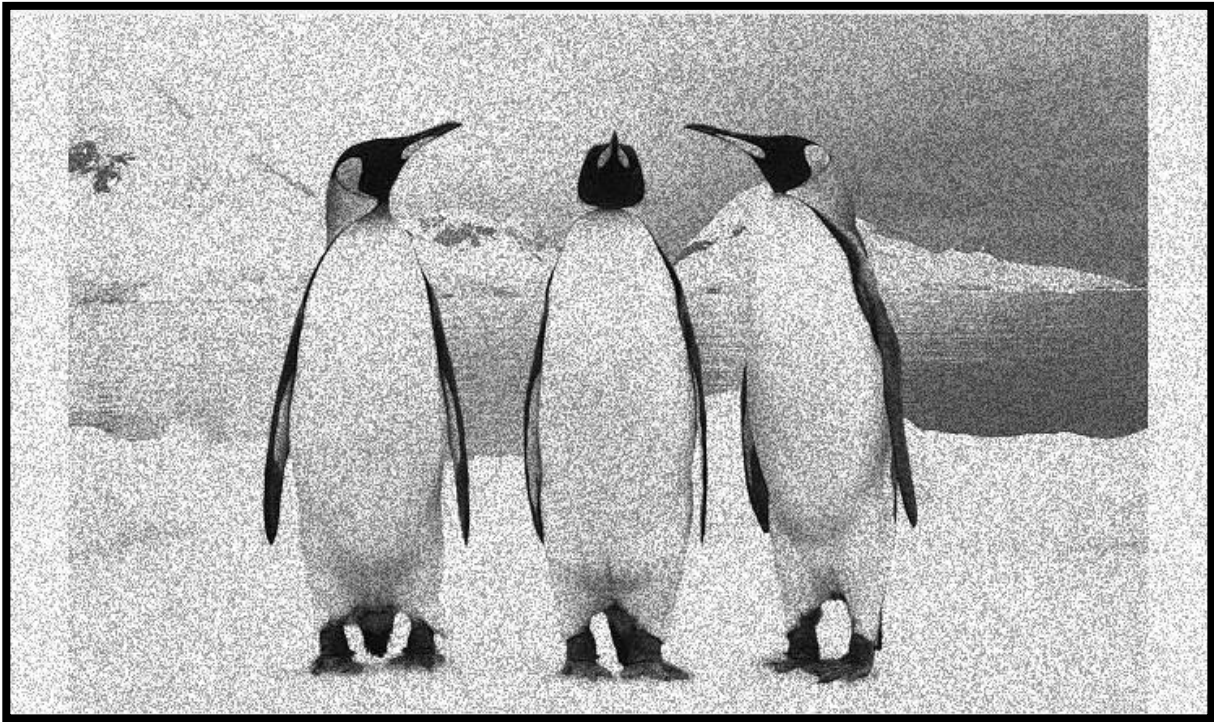
- Step 2: Converting RGB image into greyscale



*Figure 2*

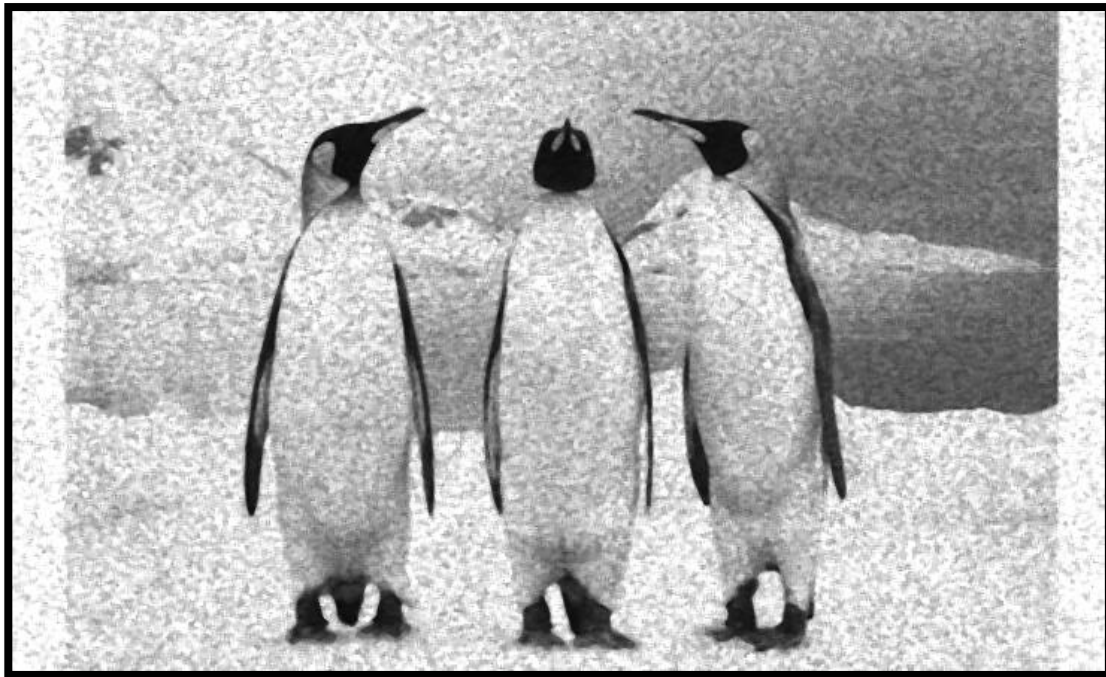


- **Step 3:** Adding noise on the greyscale image



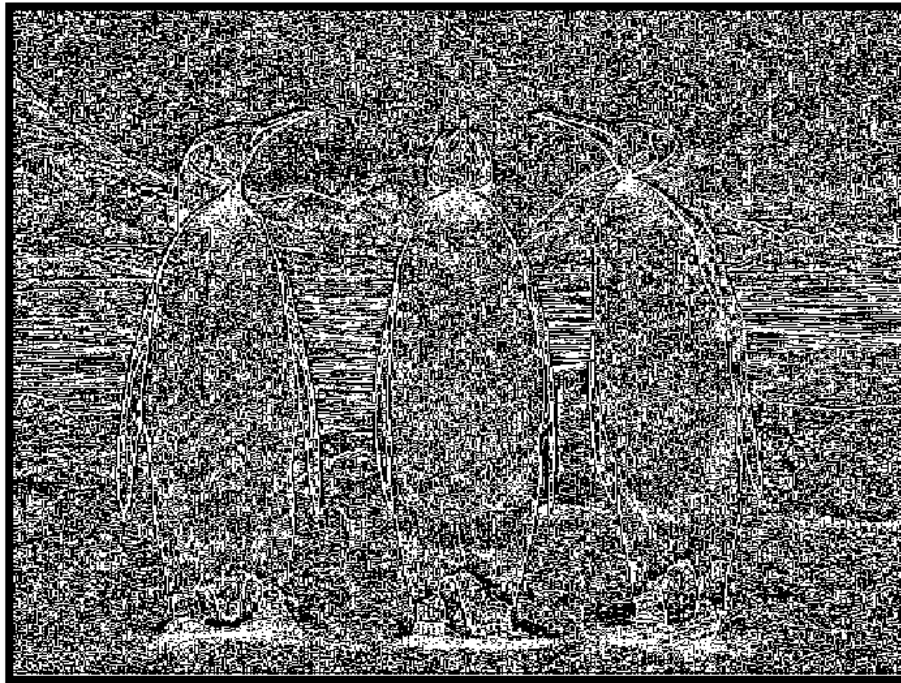
*Figure 3*

- **Step 4:** Applying filter on the noisy image



*Figure 4*

- Step 5: Applying high pass filter on the greyscale image



*Figure 5*

## Conclusion:

In this project we have made four filters. The conclusion is as under:

- We convert RGB image into grayscale image.
- Then we apply noise such as "gaussian noise" to our grayscale image.
- After applying noise we filtered the noise from the noisy image.
- At last we made high pass filter for passing the high frequencies on the gray scale image and block the low frequencies.