UJIAN TENGAH SEMESTER

Laporan UTS Pengelolaan Citra Digital

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1. Konvolusi Citra

Contoh kode awal menggunakan Gaussian Mask 3x3

```matlab
clc; clear; close all;

f = imread('Picture1.jpg');
f | imread(filename,fmt,options)    1 of 2 

mask = [1 2 1; 2 4 2; 1 2 1]/16;

[M, N, C] = size(f);
[m, n] = size(mask);
pad_row = floor(m/2);
pad_col = floor(n/2);

f_pad = padarray(f, [pad_row pad_col], 0, 'both');
g_manual = zeros(M, N, C);

for c = 1:C
    for x = 1:M
        for y = 1:N
            region = f_pad(x:x+m-1, y:y+n-1, c);
            g_manual(x,y,c) = sum(sum(region .* mask));
        end
    end
end
```
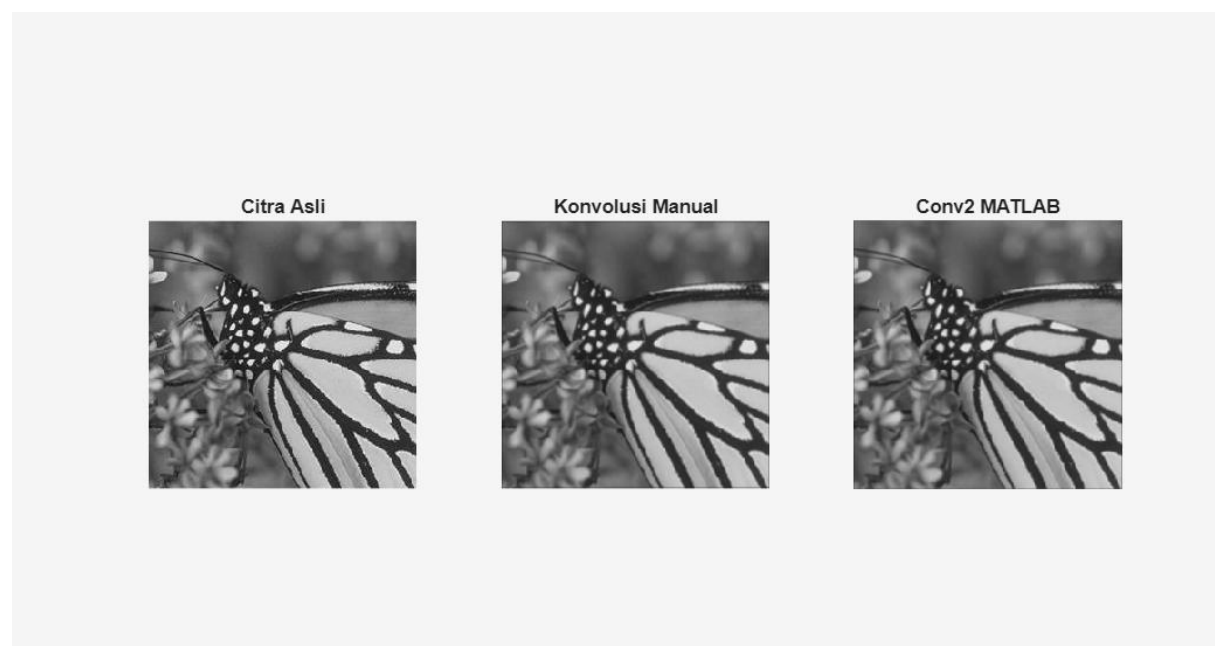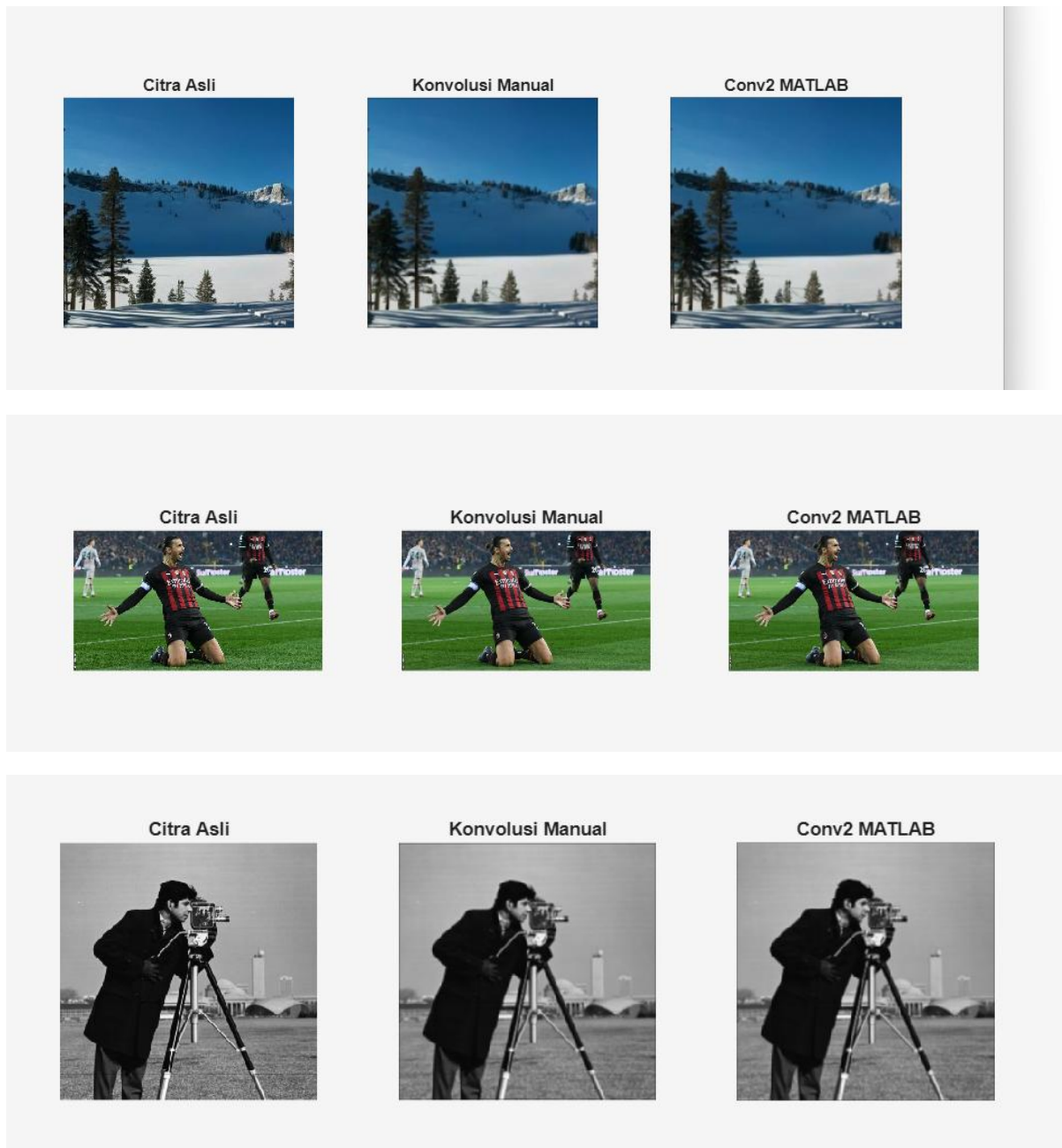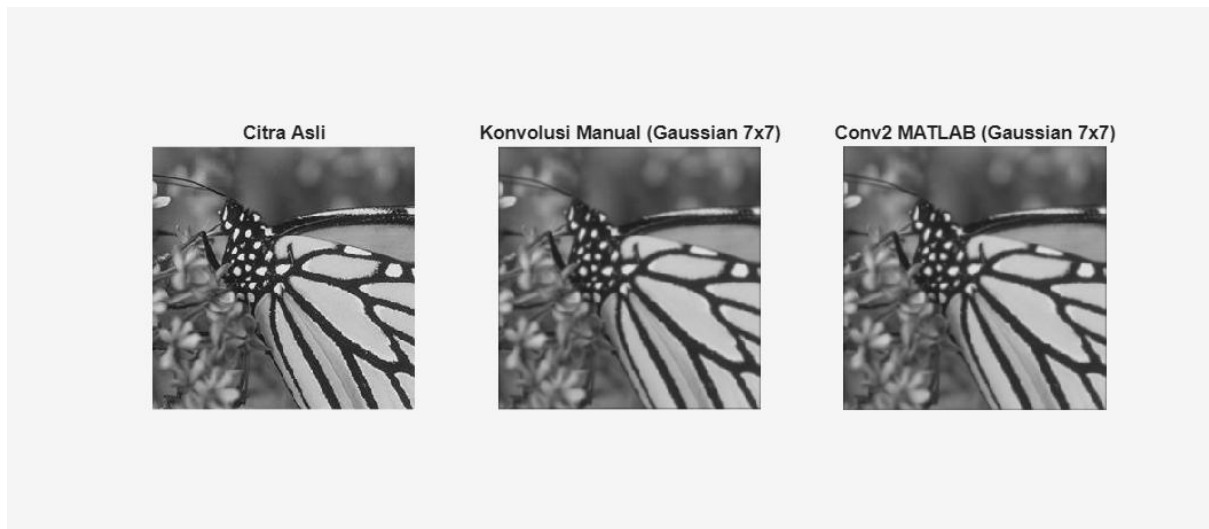
Hasil:

Hasil menggunakan contoh foto lain:

Menggunakan Gaussian Mask 7x7:

Citra Asli | Konvolusi Manual (Gaussian 7x7) | Conv2 MATLAB (Gaussian 7x7)

2. Image Smoothing

```matlab
clc; clear; close all;

f = imread('gambar1.jpg');
f = double(f);

[M, N, ~] = size(f);
D0 = 30;
n = 2;

[u, v] = meshgrid(0:N-1, 0:M-1);
u = u - floor(N/2);
v = v - floor(M/2);
D = sqrt(u.^2 + v.^2);

% Filter di domain frekuensi
H_ILPF = double(D <= D0);
H_GLPF = exp(-(D.^2)./(2*(D0^2)));
H_BLPF = 1 ./ (1 + (D./D0).^(2*n));

% Inisialisasi hasil untuk tiap channel
g1 = zeros(M, N, 3);
g2 = zeros(M, N, 3);
g3 = zeros(M, N, 3);
```
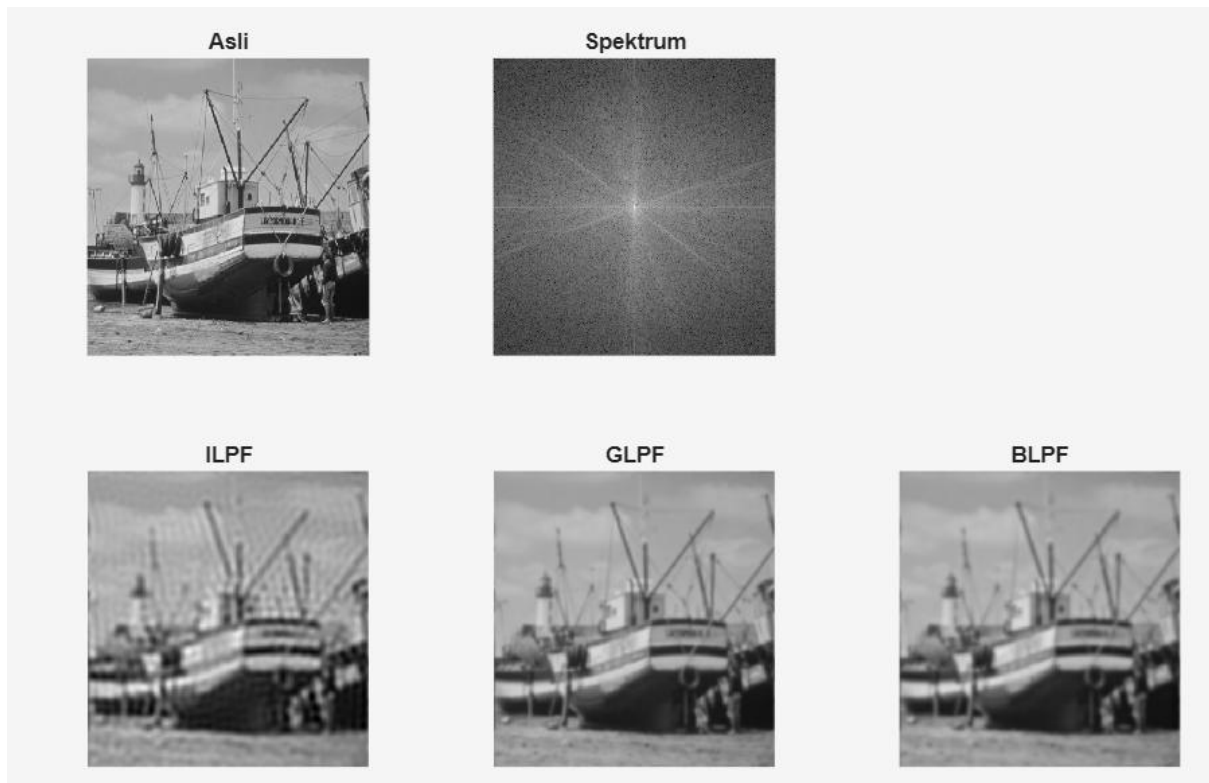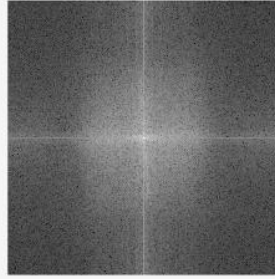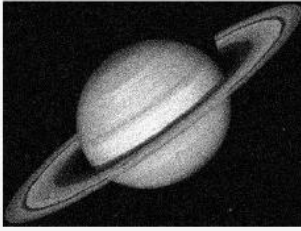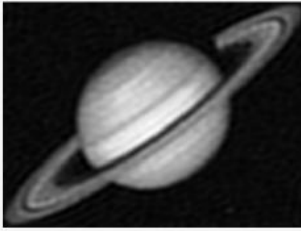
Hasil:

Asli
Spektrum

ILPF
GLPF
BLPF
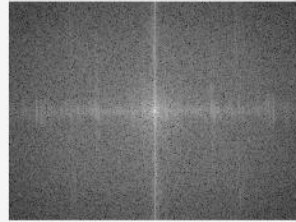
Asli — Spektrum

ILPF — GLPF — BLPF

Asli — Spektrum
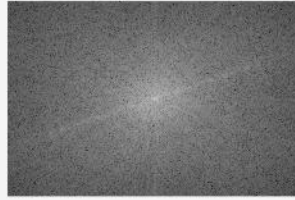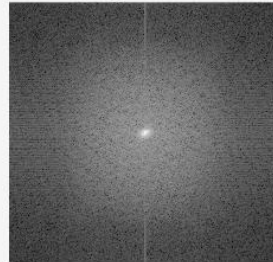
ILPF — GLPF — BLPF

Asli | Spektrum

ILPF | GLPF | BLPF

Asli | Spektrum

ILPF | GLPF | BLPF
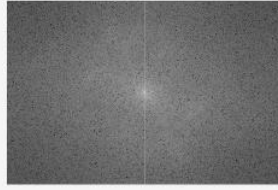
Asli

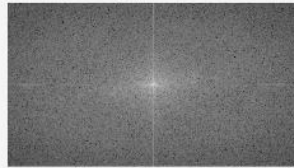**Spektrum**

ILPF

GLPF
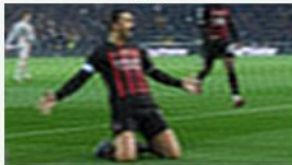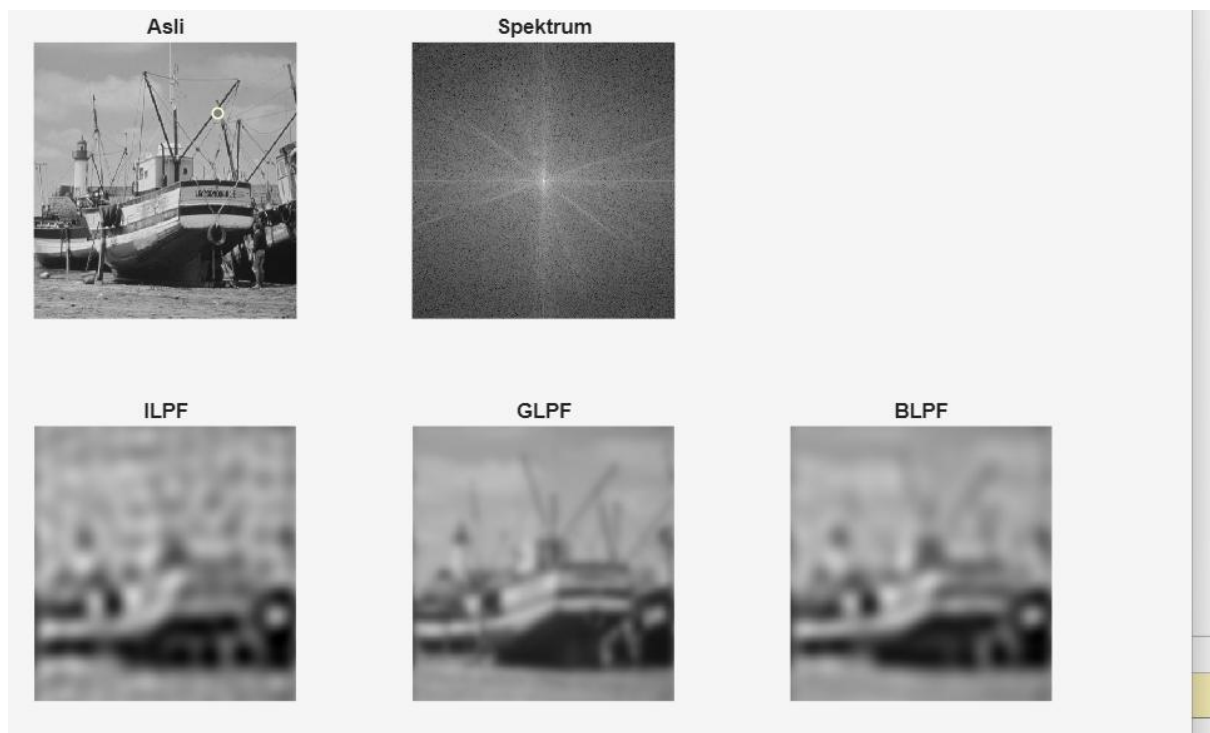
BLPF

Asli

Spektrum

ILPF

GLPF

BLPF

Contoh Modifikasi Efek:


```
% Modifikasi Efek
[M, N, ~] = size(f);
D0 = 10;
n = 5;
```

3. Melakukan Penapisan Citra Dalam Ranah Frekuensi.

High-Pass Filtering (IHPF, GHPF, dan BHPF)

```matlab
clc; clear; close all;
f = imread('gambar8.jpg');
f = double(f);
[M,N,~] = size(f);
D0 = 30;
[u,v] = meshgrid(0:N-1,0:M-1);
u = u - floor(N/2);
v = v - floor(M/2);
D = sqrt(u.^2 + v.^2);
H_ILPF = double(D <= D0);
H_IHPF = 1 - H_ILPF;
H_GLPF = exp(-(D.^2)./(2*(D0^2)));
H_GHPF = 1 - H_GLPF;
n = 2;
H_BLPF = 1 ./ (1 + (D./D0).^(2*n));
H_BHPF = 1 - H_BLPF;
g1 = zeros(M,N,3);
g2 = zeros(M,N,3);
g3 = zeros(M,N,3);
for c = 1:3
    Fc = fft2(f(:,:,c));
    Fshift = fftshift(Fc);
    G1 = Fshift .* H_IHPF;
    G2 = Fshift .* H_GHPF;
```
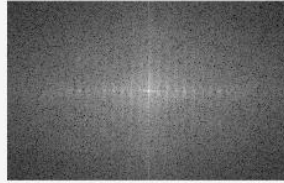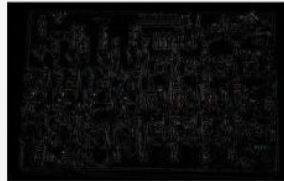
Hasil:

Asli
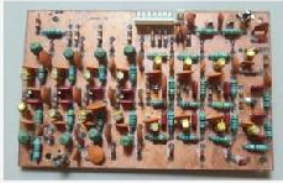
Spektrum

IHPF

GHPF

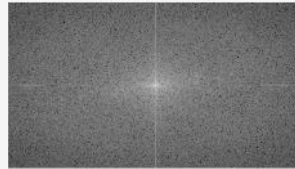
BHPF

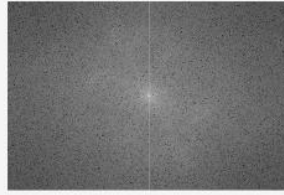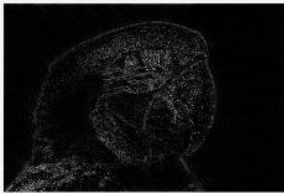**Asli**

Spektrum

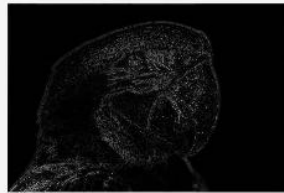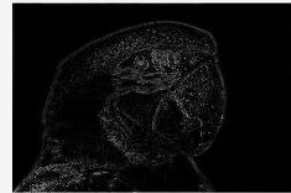**IHPF**

GHPF

BHPF

Asli Spektrum

IHPF GHPF BHPF

Asli Spektrum
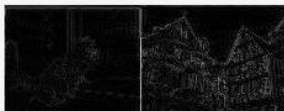
IHPF GHPF BHPF
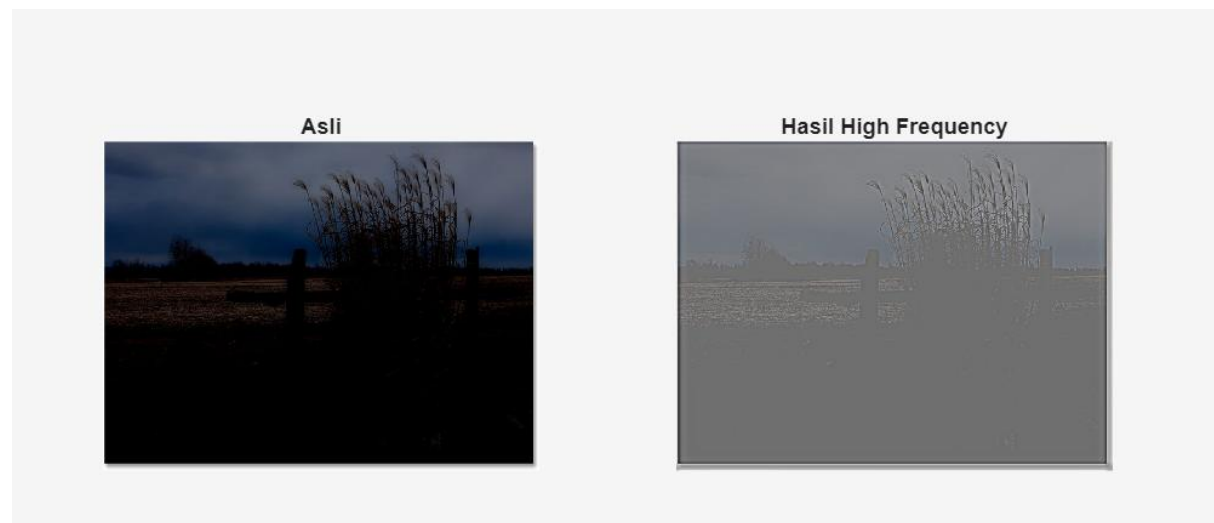
4. Penapisan citra di ranah frekuensi untuk membuat citra lebih terang


```matlab
clc; clear; close all;

f = imread('pic1.jpg');
f = im2double(f);
isColor = (size(f,3) == 3);

D0 = 40;
n = 2;
a = 0.2;
b = 0.8;

[M, N, ~] = size(f);
[u,v] = meshgrid(0:N-1,0:M-1);
u = u - floor(N/2);
v = v - floor(M/2);
D = sqrt(u.^2 + v.^2);

H_BLPF = 1 ./ (1 + (D./D0).^(2*n));
H_BHPF = 1 - H_BLPF;
H_HFE = a + b * H_BHPF;

if isColor
    F_R = fftshift(fft2(f(:,:,1)));
    F_G = fftshift(fft2(f(:,:,2)));
```


Asli

Hasil High Frequency

5. Penambahan dan Penghilangan Derau (Noise) pada Citra

C:\Users\LENOVO\Documents\MATLAB\UTS_PCD\noise_filters.m

```matlab
1    clc; clear; close all;
2
3    f = imread('gambar2.jpg');
4    f = im2double(f);
5    sp_prob = 0.05;
6
7    if size(f,3)==1
8        f_sp = imnoise(f,'salt & pepper',sp_prob);
9        f_gauss = imnoise(f,'gaussian',0,0.01);
10   else
11       f_sp = zeros(size(f));
12       f_gauss = zeros(size(f));
13       for c = 1:3
14           f_sp(:,:,c) = imnoise(f(:,:,c),'salt & pepper',sp_prob);
15           f_gauss(:,:,c) = imnoise(f(:,:,c),'gaussian',0,0.01);
16       end
17   end
18
19   w = 3;
20   pad = floor(w/2);
21
22   if size(f,3)==1
23       fpad = padarray(f_sp,[pad pad],0,'both');
24       [M,N] = size(f_sp);
```
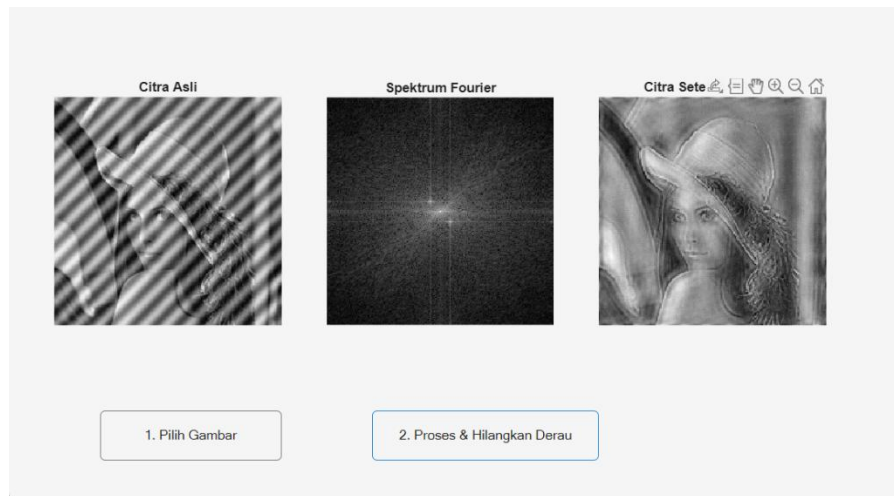
Command Window

Figure 1 X

Asli

Salt & Pepper

Min

Max

Median

Arithmetic Mean

Geometric Mean

Harmonic Mean

Contraharmonic

Midpoint

Alpha-trimmed

Gaussian Noise

Asli

Salt & Pepper

Min

Max

Median

Arithmetic Mean

Geometric Mean

Harmonic Mean

Contraharmonic

Midpoint
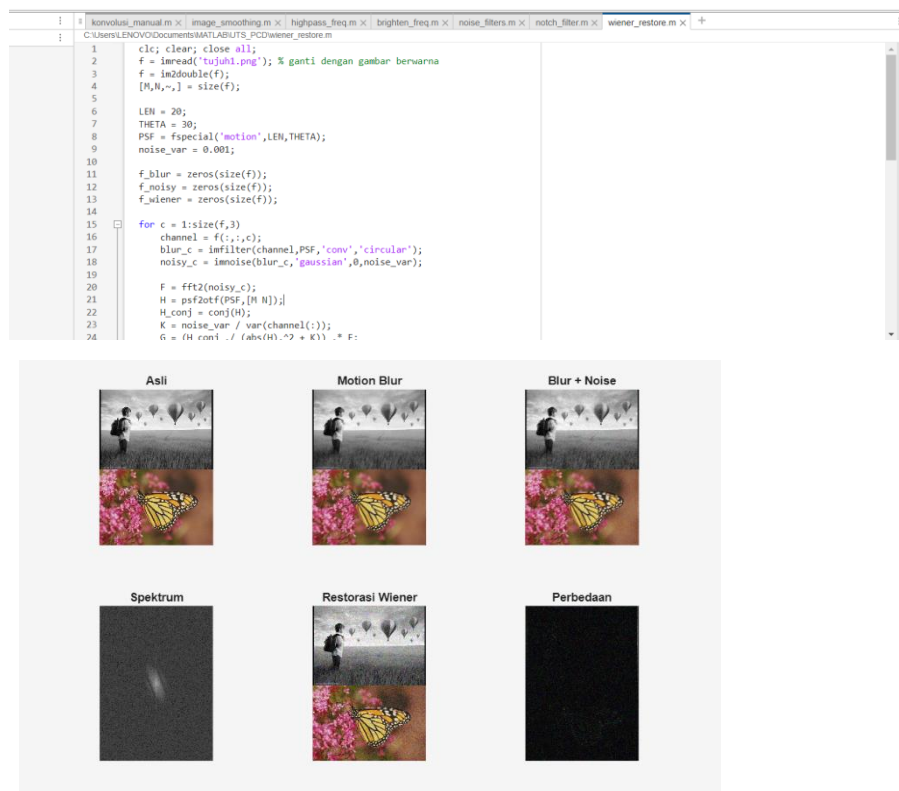
Alpha-trimmed

Gaussian Noise
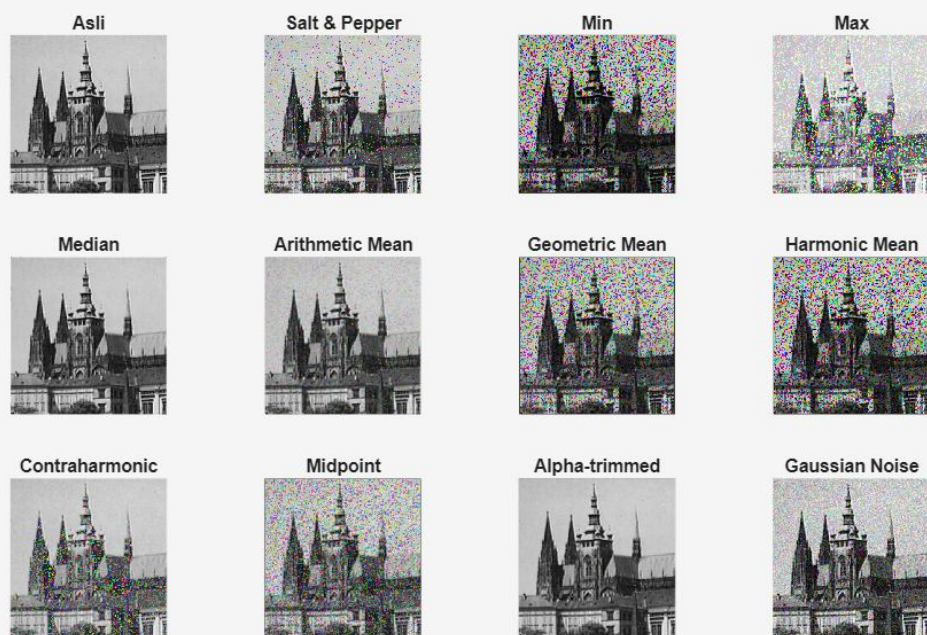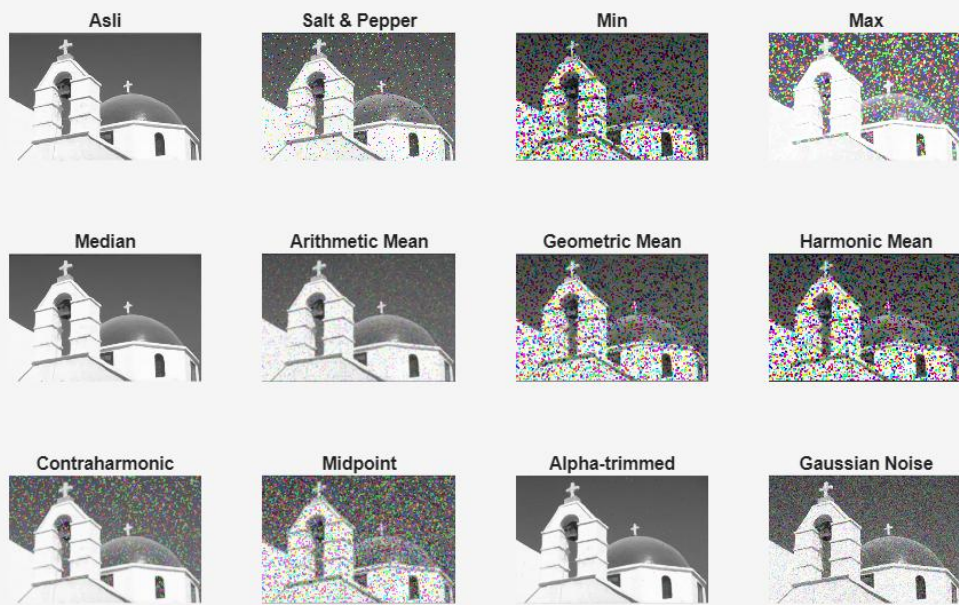
6. Menghilangkan Derau Periodik (Periodic Noise) di Ranah Frekuensi
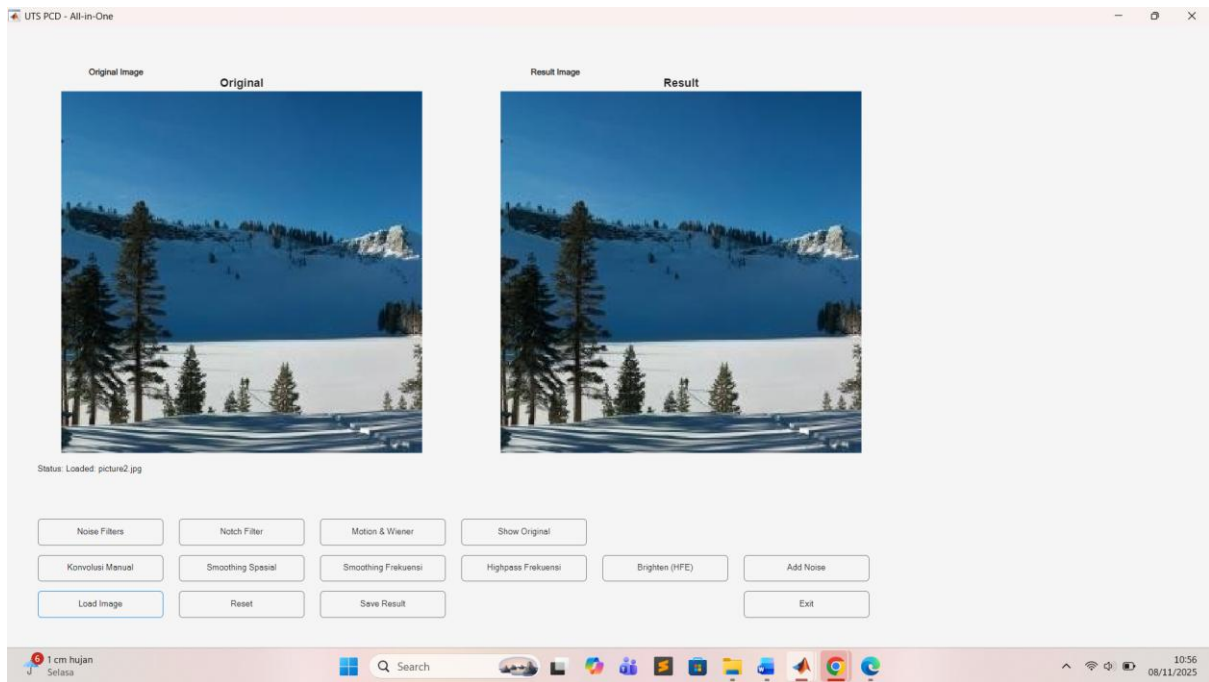

7. Motion Blur dan Restorasi Menggunakan Wiener Filter (manual)
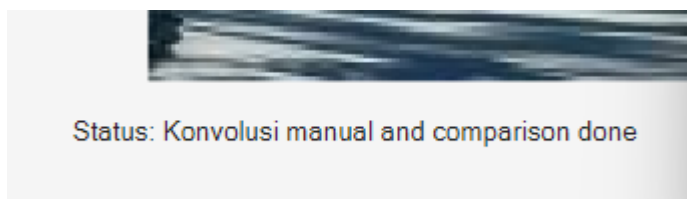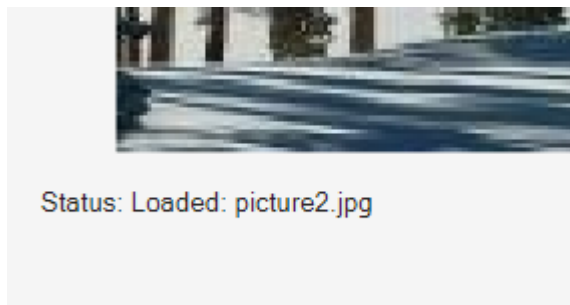

Penggabungan semua kode menjadi GUI all in one

Fitur Upload gambar dengan tombol lengkap dari 1 - 7

Status akan update sesuai fitur yang sedang digunakan:

-TERIMAKASIH -