Simulasi I

Bagian Bandpass Filter

```
% BandPass filter:
clear;
close all;
clc;

%[voice, fs, bits] = wavread('voice9',[10001 50000]);
[voice, fs, bits] = wavread('s1',[1 15000]);
disp('fs= ');disp(fs);
disp('bits= '); disp(bits);
voice=voice(:,1);
v1 = fft(voice);
wavwrite(voice,22050,'piece1')
disp('size v1=');disp(length(v1));

figure(1);
plot(voice);grid on
title('Sinyal Suara sebagai Input');
xlabel('Indeks Waktu');
ylabel('Amplituda');

v1_ifft = ifft(v1);

wavwrite(v1_ifft,22050,'try1');

num = [0.1367 0 -0.1367];                    %with central frequency of 0.1pi
den = [1 -1.6423 0.7267];                    %and bandwidth of 0.1pi
%[H,w] = freqz(num,den,40000,'whole');
[H,w] = freqz(num,den,15000,'whole');

figure(2);
plot(abs(H));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Fungsi Alih Bandpass H(z)');
xlabel('Frekuensi Angular'); ylabel('Amplituda');

disp('size H =');disp(length(H));

v2 = H.*v1;
v3 = ifft(v2);

figure(3);
plot(real(v3));grid on;
title('Output dari Bandpass Filter');
```

```
xlabel('Indeks Waktu');ylabel('Amplituda');
figure(4);
subplot(2,1,1);plot(abs(v1));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari FFT Sinyal Input');
xlabel('Frekuensi Angular');ylabel('Amplituda');

subplot(2,1,2);plot(abs(v2));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari Output ');
xlabel('Frekuensi Angular');ylabel('Amplituda');

wavwrite(v3,22050,'bp_voice');
```

Bagian Pengurangan Spektral

```
clear;
close all;
clc;

% signal
[voice, fs, bits] = wavread('piece1',[1001 15000]);
% [x,fs] = wavread('s1.wav',[9001,16000]);
% [x,fs] = wavread('e:\dsp\p1\a.wav',[26001,33000]);
x=voice;
N = length(x);

% noise
[y,fs] = wavread('piece1.wav',[1,14000]);
% [y,fs] = wavread('noise.wav',[1,7000]);
% [y,fs] = wavread('e:\dsp\p1\a.wav',[1,7000]);
% y=0.1*randint(1,7000);

n = 0:N-1;
%plot(n,x);
% STFT

nfft=input('Lebar window = ');
overlap=input('Overlap yang diinginkan = ');
[BS,f,t] = specgram(x,nfft,fs,hamming(nfft),overlap);
BN = specgram(y,nfft,fs,hamming(nfft),overlap);

figure(1);
surf(t,f,abs(BS));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Sinyal Suara dan Noise');
```

```
figure(2);
surf(t,f,abs(BN));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Noise');

PS = abs(BS).^2;
PN = abs(BN).^2;

PP = PS - PN;
P = PP.^(1/2);

figure(3);
surf(t,f,abs(P));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Sinyal Output setelah Pengurangan Spektral');
soundsc(voice,.5*fs)
```

Simulasi II

Bagian Bandpass Filter

```
% BandPass filter:
clear;
close all;
clc;

%[voice, fs, bits] = wavread('voice9',[10001 50000]);
[voice, fs, bits] = wavread('s2',[1 10000]);
disp('fs= ');disp(fs);
disp('bits= '); disp(bits);
voice=voice(:,1);
v1 = fft(voice);
wavwrite(voice,22050,'piece2')
disp('size v1=');disp(length(v1));

figure(1);
plot(voice);grid on
title('Sinyal Suara sebagai Input');
xlabel('Indeks Waktu');
ylabel('Amplituda');

v1_ifft = ifft(v1);

wavwrite(v1_ifft,22050,'try2');
```

```
num = [0.1367 0 -0.1367];                    %with central frequency of 0.1pi
den = [1 -1.6423 0.7267];                    %and bandwidth of 0.1pi
%[H,w] = freqz(num,den,40000,'whole');
[H,w] = freqz(num,den,10000,'whole');

figure(2);
plot(abs(H));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Fungsi Alih Bandpass H(z)');
xlabel('Frekuensi Angular'); ylabel('Amplituda');

disp('size H =');disp(length(H));

v2 = H.*v1;
v3 = ifft(v2);

figure(3);
plot(real(v3));grid on;
title('Output dari Bandpass Filter');
xlabel('Indeks Waktu');ylabel('Amplituda');

figure(4);
subplot(2,1,1);plot(abs(v1));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari FFT Sinyal Input');
xlabel('Frekuensi Angular');ylabel('Amplituda');

subplot(2,1,2);plot(abs(v2));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari Output Y');
xlabel('Frekuensi Angular');ylabel('Amplituda');

wavwrite(v3,22050,'bp_voice');
```

Bagian Pengurangan Spektral

```
clear;
close all;
clc;

% signal
[voice, fs, bits] = wavread('piece2',[1001 10000]);
% [x,fs] = wavread('s2.wav',[9001,16000]);
% [x,fs] = wavread('e:\dsp\p2\a.wav',[26001,33000]);
x=voice;
N = length(x);
```

```
% noise
[y,fs] = wavread('piece2.wav',[1,9000]);
% [y,fs] = wavread('noise.wav',[1,7000]);
% [y,fs] = wavread('e:\dsp\p2\a.wav',[1,7000]);
% y=0.1*randint(1,5000);

n = 0:N-1;
%plot(n,x);
% STFT

nfft=input('Lebar window = ');
overlap=input('Overlap yang diinginkan = ');
[BS,f,t] = specgram(x,nfft,fs,hamming(nfft),overlap);
BN = specgram(y,nfft,fs,hamming(nfft),overlap);

figure(1);
surf(t,f,abs(BS));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Sinyal Suara dan Noise');

figure(2);
surf(t,f,abs(BN));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Noise');

PS = abs(BS).^2;
PN = abs(BN).^2;

PP = PS - PN;
P = PP.^(1/2);

figure(3);
surf(t,f,abs(P));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Sinyal Output setelah Pengurangan Spektral');
soundsc(voice,.5*fs)
```

Simulasi III

Bagian Bandpass Filter

```
% BandPass filter:
clear;
close all;
clc;
```

```
%[voice, fs, bits] = wavread('voice9',[10001 50000]);
[voice, fs, bits] = wavread('s3',[1 15000]);
disp('fs= ');disp(fs);
disp('bits= '); disp(bits);
voice=voice(:,1);
v1 = fft(voice);
wavwrite(voice,22050,'piece3')
disp('size v1=');disp(length(v1));

figure(1);
plot(voice);grid on
title('Sinyal Suara sebagai Input');
xlabel('Indeks Waktu');
ylabel('Amplituda');

v1_ifft = ifft(v1);

wavwrite(v1_ifft,22050,'try3');

num = [0.1367 0 -0.1367];                %with central frequency of 0.1pi
den = [1 -1.6423 0.7267];                %and bandwidth of 0.1pi
%[H,w] = freqz(num,den,40000,'whole');
[H,w] = freqz(num,den,15000,'whole');

figure(2);
plot(abs(H));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Fungsi Alih Bandpass H(z)');
xlabel('Frekuensi Angular'); ylabel('Amplituda');

disp('size H =');disp(length(H));

v2 = H.*v1;
v3 = ifft(v2);

figure(3);
plot(real(v3));grid on;
title('Output dari Bandpass Filter');
xlabel('Indeks Waktu');ylabel('Amplituda');

figure(4);
subplot(2,1,1);plot(abs(v1));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari FFT Sinyal Input');
xlabel('Frekuensi Angular');ylabel('Amplituda');

subplot(2,1,2);plot(abs(v2));grid on;
```

```
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari Output Y');
xlabel('Frekuensi Angular');ylabel('Amplituda');

wavwrite(v3,22050,'bp_voice');
```

Bagian Pengurangan Spektral

```
clear;
close all;
clc;

% signal
[voice, fs, bits] = wavread('piece3',[1001 15000]);
% [x,fs] = wavread('s3.wav',[9001,16000]);
% [x,fs] = wavread('e:\dsp\p3\a.wav',[26001,33000]);
x=voice;
N = length(x);

% noise
[y,fs] = wavread('piece3.wav',[1,14000]);
% [y,fs] = wavread('noise.wav',[1,7000]);
% [y,fs] = wavread('e:\dsp\p3\a.wav',[1,7000]);
% y=0.1*randint(1,5000);

n = 0:N-1;
%plot(n,x);
% STFT

nfft=input('Lebar window = ');
overlap=input('Overlap yang diinginkan = ');
[BS,f,t] = specgram(x,nfft,fs,hamming(nfft),overlap);
BN = specgram(y,nfft,fs,hamming(nfft),overlap);

figure(1);
surf(t,f,abs(BS));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Sinyal Suara dan Noise');

figure(2);
surf(t,f,abs(BN));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Noise');

PS = abs(BS).^2;
PN = abs(BN).^2;
```

```
PP = PS - PN;
P = PP.^(1/2);

figure(3);
surf(t,f,abs(P));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Sinyal Output setelah Pengurangan Spektral');
soundsc(voice,.5*fs)
```

Simulasi IV:

Bagian Bandpass Filter

```
% BandPass filter:
clear;
close all;
clc;

%[voice, fs, bits] = wavread('voice9',[10001 50000]);
[voice, fs, bits] = wavread('s4',[1 16000]);
disp('fs= ');disp(fs);
disp('bits= '); disp(bits);
voice=voice(:,1);
v1 = fft(voice);
wavwrite(voice,22050,'piece4')
disp('size v1=');disp(length(v1));

figure(1);
plot(voice);grid on
title('Sinyal Suara sebagai Input');
xlabel('Indeks Waktu');
ylabel('Amplituda');

v1_ifft = ifft(v1);

wavwrite(v1_ifft,22050,'try4');

num = [0.1367 0 -0.1367];                %with central frequency of 0.1pi
den = [1 -1.6423 0.7267];                %and bandwidth of 0.1pi
%[H,w] = freqz(num,den,40000,'whole');
[H,w] = freqz(num,den,16000,'whole');

figure(2);
plot(abs(H));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Fungsi Alih Bandpass H(z)');
```

```
xlabel('Frekuensi Angular'); ylabel('Amplituda');

disp('size H =');disp(length(H));

v2 = H.*v1;
v3 = ifft(v2);

figure(3);
plot(real(v3));grid on;
title('Output dari Bandpass Filter');
xlabel('Indeks Waktu');ylabel('Amplituda');

figure(4);
subplot(2,1,1);plot(abs(v1));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari FFT Sinyal Input');
xlabel('Frekuensi Angular');ylabel('Amplituda');

subplot(2,1,2);plot(abs(v2));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari Output Y');
xlabel('Frekuensi Angular');ylabel('Amplituda');

wavwrite(v3,22050,'bp_voice');
```

Bagian Pengurangan Spektral:

```
clear;
close all;
clc;

% signal
[voice, fs, bits] = wavread('piece4',[1001 16000]);
% [x,fs] = wavread('s4.wav',[9001,16000]);
% [x,fs] = wavread('e:\dsp\p4\a.wav',[26001,33000]);
x=voice;
N = length(x);

% noise
[y,fs] = wavread('piece4.wav',[1,15000]);
% [y,fs] = wavread('noise.wav',[1,7000]);
% [y,fs] = wavread('e:\dsp\p4\a.wav',[1,7000]);
% y=0.1*randint(1,5000);

n = 0:N-1;
%plot(n,x);
```

```
% STFT

nfft=input('Lebar window = ');
overlap=input('Overlap yang diinginkan = ');
[BS,f,t] = specgram(x,nfft,fs,hamming(nfft),overlap);
BN = specgram(y,nfft,fs,hamming(nfft),overlap);

figure(1);
surf(t,f,abs(BS));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Sinyal Suara dan Noise');

figure(2);
surf(t,f,abs(BN));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Noise');

PS = abs(BS).^2;
PN = abs(BN).^2;

PP = PS - PN;
P = PP.^(1/2);

figure(3);
surf(t,f,abs(P));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Sinyal Output setelah Pengurangan Spektral');
soundsc(voice,.5*fs)
```

Simulasi V:

Bagian Bandpass Filter

```
% BandPass filter:
clear;
close all;
clc;

%[voice, fs, bits] = wavread('voice9',[10001 50000]);
[voice, fs, bits] = wavread('s5',[1 16000]);
disp('fs= ');disp(fs);
disp('bits= '); disp(bits);
voice=voice(:,1);
v1 = fft(voice);
wavwrite(voice,22050,'piece5')
disp('size v1=');disp(length(v1));
```

```
figure(1);
plot(voice);grid on
title('Sinyal Suara sebagai Input');
xlabel('Indeks Waktu');
ylabel('Amplituda');

v1_ifft = ifft(v1);

wavwrite(v1_ifft,22050,'try5');

num = [0.1367 0 -0.1367];                %with central frequency of 0.1pi
den = [1 -1.6423 0.7267];                %and bandwidth of 0.1pi
%[H,w] = freqz(num,den,40000,'whole');
[H,w] = freqz(num,den,16000,'whole');

figure(2);
plot(abs(H));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Fungsi Alih Bandpass H(z)');
xlabel('Frekuensi Angular'); ylabel('Amplituda');

disp('size H =');disp(length(H));

v2 = H.*v1;
v3 = ifft(v2);

figure(3);
plot(real(v3));grid on;
title('Output dari Bandpass Filter');
xlabel('Indeks Waktu');ylabel('Amplituda');

figure(4);
subplot(2,1,1);plot(abs(v1));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari FFT Sinyal Input');
xlabel('Frekuensi Angular');ylabel('Amplituda');

subplot(2,1,2);plot(abs(v2));grid on;
set(gca,'XTickLabel',{'0','0.25pi','0.5pi','0.75pi','pi','1.25pi','1.5pi','1.75pi','2pi'})
title('Amplituda dari Output Y');
xlabel('Frekuensi Angular');ylabel('Amplituda');

wavwrite(v3,22050,'bp_voice');
```

Bagian Pengurangan Spektral

```
clear;
close all;
clc;


% signal
[voice, fs, bits] = wavread('piece5',[1001 16000]);
% [x,fs] = wavread('s5.wav',[9001,16000]);
% [x,fs] = wavread('e:\dsp\p5\a.wav',[26001,33000]);
x=voice;
N = length(x);

% noise
[y,fs] = wavread('piece5.wav',[1,15000]);
% [y,fs] = wavread('noise.wav',[1,7000]);
% [y,fs] = wavread('e:\dsp\p5\a.wav',[1,7000]);
% y=0.1*randint(1,5000);

n = 0:N-1;
%plot(n,x);
% STFT

nfft=input('Lebar window = ');
overlap=input('Overlap yang diinginkan = ');
[BS,f,t] = specgram(x,nfft,fs,hamming(nfft),overlap);
BN = specgram(y,nfft,fs,hamming(nfft),overlap);

figure(1);
surf(t,f,abs(BS));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Sinyal Suara dan Noise');

figure(2);
surf(t,f,abs(BN));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
title('STFT dari Input Noise');

PS = abs(BS).^2;
PN = abs(BN).^2;

PP = PS - PN;
P = PP.^(1/2);

figure(3);
surf(t,f,abs(P));
xlabel ('Waktu');ylabel('Frekuensi');zlabel('Amplituda');
```

```
title('STFT dari Sinyal Output setelah Pengurangan Spektral');
soundsc(voice,.5*fs)
```