AGH

Appendix to Lab Assignment #2
Decimation solutions

Decimation – Mlab code

Mlab code `k = [1:Ns]; or k = [0:Ns-1];`

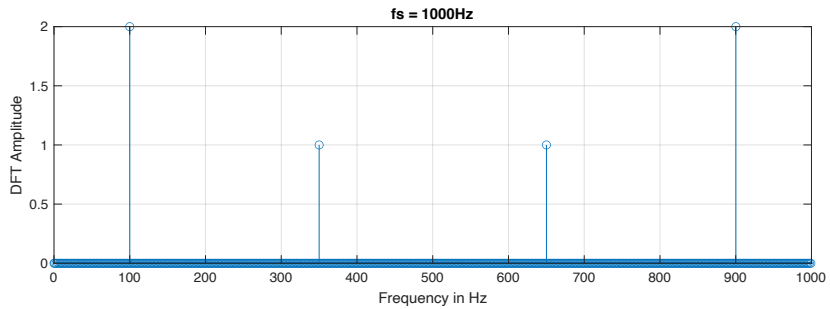
```
clear
Ns = 5000;
k = [1:Ns];
k = [0:Ns-1];
x = 4*cos(2*pi*0.1*k) +2*cos(2*pi*0.35*k);
figure(1)
h = fft(x);
f= linspace(0,1000,Ns);
subplot(211)
stem(f,abs(h(1:Ns))/Ns), grid
title('fs = 1000Hz')
xlabel('Frequency in Hz')
ylabel('DFT Amplitude')
subplot(212)
stem(f,real(h)/Ns)
hold on
stem(f,imag(h)/Ns)
hold off
title('fs = 1000Hz')
xlabel('Frequency in Hz')
ylabel('Amplitude')
legend('Real H','Imag H')
grid
```

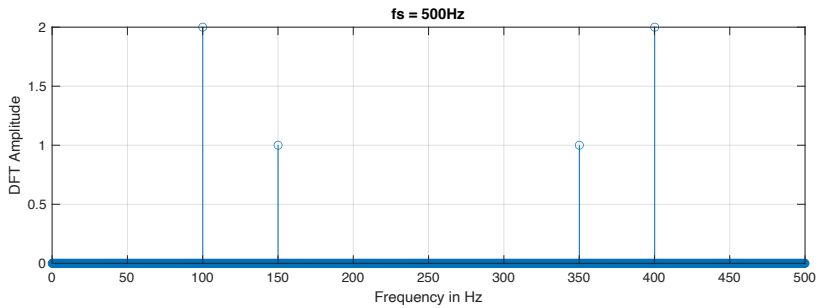
```
% Decimation
xd = x(1:2:end); % Decimate signal
Nsd = length(xd);
hd = fft(xd);
fd = linspace(0,500,Nsd);
figure(2)
subplot(211)
stem(fd,abs(hd(1:Nsd))/Nsd), grid
title('fs = 500Hz')
xlabel('Frequency in Hz')
ylabel('DFT Amplitude')
subplot(212)
stem(fd,real(hd)/Nsd)
hold on
stem(fd,imag(hd)/Nsd)
hold off
title('fs = 500Hz')
xlabel('Frequency in Hz')
ylabel('Aamplitude')
legend('Real H','Imag H')
grid
```

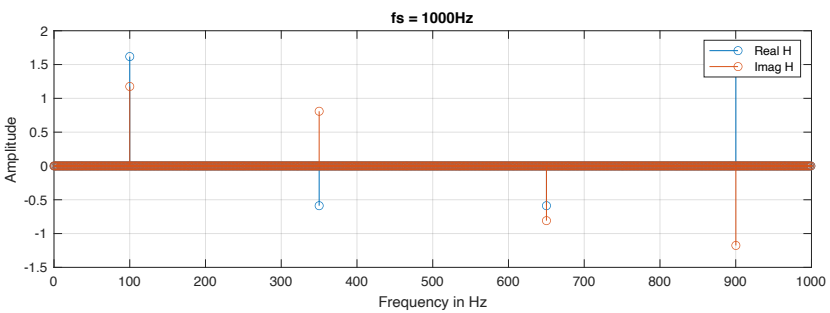
Decimation – plots

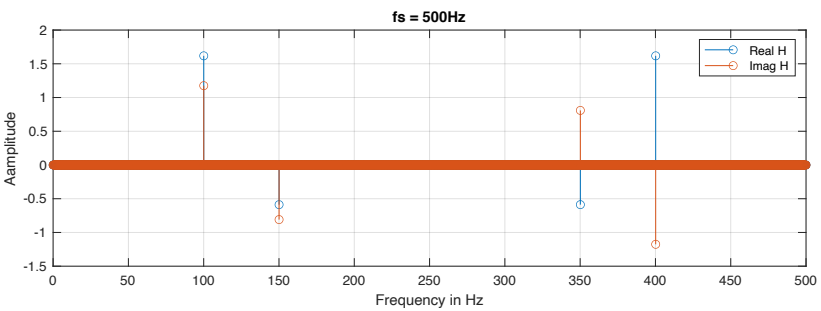
```
x = 4*cos(2*pi*0.1*k) +2*cos(2*pi*0.35*k);
k = [1:Ns];
```

DFT complex – sum of amplitudes after decimation





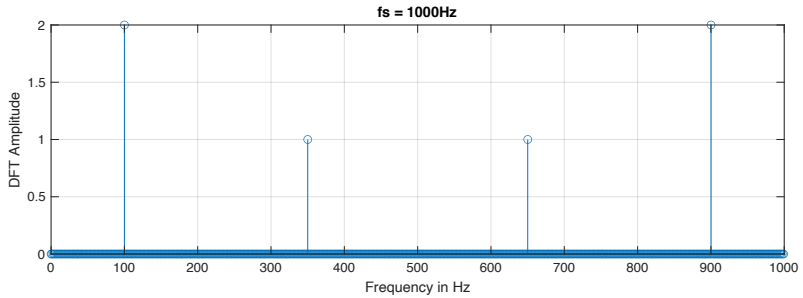


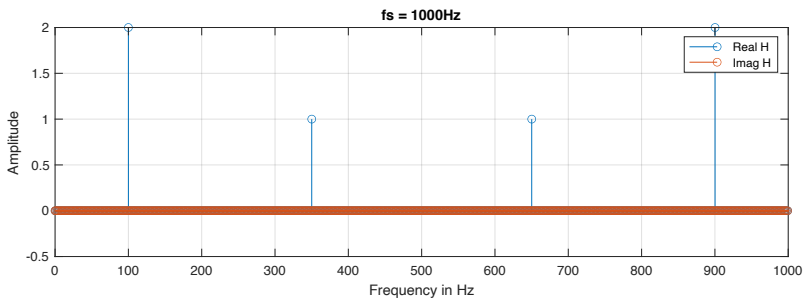


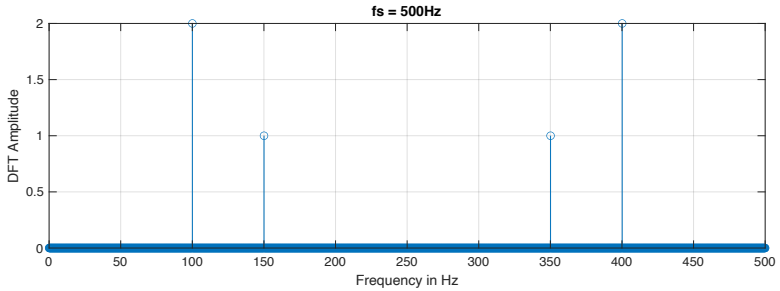
Decimation – plots

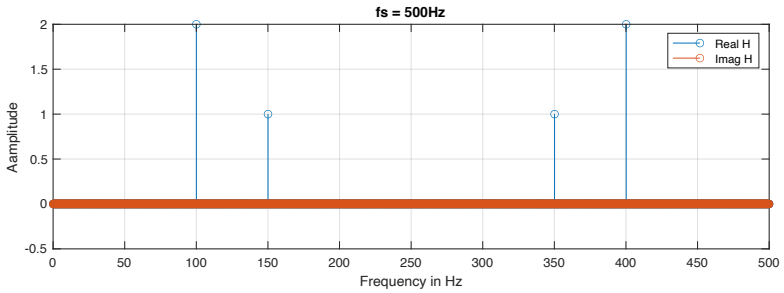
```
x = 4*cos(2*pi*0.1*k) +2*cos(2*pi*0.35*k);
k = [0:Ns-1];
```

DFT real – sum of amplitudes after decimation









Decimation – Mlab code

Mlab code `k = [1:Ns]; or k = [0:Ns-1];`

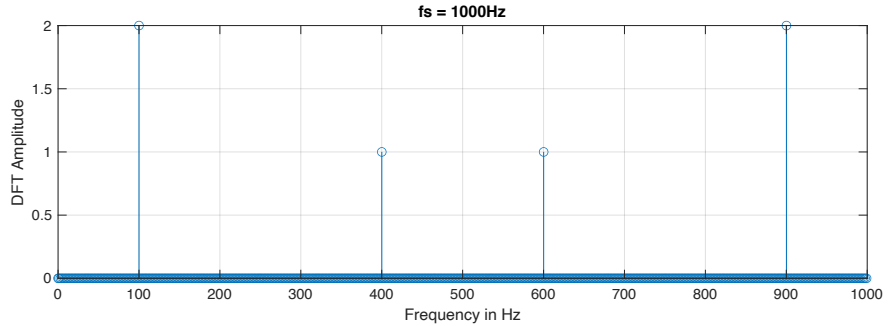
```
clear
Ns = 5000;
k = [1:Ns];
k = [0:Ns-1];
x = 4*cos(2*pi*0.1*k) +2*cos(2*pi*0.4*k);
figure(1)
h = fft(x);
f= linspace(0,1000,Ns);
subplot(211)
stem(f,abs(h(1:Ns))/Ns), grid
title('fs = 1000Hz')
xlabel('Frequency in Hz')
ylabel('DFT Amplitude')
subplot(212)
stem(f,real(h)/Ns)
hold on
stem(f,imag(h)/Ns)
hold off
title('fs = 1000Hz')
xlabel('Frequency in Hz')
ylabel('Amplitude')
legend('Real H','Imag H')
grid
```

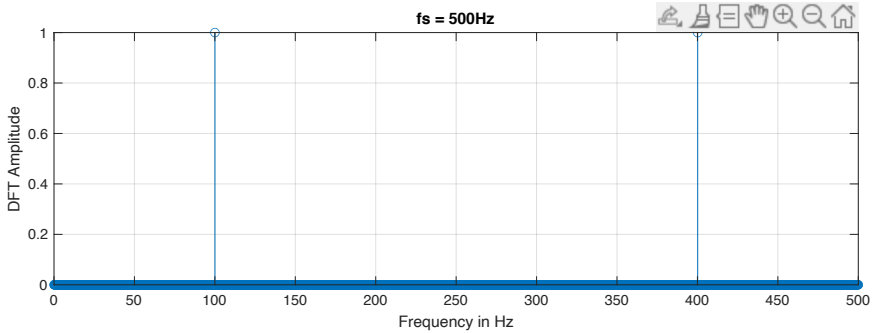
```
% Decimation
xd = x(1:2:end); % Decimate signal
Nsd = length(xd);
hd = fft(xd);
fd = linspace(0,500,Nsd);
figure(2)
subplot(211)
stem(fd,abs(hd(1:Nsd))/Nsd), grid
title('fs = 500Hz')
xlabel('Frequency in Hz')
ylabel('DFT Amplitude')
subplot(212)
stem(fd,real(hd)/Nsd)
hold on
stem(fd,imag(hd)/Nsd)
hold off
title('fs = 500Hz')
xlabel('Frequency in Hz')
ylabel('Aamplitude')
legend('Real H','Imag H')
grid
```

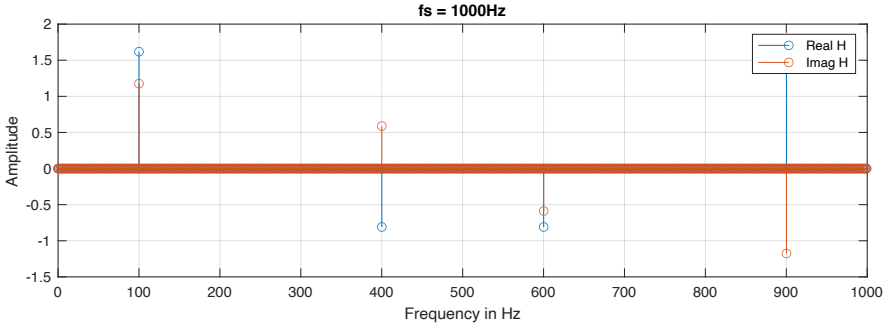
Decimation – plots

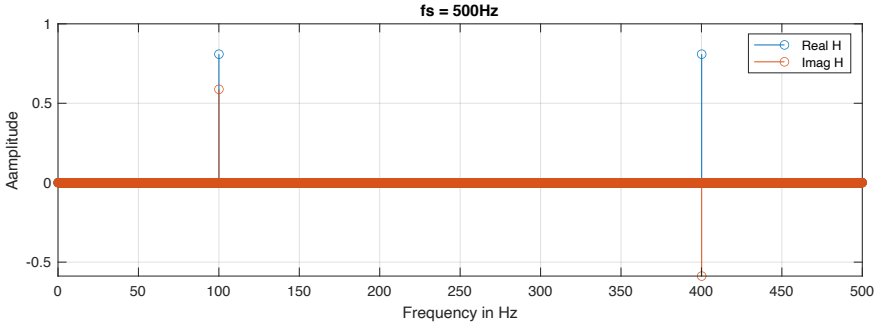
```
x = 4*cos(2*pi*0.1*k) +2*cos(2*pi*0.4*k);
k = [1:Ns];
```

DFT complex – sum of amplitudes after decimation









Decimation – plots

```
x = 4*cos(2*pi*0.1*k) +2*cos(2*pi*0.4*k);
k = [0:Ns-1];
```

DFT real – sum of amplitudes after decimation