

Εργαστήριο Υπολογιστικής Επιστήμης II
Πέμπτη 26 Φεβρουαρίου 2009

Άσκηση 4η

1) Fourier Transformation

```
fo = 4; %frequency of the sine wave
Fs = 100; %sampling rate
Ts = 1/Fs; %sampling time interval
t = 0:Ts:1-Ts; %sampling period
n = length(t); %number of samples
y = 2*sin(2*pi*fo*t); %the sine curve
```

```
%plot the cosine curve in the time domain
sinePlot = figure;
plot(t,y)
xlabel('time (seconds)')
ylabel('y(t)')
title('Sample Sine Wave')
grid
```

```
%plot the frequency spectrum using the MATLAB fft command (Discrete Fourier
%Transformation
matlabFFT = figure; %create a new figure
YfreqDomain = dft(y); %take the fft of our sin wave, y(t)
```

```
stem(abs(YfreqDomain)); %use abs command to get the magnitude
%similary, we would use angle command to get the phase plot!
```

```
xlabel('Sample Number')
ylabel('Amplitude')
title('Using the Matlab fft command')
grid
axis([0,100,0,120])
```

2) *Wavelet analysis*

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% F R E Q U E N C Y B R E A K
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

```
%The purpose of this example is to show how analysis by wavelets can detect the exact
%instant when a signal changes. The discontinuous signal consists of a slow sine wave abruptly
%followed by a medium sine wave.
```

```
load freqbrk;
signal = freqbrk;

lev = 5;
wname = 'db1';
nbc = 64;
[c,l] = wavedec(signal,lev,wname);

len = length(signal);
cfd = zeros(lev,len);
for k = 1:lev
    d = detcoef(c,l,k);
    d = d(:)';
    d = d(ones(1,2^k),:);
    cfd(k,:) = wkeep1(d(:)',len);
end
cfd = cfd(:);
I = find(abs(cfd)<sqrt(eps));
cfd(I) = zeros(size(I));
cfd = reshape(cfd,lev,len);
cfd = wcodemat(cfd,nbc,'row');

set(subplot(3,1,1),'Xtick',[]);
plot(signal,'r');
title('Analyzed signal.');
```

```
set(gca,'Xlim',[1 length(signal)])
subplot(3,1,2);
colormap(cool(128));
image(cfd);
tics = 1:lev;
labs = int2str(tics');
```

```
set(gca,'YTicklabelMode','manual','Ydir','normal','Box','On','Ytick',tics,'YTickLabel',labs ...
);
title('Discrete Transform, absolute coefficients. ');
ylabel('Level');
set(subplot(3,1,2),'Xtick',[]);
subplot(3,1,3);
scales = (1:32);
cwt(signal,scales,wname,'plot');
colormap(cool(128));
tt = get(gca,'Yticklabel');
[r,c] = size(tt);
yl = char(32*ones(r,c));
for k = 1:3:r , yl(k,:) = tt(k,:); end
set(gca,'Yticklabel',yl);
```