HERIOT-WATT UNIVERSITY

DEPARTMENT OF COMPUTING AND ELECTRICAL ENGINEERING

B39SE1 – Matlab tutorial 3
Useful Demos on Signal Processing

Objectives:

We will investigate the notion of FFT, spectrum analysis, spectrogram and filter design in the course. Matlab provides useful demos for all of these topics as we will see in the following.

During this session, you will learn & practice:

1- Access the signal processing demos
2- Sampling and aliasing
3- Look at the Fourier transform demo
4- Look at the Spectrum analysis demos
5- Design and analyse filters
6- Analyse systems using the z transform

Ressources required:

In order to carry out this session, you will need to start matlab. To launch most of the demos, you just need to start the demos using demo or sigdemos

Sampling and Aliasing:

If you have a computer with a microphone, you can record yourself using the following commands:

```
Fs = 11025;
y  = wavrecord(5*Fs, Fs, 'int16');
wavplay(y, Fs);
```

If you do not have a microphone, try this:

```
Fs = 11025;
t =  0:1/Fs:5;
y = 3*sin(2*pi*100*t)';
wavplay(y,Fs);
```

Or this:

```
t=0:1/Fs:5;              % 10 secs @ 1kHz sample rate
y=1*chirp(t,0,1,1000);       % Start @ DC, cross 150Hz at t=1sec
specgram(y,256,Fs); % Display the spectrogram
wavplay(y,Fs);
```

Aliasing

Try
wavplay(y(1:2:length(y),Fs)

and
wavplay(y(1:4:length(y),Fs)
or
wavplay(y(1:8:length(y),Fs)

Comments?

In order to verify your intuition, do

```
specgram(y,256,Fs)

specgram(y(1:2:length(y)),Fs/2);

specgram(y(1:4:length(y)),Fs/4);

specgram(y(1:8:length(y)),Fs/8);
```

Fourier Analysis:

A Basic demo is available:
sigdemo1

Modulation demonstration
moddemo

Spectral Analysis:

Two nice demos are available:

DTMF spectral analysis demo. Type
Phone

Spectral analysis
specgramdemo

Filter Design

Again two nice demos are available
filtdemo
fdatool