LAB. 1 – BASIC SIGNAL AND SPECGRAM

電子三乙
學號:106360228
姓名:魏丞澤

AM的程式:

```
1  -    [s,fs]=audioread('audio_in.wav');
2
3
4  -    duration = (1:length(s))/fs;
5  -    subplot(5,1,1); plot(duration, s);
6  -    audioLeft = s(:, 1);
7
8
9
10 -    subplot(5,1,2);spectrogram(audioLeft,128,120,128,fs,'yaxis');
11
12 -    t=[0:length(audioLeft)-1]/fs;
13 -    t=t';
14 -    f=1000;
15 -    carrier_wave=sin(2*pi*t*f);
16
```

利用Matlab來撰寫程式，透過理解老師的範例程式來寫出如何製作出AM的程式

```
17 -    audiowrite('carrier_wave.wav',carrier_wave,fs)
18
19
20 -    subplot(5,1,3);plot(carrier_wave);
21
22 -    out=audioLeft.*carrier_wave;
23
24
25 -    audiowrite('am_modulated.wav',out,fs)
26 -    subplot(5,1,4);plot(duration,out);xlabel('Time(s)');
27 -    subplot(5,1,5);spectrogram(out,128,120,128,fs,'yaxis');
28
29
30
```

AM的波形圖:

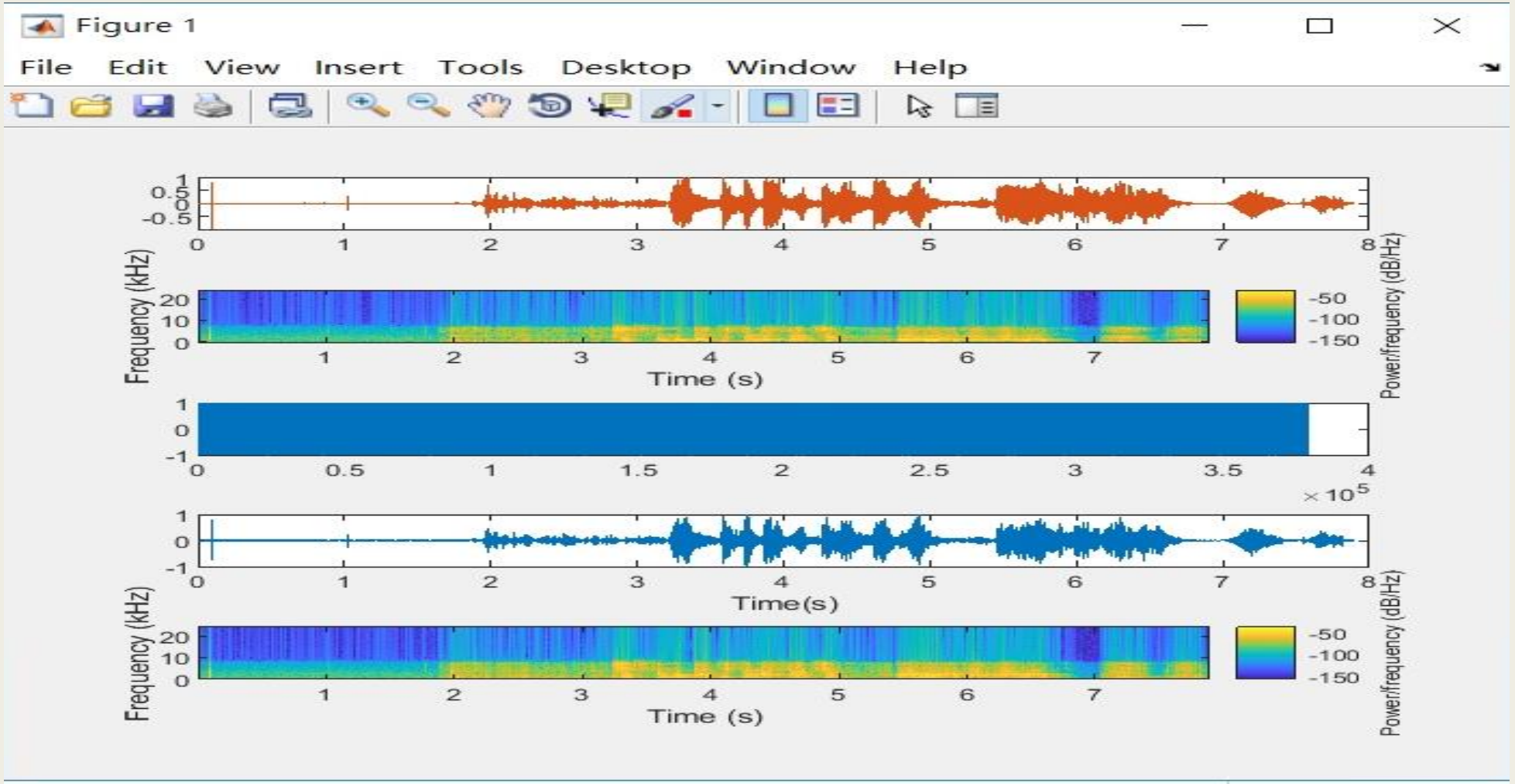
Figure 1
File Edit View Insert Tools Desktop Window Help
Frequency (kHz)
Time (s)
Power/frequency (dB/Hz)
Time(s)
×10^5

FM的程式:

```
1 -     clear all
2 -     close all
3 -     [s,fs]=audioread('audio_in.wav');
4
5 -     duration = (1:length(s))/fs;
6 -     subplot(7,1,1); plot(duration, s);
7 -     audioLeft = s(:, 1);
8
9 -     subplot(7,1,2);spectrogram(audioLeft,128,120,128,fs,'yaxis');
10
11 -    t=[0:length(audioLeft)-1]/fs;
12
13 -    t=t(:);
14
```

透過AM的部分來打出FM的程式，只需修改一點點些許的部分即可以完成。

```
15
16 -    Fc=100;
17 -    carrier_signal=cos(2*pi*Fc*t);
18 -    subplot(7,1,3);plot(duration,carrier_signal);
19 -    audiowrite('carrier_wave.wav',carrier_signal,fs)
20
21 -    freqdev=50
22 -    int_x = cumsum(audioLeft)/fs;
23 -    xfm = cos(2*pi*Fc*t + 2*pi*freqdev*int_x );
24 -    audiowrite('fm_modulated.wav',xfm,fs)
25
26 -    subplot(7,1,4);plot(duration,xfm);
27 -    subplot(7,1,5);spectrogram(xfm,128,120,128,fs,'yaxis');
28
29
30
```

FM的波形圖:

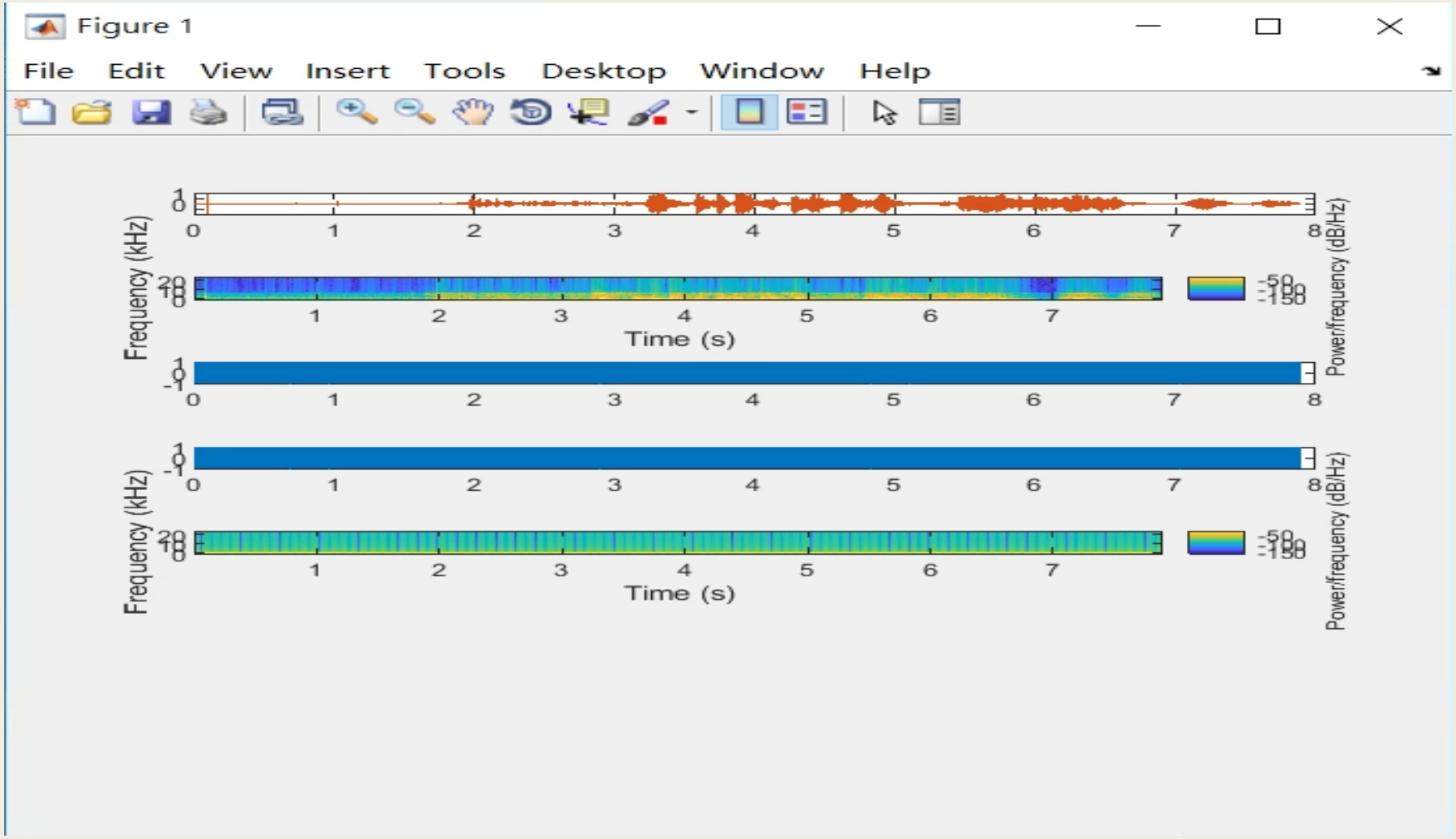
Figure 1
File Edit View Insert Tools Desktop Window Help
Frequency (kHz)
Time (s)
Power/frequency (dB/Hz)
Frequency (kHz)
Time (s)
Power/frequency (dB/Hz)

心得:

這是第一次數位信號處理的作業，也是我第一次用MatLab，非常的不熟悉，還有以前所教的GitHub都忘光了，還好有網路這個方便的東西可以令我快速的重啟大一的記憶。