ECEN 133
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Lab Report 5
Part 1

X 696.667	X 770	X 852.083	X 941.042	X 1209.17	X 1336.04
Y 3824.18	Y 2006.19	Y 1003.61	Y 996.39	Y 1977.24	Y 999.221

X 1476.67
Y 4770.91

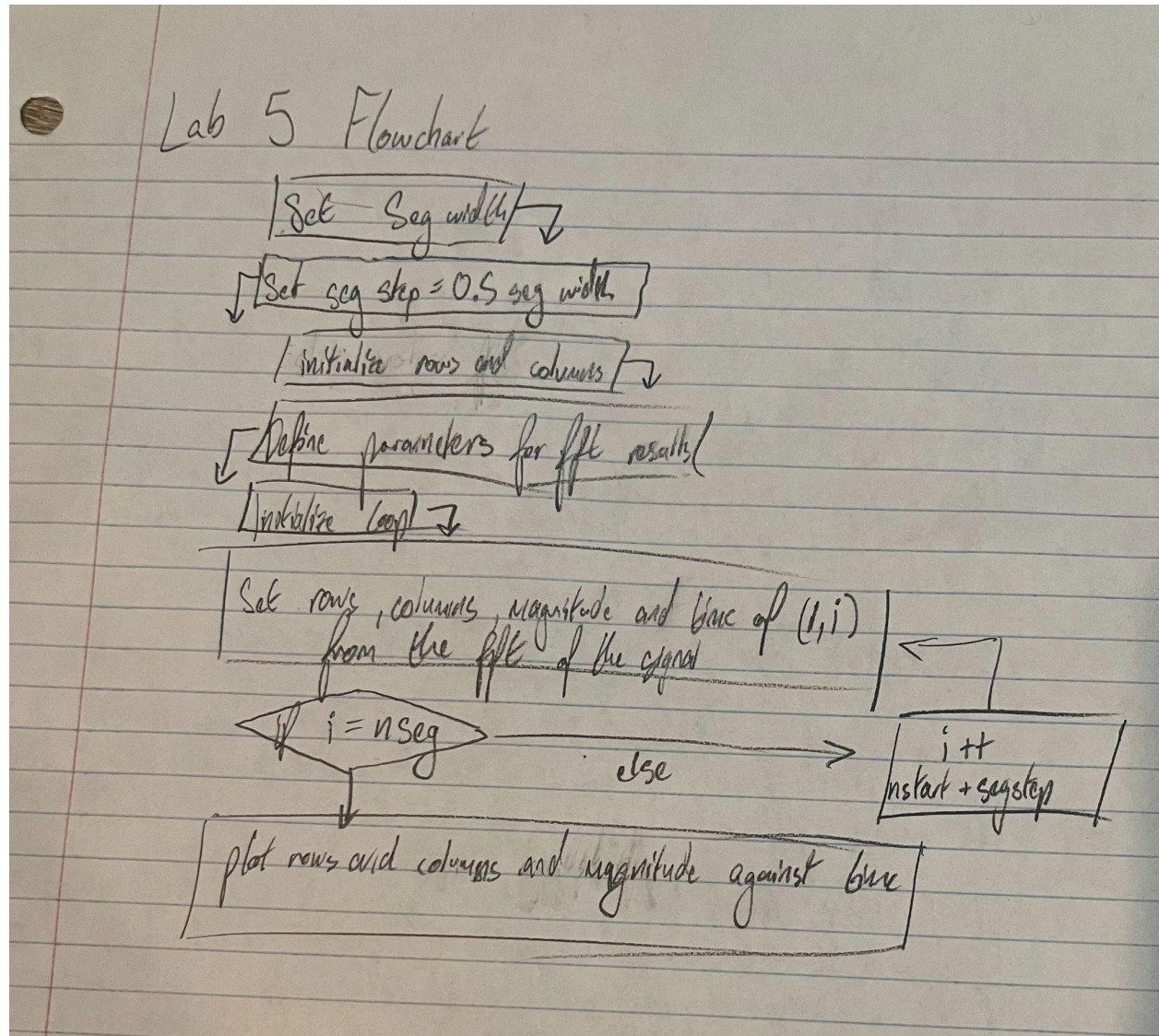,The X values are the frequencies
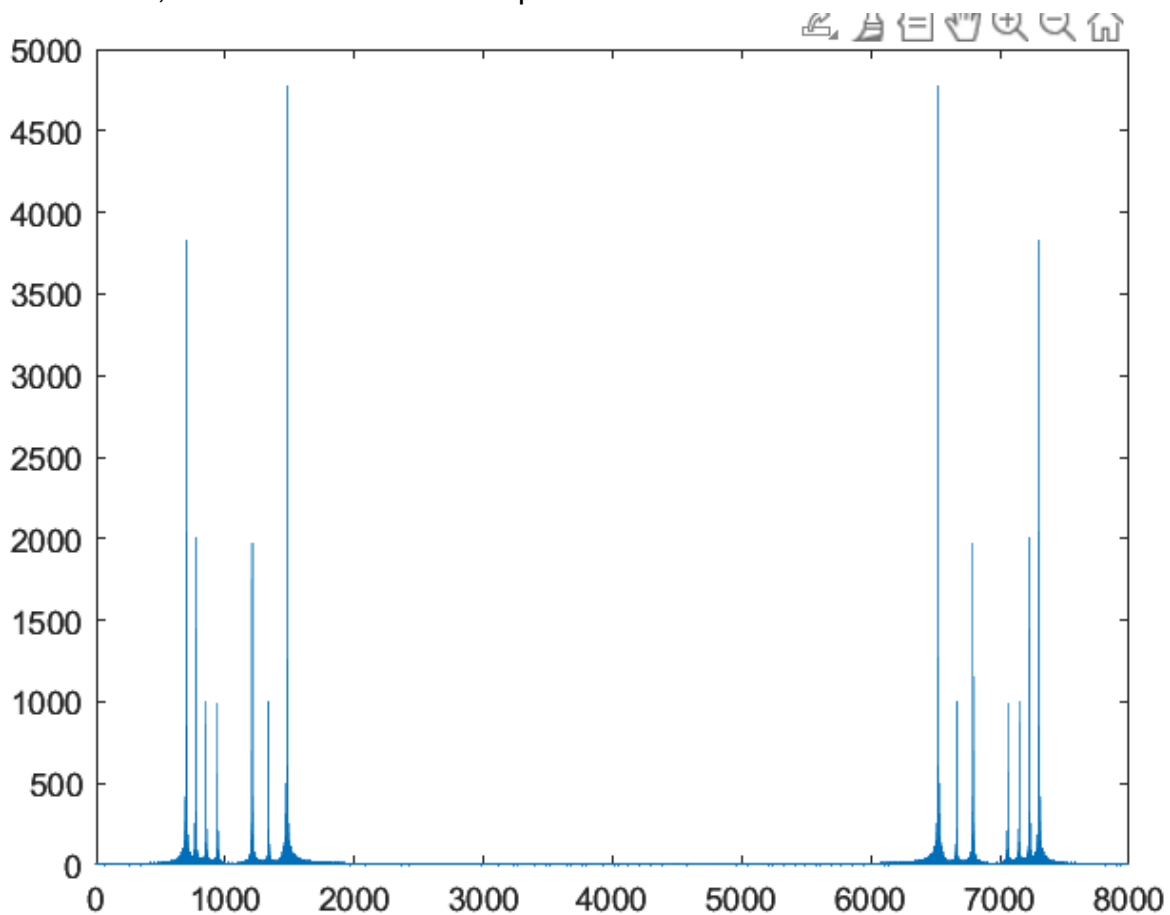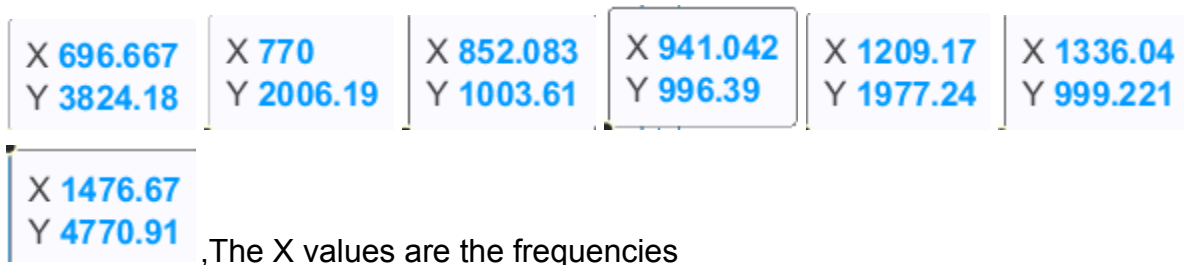
For each unique value in dialvals there exists a pulse.
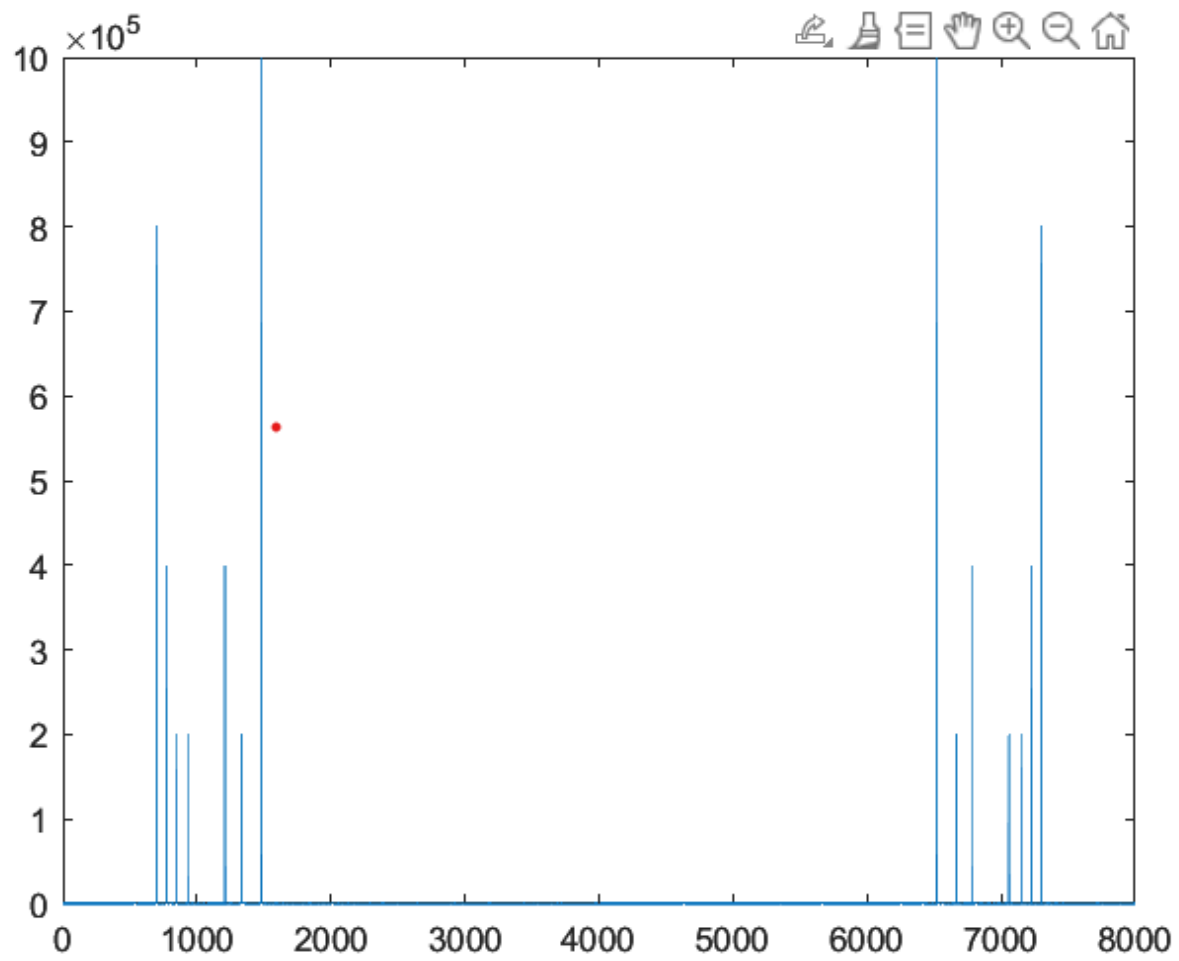The frequencies of 2, 4, and 6 are amplified with the least gain, while the amplitudes of 1 and 12 are much higher.
The pulses on the right side are these values reflected across x = 4KHz

You cannot tell the sequence of buttons because they are all amplified at randomly varying gains and are not evenly distributed across the frequency, for example 6 and 9 seem closer together than 3 and 4.
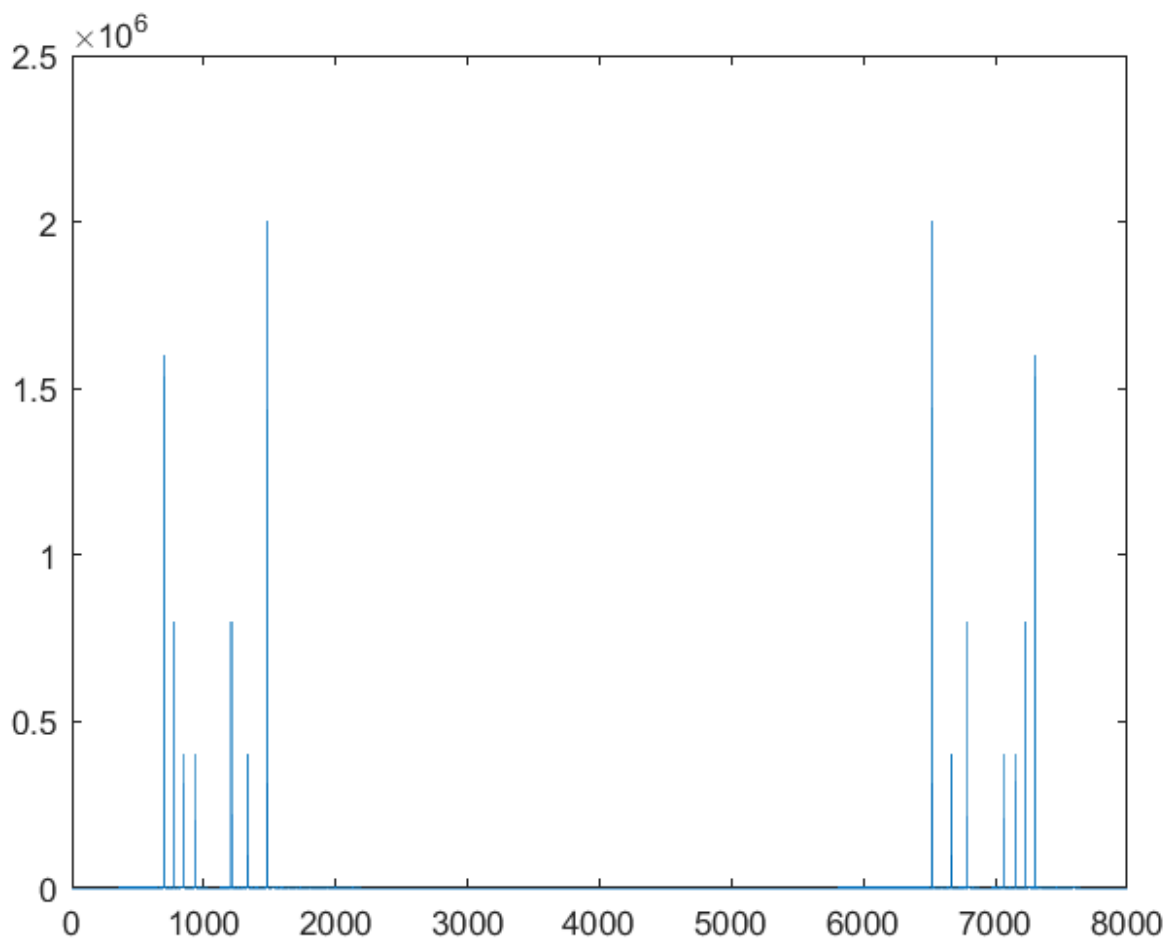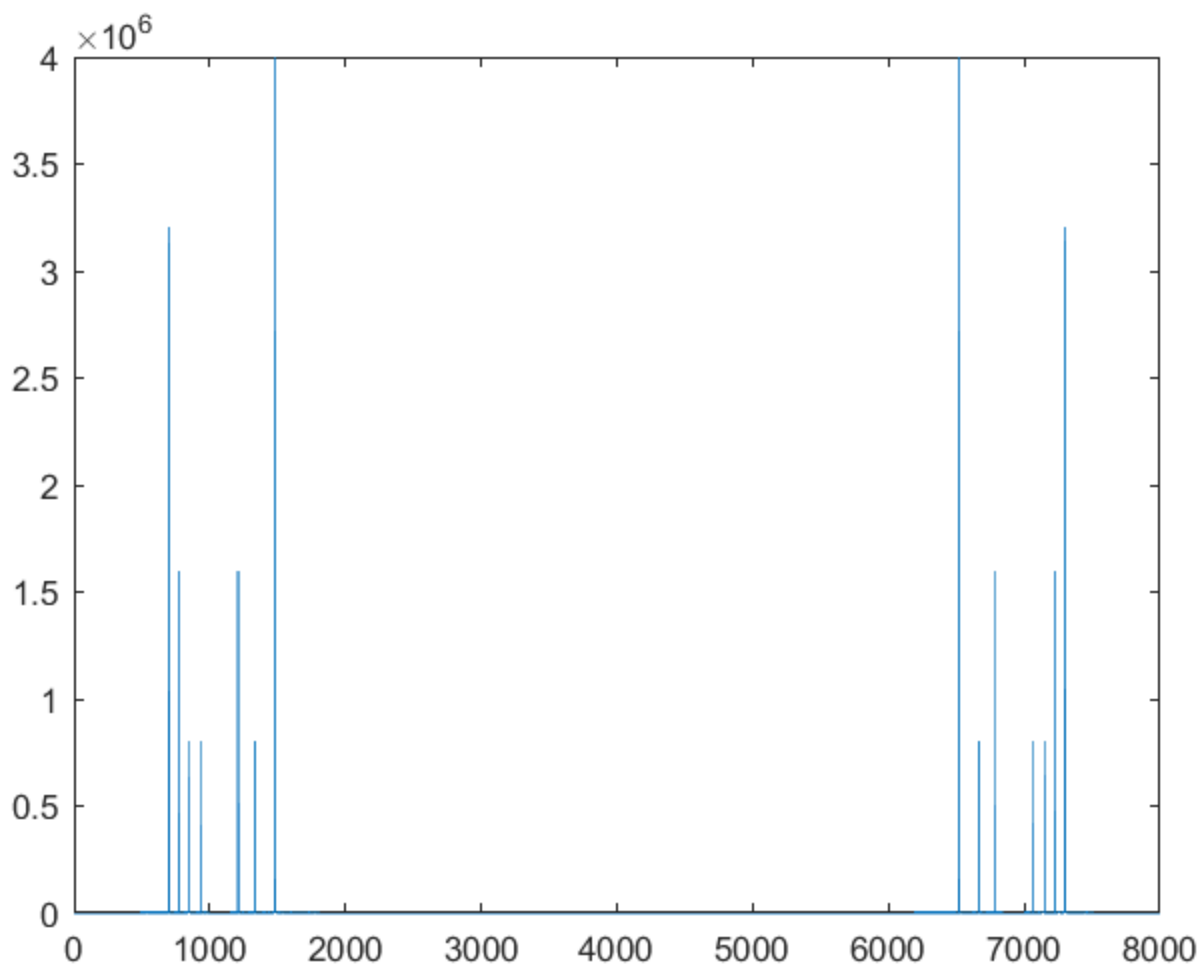
Part 2

Lab 5 Flowchart

Set Seg width

Set seg step = 0.5 seg width

Initialize rows and columns

Define parameters for fft results

Initialize loop

Set rows, columns, magnitude and time of $(1, i)$ from the fft of the signal

$i = nseg$

else

i++
nstart + segstep

plot rows and columns and magnitude against time

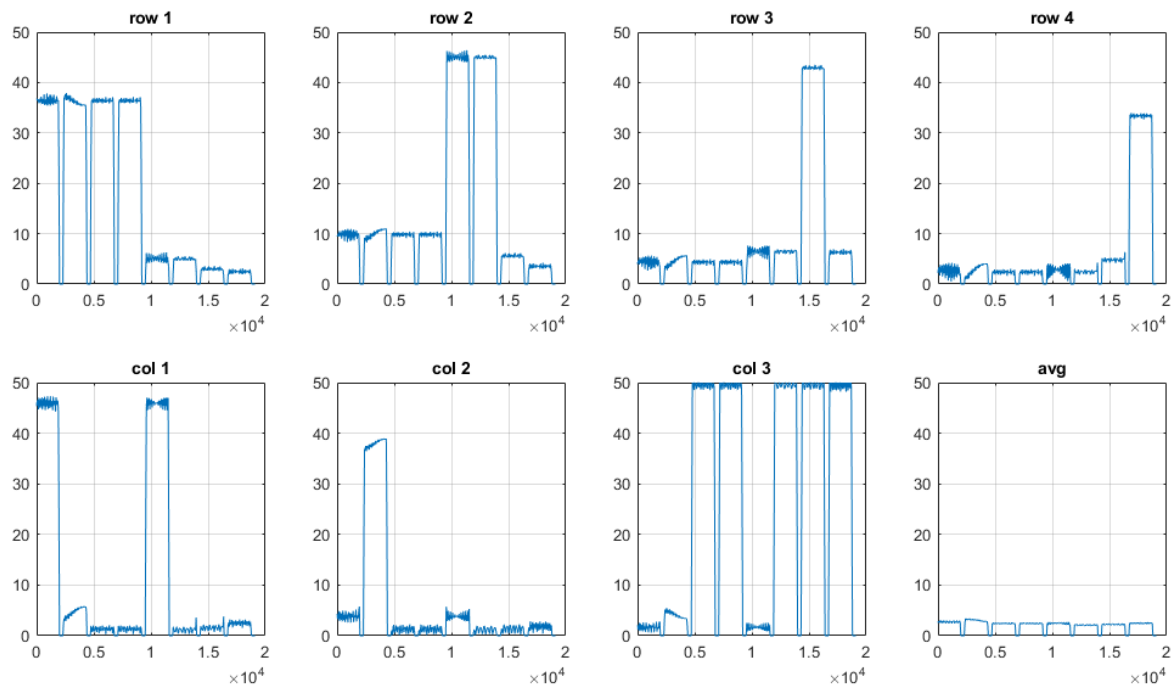With seg_width 100:

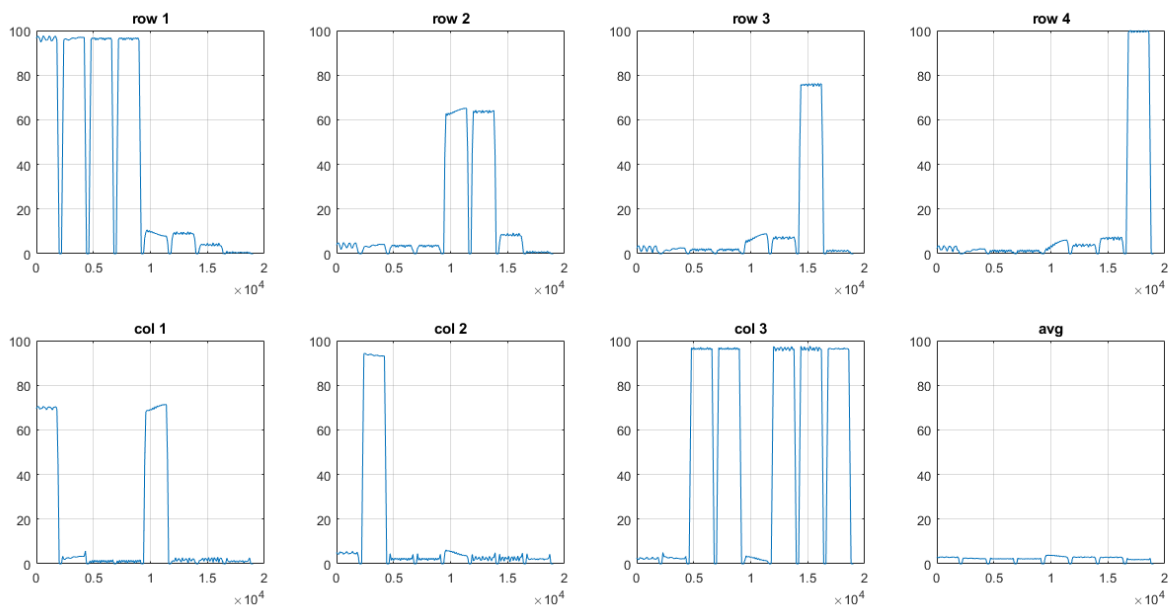With seg_width 200:

With seg_width 400:

Step 3

For Segwidth 200

For Segwidth 400

Step 4

```
seg_width = 400;
Fs = 8000;
seg_step = 0.5*seg_width;
dialvals= [1, 2, 3, 3, 4, 6, 9, 12];

sig = my_dtmf(seg_width, seg_step, Fs, dialvals);

shrAnalyze(seg_width, Fs, sig);

SS = fft(sig, 2*seg_width);

dF = Fs/200;
fv = (0:length(SS)-1)*dF;
plot(fv, abs(SS));
```
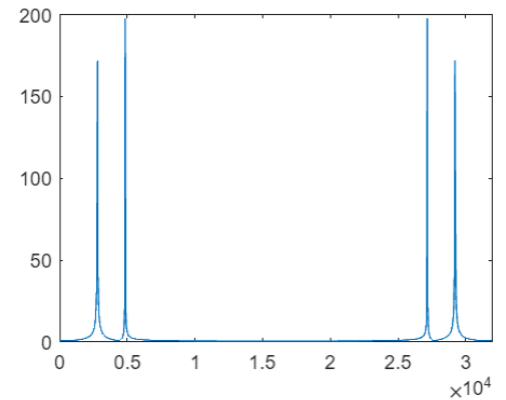


```
seg_width = 400;
Fs = 8000;
seg_step = 0.5*seg_width;
dialvals= [1, 2, 3, 3, 4, 6, 9, 12];

sig = my_dtmf(seg_width, seg_step, Fs, dialvals);

shrAnalyze(seg_width, Fs, sig);

SS = fft(sig, 4*seg_width);

dF = Fs/200;
fv = (0:length(SS)-1)*dF;
plot(fv, abs(SS));
```
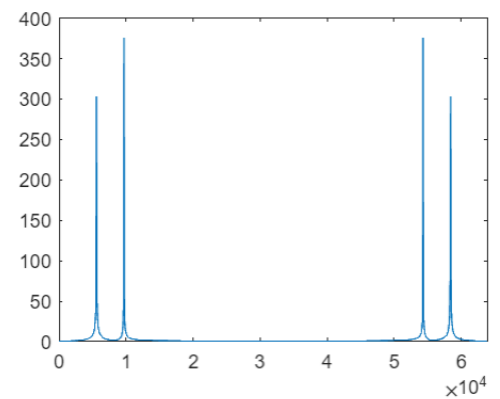

Step 5

Step 5

```
aa = 1;   %Too high the tones cant be detected
xn = x + aa*randn(1, length(x));
sound(xn);

aa = 0.1;   %The noise is still very noticeable but the tones can be detected
xn = x + aa*randn(1, length(x));
sound(xn);
```

Zero padding our signal could improve its clarity