

q2

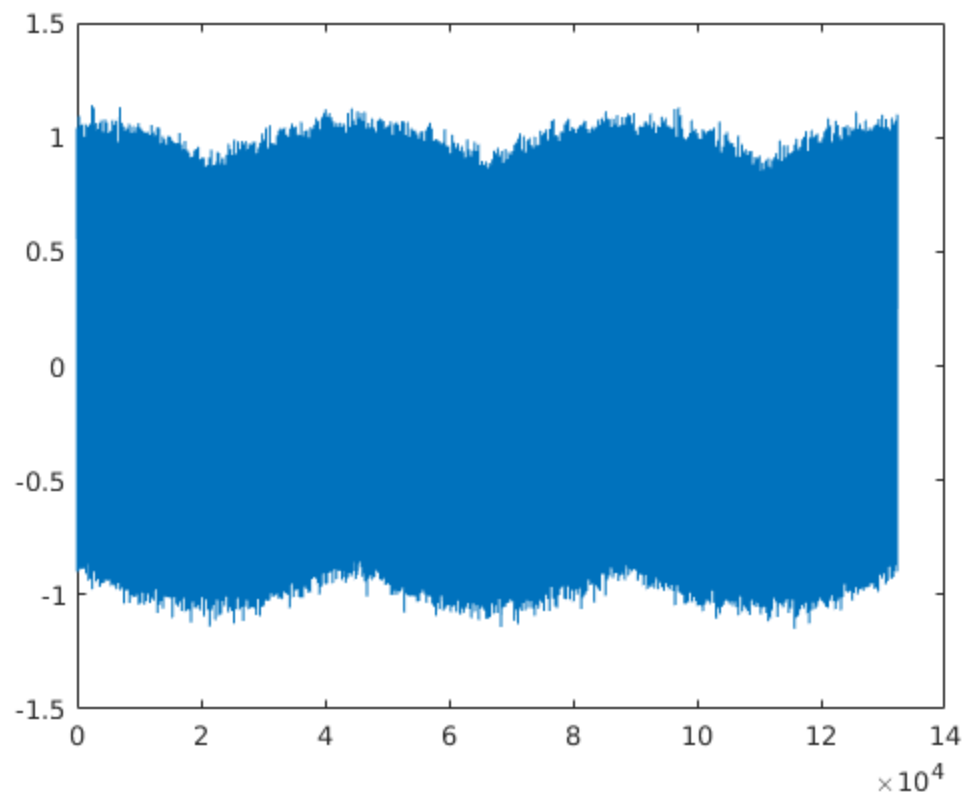
March 12, 2018

## 1 Removing Noise from a signal

- Our goal is to remove the noise added to the two tone telephones sinusoids
- By taking the fourier transform of the signal
- Find the main frequencies
- Use a rect filter and take an ifft of the smooth signal

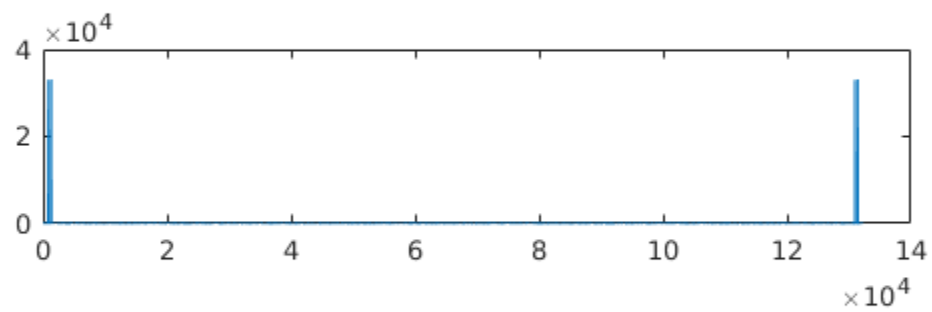
### 1.0.1 Load and play the original audio

```
In [11]: load('./q2.mat')  
         audio_x = audioplayer(X,44100);  
         play(audio_x);  
         plot(X);
```



### 1.0.2 Compute the fourier transform and plot it.

```
In [2]: f_x = fft(X);  
        plot(abs(f_x));  
        pbaspect([5 1 1]);
```



### 1.0.3 We notice 4 peaks in the plot

```
In [3]: [val,f] = sort(abs(f_x));  
        val(end-4:end),f(end-4:end)
```

ans =

1.0e+04 \*

0.0339

3.3068

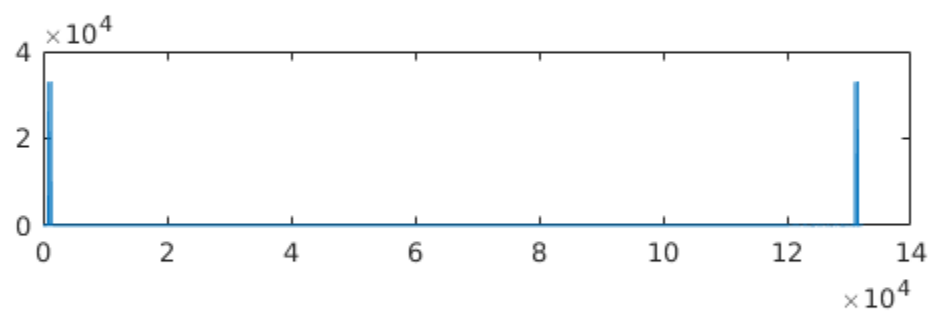
3.3068  
3.3082  
3.3082

ans =

130981  
1321  
130982  
882  
131421

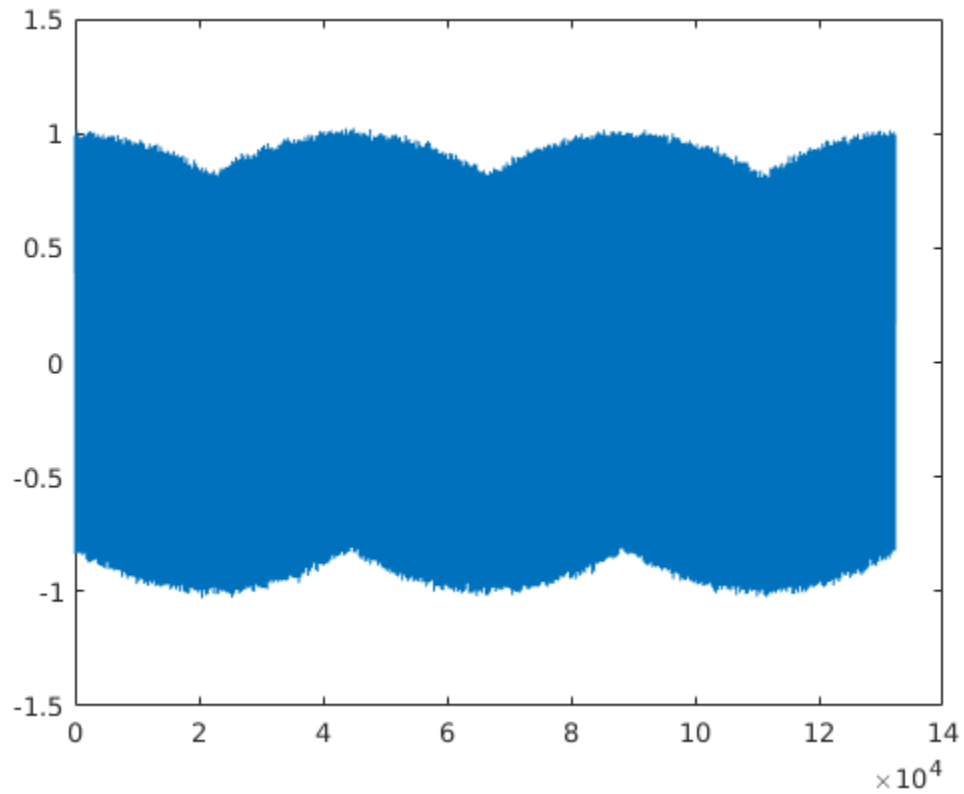
#### 1.0.4 Multiply with a rect function for bandwidth 700-1400 , 11000-end to remove noise

```
In [5]: rect = zeros(size(f_x));  
        rect(700:1400) = 1;  
        rect(end-12000:end) = 1;  
        plot(abs(f_x.*rect));  
        pbaspect([5 1 1])
```



### 1.0.5 Do inverse fourier transform

```
In [6]: y = ifft(f_x.*rect);  
        plot(real(y));
```



### 1.0.6 Convert to audio

```
In [12]: audio_r = audioplayer(real(y),Fs);  
         audiowrite('result.wav',real(y),Fs);  
         play(audio_r);
```

Warning: Data clipped when writing file.

> In audiowrite>clipInputData (line 396)

In audiowrite (line 176)