fourier2

February 2, 2018

```
In [4]: import scipy as sp
        from scipy.io import wavfile
        from scipy.fftpack import fft, ifft
        from scipy import signal
        import numpy as np
        from matplotlib import pyplot as plt
        import IPython
        %matplotlib inline
```

1 Fourier Transformations

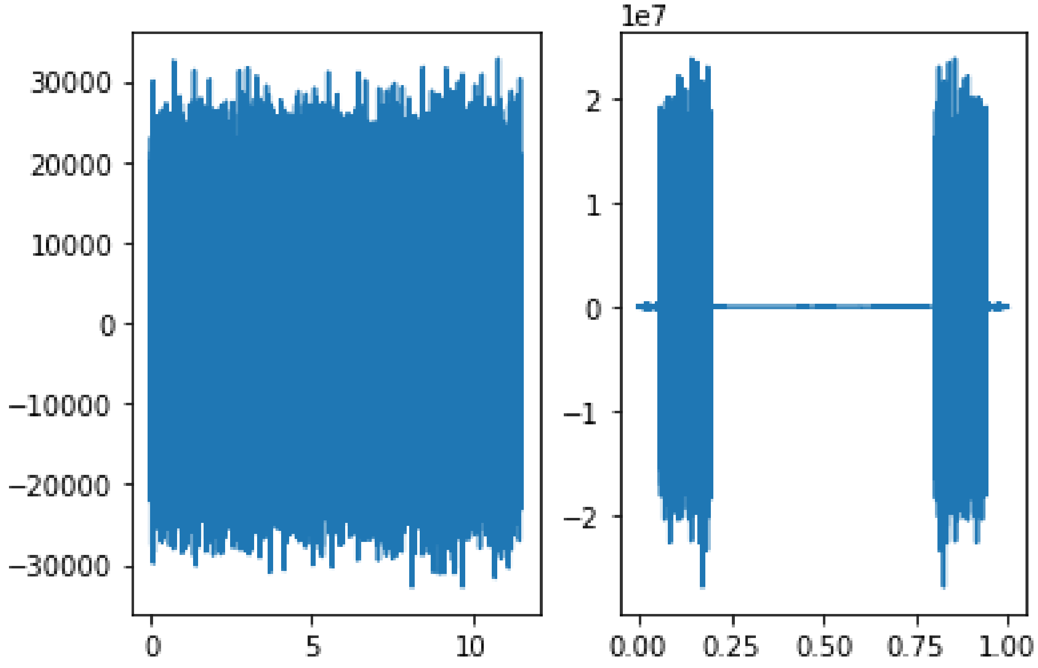
Edit sound using fourier transformations. Corresponding audio files are included in the repo.

```
In [5]: class Signal(object):

            def __init__(self, rate, sample):
                """This makes the code light on fire.
                rate: rate of the sample
                sample: array of samples"""
                self.rate=rate
                self.sample=sample


            def plot(self):
                """This makes Koa light on fire."""
                x=np.linspace(0,len(self.sample)/self.rate, len(self.sample))
                plt.subplot(121)
                plt.plot(x, self.sample)
                dft=sp.fft(self.sample)
                x_vals=sp.arange(1, len(dft)+1, 1)*1.
                x_vals=x_vals/len(self.sample)
                xvals=x_vals*rate
                plt.subplot(122)
                plt.plot(x_vals, dft)
                plt.show()
```

```
    def export(self, filename):
        samples=sp.int16(self.sample/sp.absolute(self.sample).max()*32767)
        wavfile.write(filename, self.rate, samples)


def note_generator(samplerate, frequency):
    stepsize=1./samplerate
    sample_points=sp.arange(0, 5,stepsize)
    wave_function=lambda x:sp.sin(2*sp.pi*x*frequency)
    samples=wave_function(sample_points)
    return Signal(samplerate, samples)
```

```
In [6]: #problem 1
        rate, data=wavfile.read('Noisysignal2.wav')
        signal=Signal(rate, data)
        signal.plot()
```

```
/Users/alexandragreenwood/anaconda3/lib/python3.6/site-packages/numpy/core/numeric.py:531: Compl
  return array(a, dtype, copy=False, order=order)
```



```
In [8]: fsig=sp.fft(data, axis=0)
        for j in range(14000, 200000):
                fsig[j]=0
                fsig[-j]=0
        newsig=sp.ifft(fsig)
        newsig=sp.real(newsig)
        newsig=sp.int16(newsig/sp.absolute(newsig).max()*32767)

In [10]: wavfile.write("newsig.wav", rate, newsig)

         print("The audio is JFK")
```

```
The audio is JFK
```

```
In [13]: #problem 3
         rate, data=wavfile.read("chopin.wav")
         silence=note_generator(44100, 0)
         added=np.hstack([data, np.zeros(4*rate)])
         rate1, data1=wavfile.read("balloon.wav")
         temp=fft(data1)
         response=np.hstack([temp[0:len(temp)/2],np.zeros(len(added)-len(temp)),temp[len(temp)/2
         finale=fft(added)*response
         finale=ifft(finale)
         finale=Signal(rate, finale)
         finale.plot()
         finale.export("newchopin1.wav")
         IPython.display.Audio("newchopin1.wav")
```

```
        ---------------------------------------------------------------------------

        TypeError                                 Traceback (most recent call last)

        <ipython-input-13-ab9eb25a897e> in <module>()
          5 rate1, data1=wavfile.read("balloon.wav")
          6 temp=fft(data1)
    ----> 7 response=np.hstack([temp[0:len(temp)/2],np.zeros(len(added)-len(temp)),temp[len(temp
          8 finale=fft(added)*response
          9 finale=ifft(finale)


        TypeError: slice indices must be integers or None or have an __index__ method
```

```
In [ ]: rate, data=wavfile.read("newsig.wav")
        sig=Signal(rate, data)
        sig.plot()

In [ ]: #problem 4

        samplerate=22050
        noise=sp.int16(sp.random.randint(-32767, 32767, samplerate*10))
        noise=Signal(samplerate, noise)
        noise.export("noise.wav")
        IPython.display.Audio("noise.wav")

In [ ]:
```