pyrecplay_lpfilterblock

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1 Program - Pyrecplay_lpfilterblock

PyAudio Example: Low pass filter between input and output (i.e., record a few samples, filter them, and play them back immediately).

- Gerald Schuller, January 2015

- **Import relevant modules**

```
In [1]: %matplotlib inline
        import pyaudio
        import struct
        import math
        #import array
        import numpy as np
        import scipy.signal
        import matplotlib.pyplot as plt
        import warnings

        warnings.filterwarnings('ignore')


        CHUNK = 1024 #Blocksize
        WIDTH = 2 #2 bytes per sample
        CHANNELS = 1 #2
        RATE = 32000  #Sampling Rate in Hz
        RECORD_SECONDS = 8
```

```
In [ ]:
```

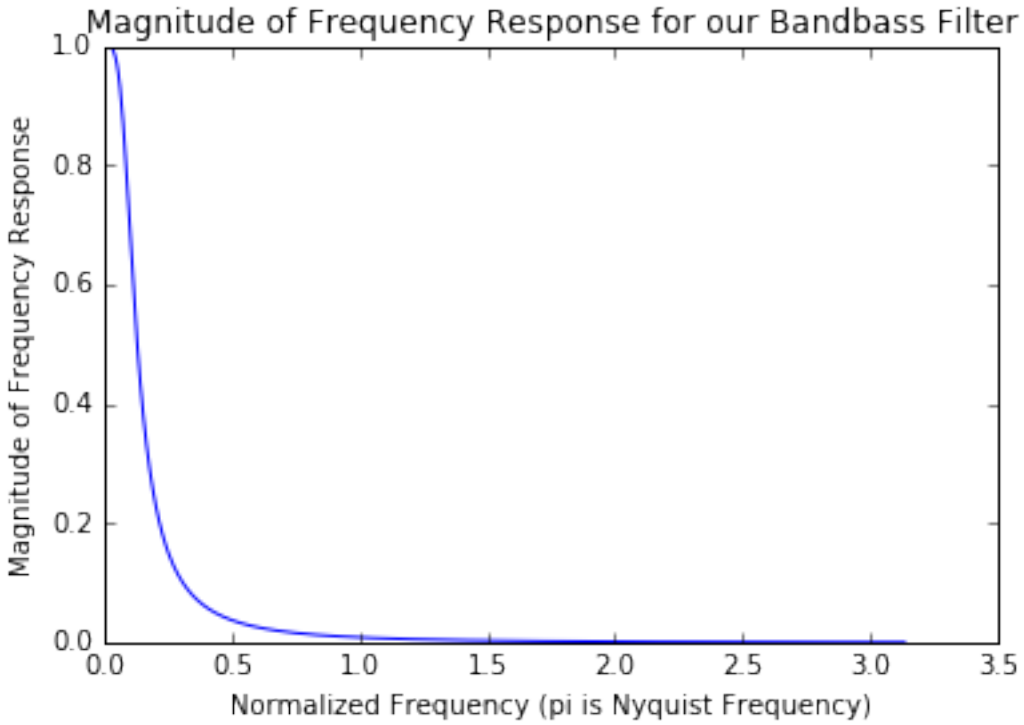
- **Design Low-pass Filter:**

```
In [2]: [b,a]=scipy.signal.iirfilter(2, 500.0/16000,rp=60,btype='lowpass')
```

- **Plot the freqeuncy response for the filter:**

```
In [3]: fig = plt.figure()
        [freq, response] = scipy.signal.freqz(b,a)
```

```
        plt.plot(freq, np.abs(response))
        plt.xlabel('Normalized Frequency (pi is Nyquist Frequency)')
        plt.ylabel("Magnitude of Frequency Response")
        plt.title("Magnitude of Frequency Response for our Bandbass Filter")
        fig.show()
```



- **Initialise audio port and start recording**

```
In [4]: p = pyaudio.PyAudio()

        stream = p.open(format=p.get_format_from_width(WIDTH),
                        channels=CHANNELS,
                        rate=RATE,
                        input=True,
                        output=True,
                        #input_device_index=10,
                        frames_per_buffer=CHUNK)


        print("* recording")
```

```
* recording
```

- **Initialize memory for filter:**

```
In [5]: z=np.zeros(3-1)
```

- **Loop for the blocks:**

```
In [6]: for i in range(0, int(RATE / CHUNK * RECORD_SECONDS)):
            #Reading from audio input stream into data with block length "CHUNK":
            data = stream.read(CHUNK)
            #Convert from stream of bytes to a list of short integers (2 bytes here) in "samples
            #shorts = (struct.unpack( "128h", data ))
            shorts = (struct.unpack( 'h' * CHUNK, data ));
            #samples=list(shorts);
            samples=np.array(list(shorts),dtype=float);
            #filter function:
            [filtered,z]=scipy.signal.lfilter(b, a, samples, zi=z)
            #Bypass filter:
            #filtered=samples
            filtered=np.clip(filtered, -32000,32000)
            #converting from short integers to a stream of bytes in data:
            data=struct.pack('h' * len(filtered), *filtered);
            #Writing data back to audio output stream:
            stream.write(data, CHUNK)

        print("* done")

        stream.stop_stream()
        stream.close()

        p.terminate()

* done
```