# Freqz(Module)

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## 1 This is a module which has a function freqz which can be used to plot the frequency response of a filter or a digital signal and outputs the plot for frequency response and phase response for the given filter or signal.

#### 1.0.1 Input:

Inputs for the function freqz are as follows: ##### 'b' - vector of Filter coefficients in the numerator of its transfer function ##### 'a' - vector of Filter coefficients in the denominator of its transfer function(default value is 1 for FIR filter) ##### 'whole' - boolean parameter for plotting the frequency/phase for the complete timeperiod(cycle/2pi) ##### axisFreqz - vector of values for scaling axes of Frequency response. Vector structure: [xmin, xmax, ymin, ymax]. ##### axisPhase - vector of values for scaling axes of Phase response. Vector structure: [xmin, xmax, ymin, ymax].

#### 1.0.2 Output:

Shows a plot with twos subplots of frequency response on top and phase response at the bottom for the given signal of for filter coefficients provided.

#### 1.0.3 Import the relevant modules and define the function.

```
In [1]: # Module for show impulse rsponse answer
        # Julia Peter, Mathias Kuntze
        #Modified, Gerald Schuller, Nov. 2016

        import matplotlib.pyplot as plt
        import numpy as np
        from scipy import signal as sp

        def freqz(b, a=1, whole = False, axisFreqz = None, axisPhase = None):

            w, h = sp.freqz(b, a, worN=512, whole=whole)
            #w = w/np.pi
            fig = plt.figure()
            plt.title('Digital filter frequency response')
            plt.subplot(2,1,1)
plt.plot(w, 20 * np.log10(abs(h)), 'b')
plt.ylabel('Amplitude (dB)')
plt.xlabel('Normalized Frequency')
plt.grid()
if axisFreqz is not None:
    plt.axis(axisFreqz)

plt.subplot(2,1,2)
#angles = np.unwrap(np.angle(h))
angles = np.angle(h)
plt.plot(w, angles, 'g')
plt.ylabel('Angle (radians)')
plt.xlabel('Normalized Frequency')
plt.grid()

if axisPhase is not None:
    plt.axis(axisPhase)

plt.show()
return h
```