

# Audio Filtering

EE23BTECH11009 - AROSHISH PRADHAN\*

Symbol	Description
$x(n)$	Input Audio Signal
$y(n)$	Output Audio Signal
$H(\omega)$	Transfer Function
$h(n)$	Impulse Response

TABLE I: Parameter Table

Plot of input audio signal 'music7\_cut.wav' as  $x(n)$ :

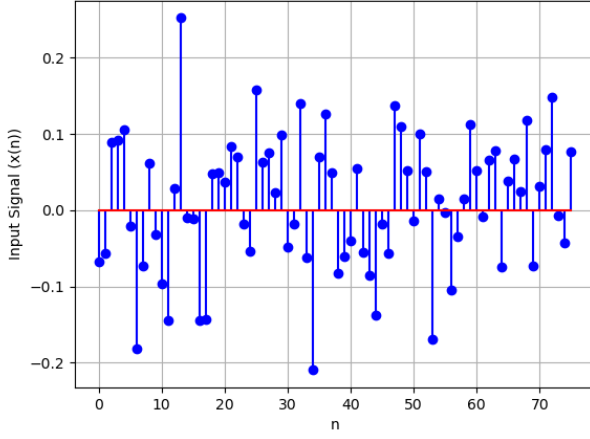


Fig. 1: Plot of  $x(n)$  vs  $n$

$y(n)$  is obtained through the following difference equation:

$$\sum_{m=0}^M a(m)y(n-m) = \sum_{k=0}^N b(k)x(n-k) \quad (1)$$

Coefficients  $a$  and  $b$  are calculated in 'audiofilter.py'

Plot of  $y(n)$  is as shown in Fig. 2.

$$x(n) \xleftrightarrow{\mathcal{F}} X(\omega) \quad (2)$$

$$y(n) \xleftrightarrow{\mathcal{F}} Y(\omega) \quad (3)$$

$$\Rightarrow H(\omega) = \frac{Y(\omega)}{X(\omega)} \quad (4)$$

Plot of  $H(\omega)$  is shown in Fig. 3

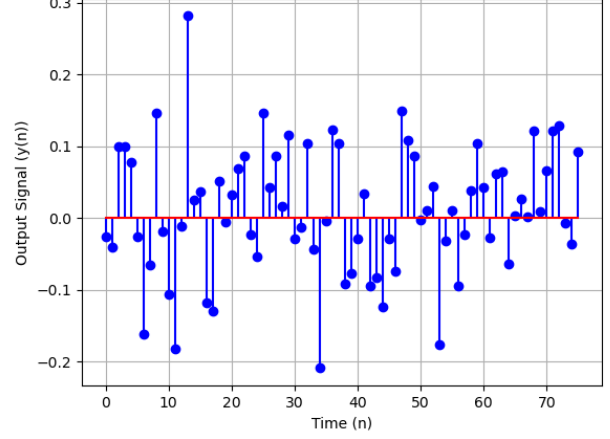


Fig. 2: Plot of  $y(n)$  vs  $n$

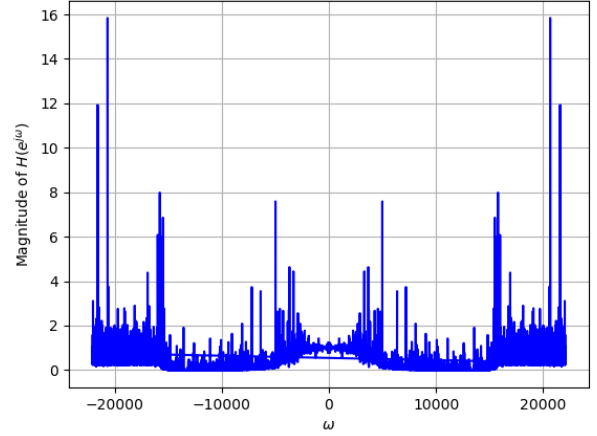


Fig. 3: Plot of  $H(\omega)$  vs  $\omega$

Impulse Response ( $h(n)$ ) is calculated by taking the Inverse Fourier Transform of  $H(\omega)$ . Plot of  $h(n)$  vs  $n$  is shown in Fig. 4

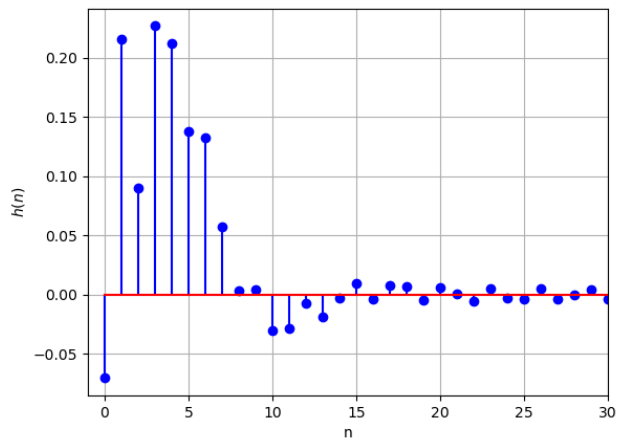


Fig. 4: Plot of  $h(n)$  vs  $n$