

EE3025 Assignment-1

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Download all python codes from

<https://github.com/Shreshta126/EE3025-IDP/tree/main/Assignment1/codes>

and latex-tikz codes from

https://github.com/saivarsha17/EE3025/blob/main/Assignment_1/ee18btech11042.tex

Taking **fft** of $x(n)$ and multiplying it by $H(e^{j\omega})$ we get $Y(e^{j\omega})$. Taking **ifft** of $Y(e^{j\omega})$ we get $y(n)$.

Python code for the problem

`codes/ee18btech11041.py`

Below are the plots which verifies our own routine

1 PROBLEM

The command

```
output_signal = signal.lfilter(b,a,
    output_signal)
```

in Problem 2.3 is executed through following difference equation

$$\sum_{m=0}^M a(m) y(n-m) = \sum_{k=0}^N b(k) x(n-k) \quad (1.0.1)$$

where input signal is $x(n)$ and output signal is $y(n)$ with initial values all 0. Replace **signal.filtfilt** with your own routine and verify.

2 SOLUTION

Shifting property of z-transform

$$\mathcal{Z}\{x(n-u)\} = z^{-u}X(z) \quad (2.0.1)$$

where $X(z)$ is the Z- transform of $x(n)$ and u is constant.

Applying Z-transform on both sides of the eq.(1.0.1) and using the above property:

$$\sum_{m=0}^M a(m) Y(z) z^{-m} = \sum_{k=0}^N b(k) X(z) z^{-k} \quad (2.0.2)$$

$$H(z) = \frac{Y(z)}{X(z)} = \frac{\sum_{k=0}^N b(k) z^{-k}}{\sum_{m=0}^M a(k) z^{-m}} \quad (2.0.3)$$

The coefficients a,b are obtained by passing $x(n)$ through the low pass filter.

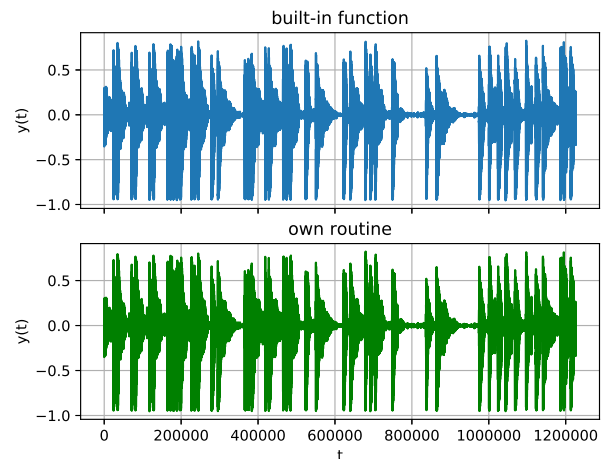


Fig. 0: Time response

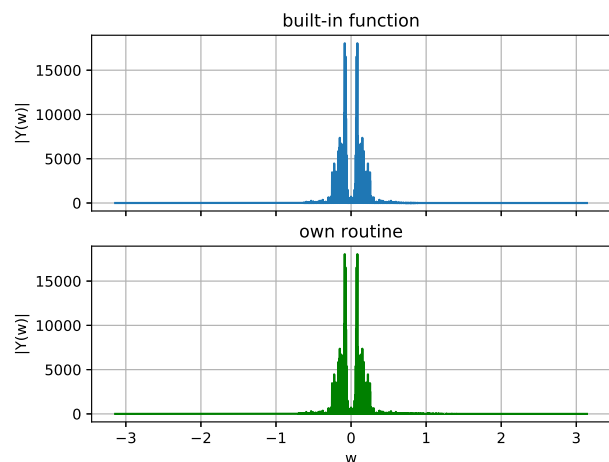


Fig. 0: Frequency response