from scipy.signal import lfilter,dlti,dimpulse #Base on Scipy,numpy,matplotlib

import numpy as np

import matplotlib.pyplot as plt

def bigshow(\*v):

if len(v) < 2 or len(v) > 4: #Determine the number of parameters and assign values

print('Error. Wrong number of input arguments.') #Report error if variables <2 or>4

else: #Set a,b,tsim,timpulse vaule

a = v[0]

b = v[1]

if len(v) >= 3:

tsim = v[2]

if len(v) >= 4:

timpulse = v[3]

else:

timpulse = 30

else:

tsim = 80

timpulse = 26

#First generate the simulation (Gaussian errors)

nn = 100 #Number of observations to be discarded

u = np.random.randn(tsim+nn) #Generate white noise with var σ^2 = 1

y = lfilter(b,a,u,-1 ,None) #Digital filter

plt.figure(figsize=(10, 4)) #Set display size 1000\*400

plt.subplot(1,2,1)

plt.plot(y)

plt.title('Simulation')

plt.xlim(0,tsim)

#Impulse Response

sys = dlti(b,a) #Building function system

x1,y1 = dimpulse(sys) #Impulse response function

plt.subplot(1,2,2)

plt.plot(x1,y1[-1])

plt.title('Impulse Response')

plt.xlim(0,timpulse)

#plt.ylim(0) Set y limit

plt.show()

bigshow([1],[1]) #Results

bigshow([1,0],[1,0.5])

bigshow([1,0,0 ],[1,0.5,0.4])

bigshow([1,-0.999],[1,-0.4])

bigshow([1,-0.8,0],[1,0.5,0.4])