Signals Project

(milestone I)
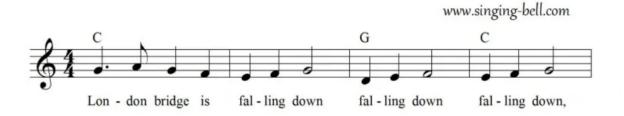
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Tutorial: *T-26*

- ## Description:

My code is simply generating the song "London Bridge is falling down" using notes of the fourth octave with the right hand only . It consists of 13 piano notes with different durations 0.3 or 0.6 sec , with gap between every note of 0.1 sec. The whole song is 6 sec. The music Sheet is shown in the figure below.

The code starts by importing the needed libraries

such as :   import numpy as np

import matplotlib.pyplot as plt

import sounddevice as sd

Then making a t on x-axis by using linspace method starting form 0 to 6 with 12*1024 divisions.

After that the frequencies ,duration and stating time of each note each is represented in an array.

Then inside a for loop recalling the formula :

$$xi\ t = \sin 2\pi fi\ t\ [u(t - ti) - u(t - ti - Ti)]$$

for each note using its f[i] (frequency) and ti[i] (starting time of the note) and Ti[i] (duration of the note) and adding it to the output signal x.

Lastly, the output signal x is plotted and played using sounddevice.

• <u>Full code:</u>

```
import matplotlib.pyplot as plt
import sounddevice as sd
import numpy as np

t = np. linspace(0 , 6 , 12*1024)

f = [392.00, 440.00,
392.00,349.23,329.63,349.23,392.00,293.66,329.63,349.23,329.63,349.23,
392.00]
ti =[0,   0.4, 0.8, 1.2, 1.6, 2,   2.4, 3.1, 3.5, 3.9, 4.6, 5,   5.4]
Ti =[0.3, 0.3, 0.3, 0.3, 0.3, 0.3, 0.6, 0.3, 0.3, 0.6, 0.3, 0.3, 0.6]
x=0
i=0
for i in range(len(f)) :
    x+= np.sin( 2*np.pi*f[i]*t )*( t>ti[i] )*( t<(Ti[i]+ti[i]) )
    i+=1

plt.plot(t, x)

sd.play(x, 2*1024)   #where 2*1024 is got from 12*1024/(6-0)
```

- ## <u>Plot:</u>