Music Player

~DSP project~

1. Project

Our project scope is to create a music player capable of **playing**, **loading**, **stopping**, and **pausing** music from WAV and MP3 files, and it can apply a **Finite Impulse Response filter** and **Infinite Impulse Response filter** displaying information graphics (the filters work only on WAV files).

2. What we used

The Music Player represents an application built in Python using the following libraries:

a. *pygame* – for playing sounds
b. *tkinter* – for creating the interface and loading files
c. *numpy* – for numerical functions
d. *scipy* – for dealing with signals
e. *matplotlib* – for displaying graphics
f. *myDSP* – it is a module created by us to create signals

The I.D.E. used to develop the application is Spyder.

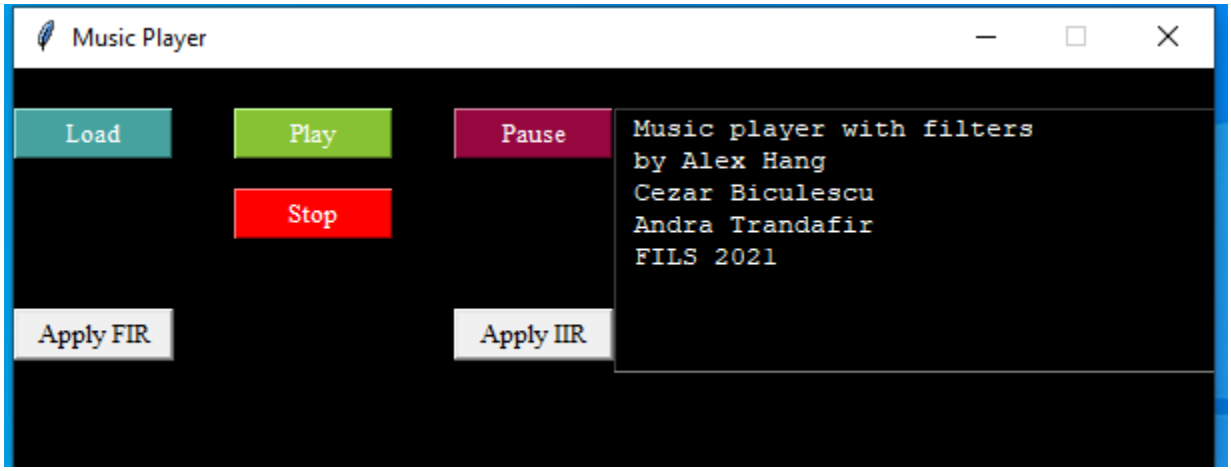

Fig. 1: Application Interface

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3. Filters

Finite Impulse Response Filter:

“In signal processing, a finite impulse response (FIR) filter is a filter whose impulse response (or response to any finite length input) is of finite duration, because it settles to zero in finite time.” - https://en.wikipedia.org/wiki/Finite_impulse_response

$$y[n] = b_0 x[n] + b_1 x[n-1] + \cdots + b_N x[n-N]$$
$$= \sum_{i=0}^{N} b_i \cdot x[n-i],$$

x[n] – input signal
y[n] – output signal
N – filter order
b_i – value of the impulse response at the ith term, 0 <= i <= N

Infinite Impulse Response Filter:

“Infinite impulse response (IIR) is a property applying to many linear time-invariant systems that are distinguished by having an impulse response which does not become exactly zero past a certain point but continues indefinitely.” https://en.wikipedia.org/wiki/Infinite_impulse_response

4. Functionalities:

Each button is responsible for keeping in order all possible states of the application. Only one file can be loaded at a time, and during its playtime it can be paused or stopped.

Using the application, we can observe how the same melody sounds with a filter modifier.

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5. Plots

Finite Impulse Response Plot:

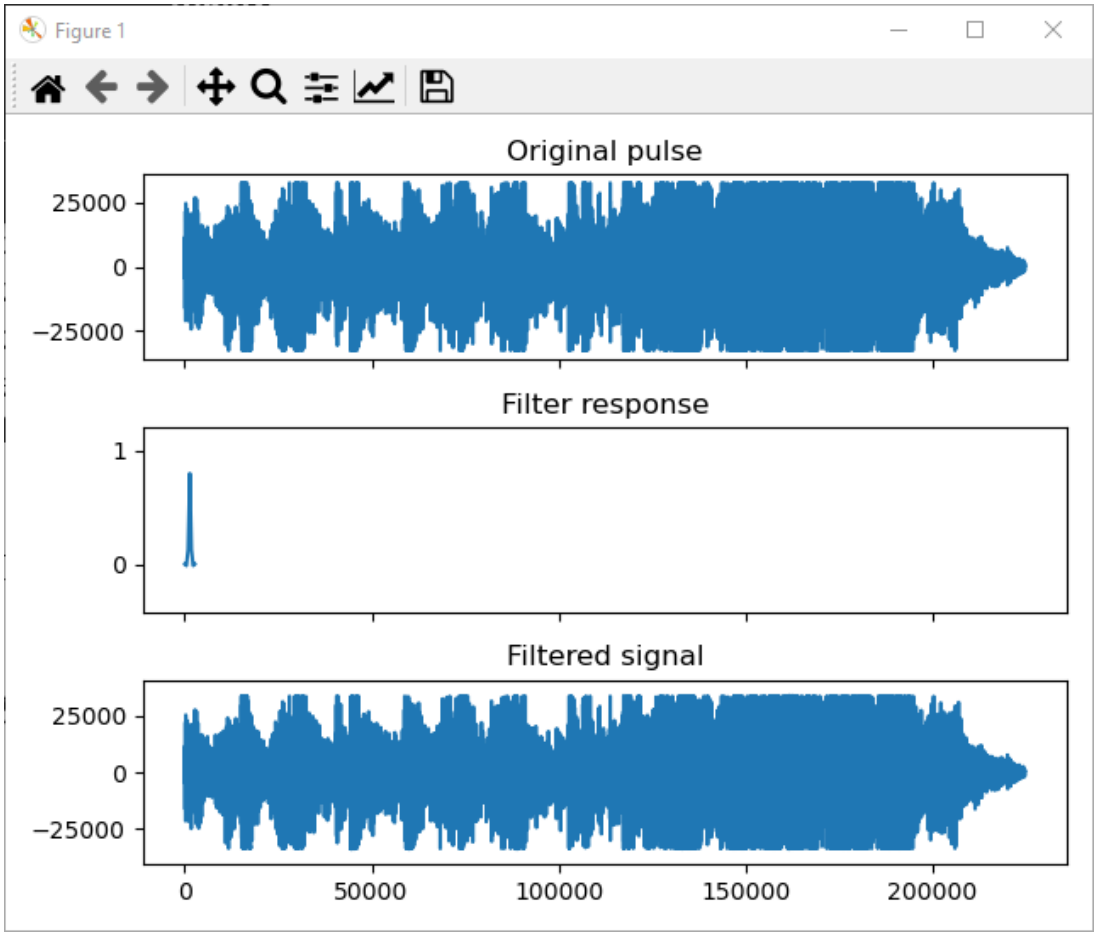

Fig. 2: Plot for F.I.R. filter

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Infinite Impulse Response Plot:

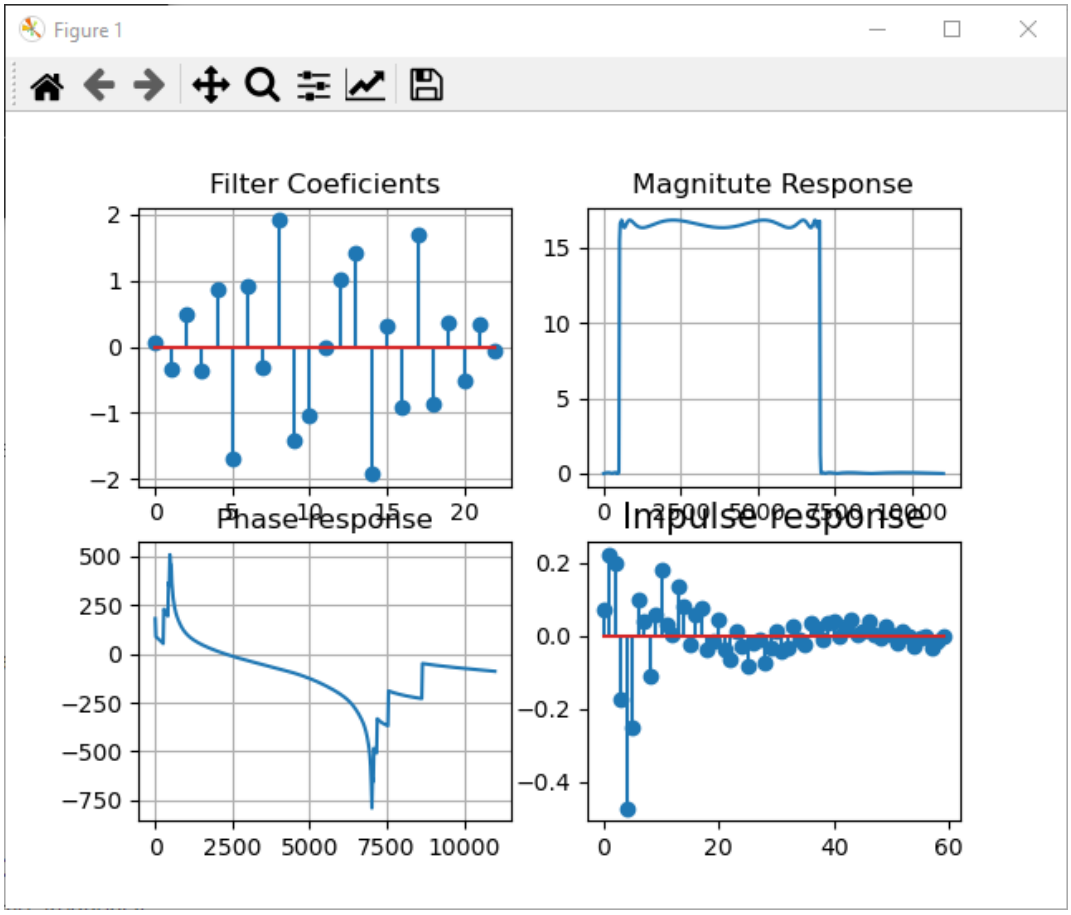

Fig. 3: Plot for I.I.R. filter

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