Assignment 3a

Starting form the provided template, implement in C++ the real-time second order two-stage low-pass IIR filter here described.

Equation:

$$y[n] = b_0 x[n] + b_1 x[n-1] + b_2 x[n-2] + a_1 y[n-1] + a_2 y[n-2]$$

with coefficients:

$$b_0 = \frac{\omega^2 T^2}{4 + 2\frac{\omega}{Q}T + \omega^2 T^2} \qquad a_1 = \frac{2\omega^2 T^2 - 8}{4 + 2\frac{\omega}{Q}T + \omega^2 T^2}$$

$$b_1 = \frac{2\omega^2 T^2}{4 + 2\frac{\omega}{Q}T + \omega^2 T^2} \qquad a_2 = \frac{4 - 2\frac{\omega}{Q}T + \omega^2 T^2}{4 + 2\frac{\omega}{Q}T + \omega^2 T^2}$$

$$b_2 = \frac{\omega^2 T^2}{4 + 2\frac{\omega}{Q}T + \omega^2 T^2}$$

where:

$$\omega = 2\pi f_c$$

$$T = \frac{1}{f_s}$$

f_c is the cut-of frequency, f_s is the sample rate and Q is the resonance factor of the filter

Set:
f_c = 500 Hz
Q = 4

Input and visualization:
use as input the white noise generator provided in the template and visualize the spectrum of both the input and the output (i.e., filtered) signals on Bela's Scope.

When finished, download the render.cpp file on your laptop and rename it as "assignment3a_YOURNAME.cpp".