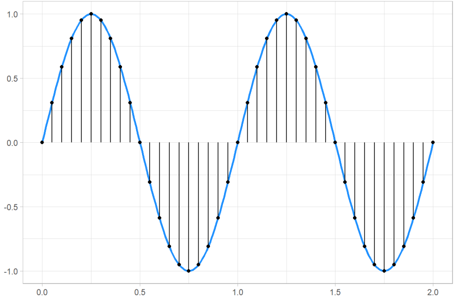
Institut Supérieur d'Electronique de Paris

CT.2306 - Signals and Systems II

Project : **Help Matlab−Simulink**



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Exercise Matlab–Simulink

1) Generate a vector called `t` whose first value is 0 and the last is 10, and the step between two consecutive values is 0.001.
2) Use the `length` command to display the length of `t`.
3) `t` is a row or column vector ? Create a vector `tt` which is the transpose of `t`.
4) Generate the vector `s` which contains the values of the function : $s(t) = sin(2 \cdot \pi \cdot t) + 0.5 \cdot cos(4 \cdot \pi \cdot t)$.
5) Plot the appearance of `s`. Label the abscissa axis with `t [sec]` and the ordinate axis with `s(t)`.
6) Use one of the codes provided during the workshop No.5 (DFT or FFT) to calculate then plot the amplitude spectrum (two-sided centered) of $s(t)$.
   Limit frequency axis when displaying between -3 and $+3$ Hz.

Exercise Matlab–Simulink

7) Use the `rand` command to add noise (between -1 and $+1$) to the signal. We note $s(t)$ noisy by $s_b(t)$. Plot $s(t)$ and $s_b(t)$ on the same figure.

8) Use one of the codes provided during the workshop No.5 (DFT or FFT) to calculate then plot the amplitude spectrum (two-sided centered) of $s_b(t)$ in the same figure with $s(t)$.

9) Using Matlab, then using Simulink, design a low-pass analog filter of the first order of unit gain, allowing the signal $s_b(t)$ to be filtered. We note $s_b(t)$ after filtering by $s_f(t)$.

10) Plot the amplitude spectrum (two-sided centered) of $s_f(t)$ in the same figure with $s_b(t)$.

11) Propose a Matlab code allowing to take the values of $s_f(t)$ every $0.05\ sec$ in a vector $s_e(t_e)$, and also allowing to create the time vector corresponding, denoted t_e.

Exercise Matlab–Simulink

12) Plot $s_e(t_e)$ (`stem`) in the same figure with $s_f(t)$ (`plot`).

13) Plot the amplitude spectrum (two-sided centered) of $s_e(t_e)$.

14) Calculate then plot the signals $ds(t)$ and $is(t)$ which represent the derivative and the integral of the signal $s_e(t)$.

15) Calculate then plot the DFTs of $ds(t)$ and $is(t)$.

16) Design an IIR filter, which has the same cutoff frequency as the analog one designed previously, then implement it in Matlab and filter the signal $ds(t)$, denoted $dsf(t)$ after filtering.

17) Plot signals $ds(t)$ and $dsf(t)$ in the same figure.

18) Plot the spectra of $ds(t)$ and $dsf(t)$ in the same figure.