
2016 Fall - Introduction to Communication Systems

Homework 2 (Due to Nov.14)

Matlab Exercises

Do 3 of the 6 exercises of choice in the set 3.j for $j \in \{1 \dots 6\}$.

In your report include also the code you wrote. Please comment the code sufficiently for us to understand it.

Textbook exercise

1. Do exercise 2.53, 2.59, 3.15, 3.17.
2. Signal $s_1(t)$ is periodic with period T_1 , and signal $s_2(t)$ is periodic with period T_2 . Assume $s(t) = s_1(t) + s_2(t)$, please find and prove the period of $s(t)$.

A different kind of envelope detector

The Hilbert transform can also be used for envelope detection. Let's see how this works in an example.

- Consider the signal

$$m(t) = \alpha \cos(2t) + \beta \sin(3t) \quad (1)$$

- modulate the signal with a carrier of frequency $f_c = 100$, what is the expression of the modulated signal $u(t)$?
- compute the Hilbert transform of the modulated signal $\hat{u}(t)$
- evaluate $g(t) = u(t) + j\hat{u}(t)$. What is the absolute value of this signal?

From the example above, describe how an envelope detector can be obtained using the Hilbert transform. What is the Fourier transform of a modulated signal?