Interpreting discrete Fourier transform.

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Fellow physicians,

Discrete Fourier transform can be very useful to evaluate frequency and amplitude of oscillation in a measured signal. Interpretation is extremely simple if obtained spectral function has non−zero value for only one frequency, e.g.

f = 4.2 Hz A = 0 mm
f = 4.3 Hz A = 40 mm
f = 4.4 Hz A = 0 mm

Here A is an absolute value of the Fourier transform, that is A = sqrt((Im A)^2 + (Re A)^2). In that case oscillation has frequency of 4.3 Hz and amplitude of 40 mm.

What about more complex situations? When oscillation is not perfect, values are obtained in narrow range around dominant oscillation, e.g.

f = 4.2 Hz A = 5 mm
f = 4.3 Hz A = 32 mm
f = 4.4 Hz A = 3 mm

How can one obtain total amplitude for this oscillation? Simply adding amplitudes does not seem to be the answer. Also what is a theoretical explanation for this interpretation?

Thanks for the answer,

Marko.

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