ZZZZ180 - analytical Tests related to the generation of random signals with Summarized

GENE_FONC_ALEA:

This case test proposes a number of analytical tests of the operator of generation of random signals GENE_FONC_ALEA. This operator generates achievements of a steady Gaussian random process characterized by his power spectral density (DSP). One also tests the construction of the DSP via POST_DYNA_ALEA, the operator for postprocessing statistics of DSP.

This test is primarily a data-processing test. He does not have physical meaning: there is no mesh nor of model to the finite elements.

1 Modelization A

1.1 Characteristic of the modelization

This case test proposes a number of analytical tests of the operator of generation of random signals GENE_FONC_ALEA. This operator generates achievements of a steady Gaussian random process characterized by his power spectral density (DSP). One considers a DSP two-dimensional with auto--spectrums S_1 and S_2 represented in figure 1 below.

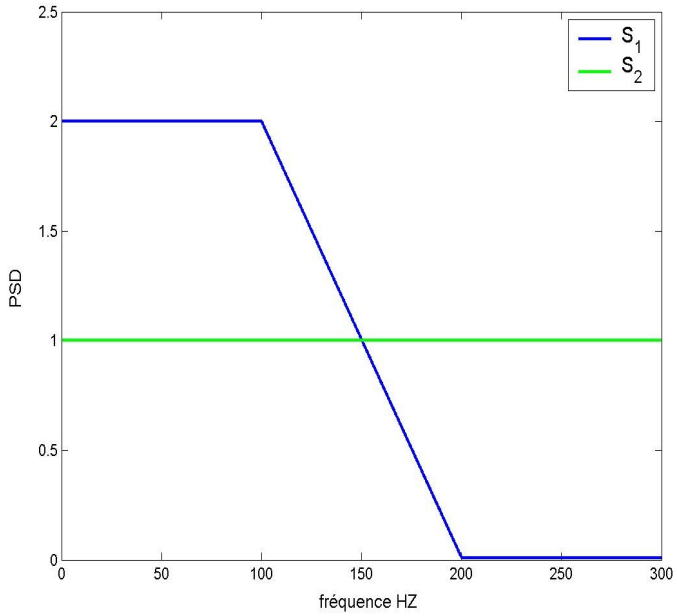

Figure 1: Pace of the auto--spectrum S_1 and S_2

the interspectrum is written $S_{12}(f)=\rho(S_1(f)S_2(f))^{0,5}e^{i2\pi fT}$ where $T=0,025$ and $\rho^2=0,8$ been the coefficient of correlation. The standard deviations are worth $\sigma_1=\sqrt{(603.)}$ and $\sigma_2=\sqrt{(600.)}$ respectively.
One also tests the construction of the DSP via POST_DYNA_ALEA, the operator for postprocessing statistics of DSP.

- The random signals are drawn by the operator GENE_FONC_ALEA
- the DSP are estimated with operator CALC_INTE_SPEC
- One carries out statistical postprocessings of the DSP with operator POST_DYNA_ALEA
- One uses INFO_FONCTION to estimate the standard deviation of a signal given

1.2 Quantities tested and Generation

1.2.1 results of signals with interpolation and imposed period

Identification	Reference	% Tolerance	Standard
Standard deviation autospectrum S_1	σ_1	1.0 10-5	Analytical
Standard deviations autospectrum S_2	σ_2	1.0 10-5	Analytical
Standard deviations signal 1.1.0	σ_1	10-3	analytical
Standard deviations signal 2.1.0	σ_2	10-3	analytical
Standard deviations autospectrum signal 1.1.0	σ_1	10-3	analytical
Standard deviations autospectrum signal 2.1.0	σ_2	10-3	analytical
Moment order 0 autospectrum signal 1.1.0	σ_1^2	10-2	analytical
Moment order 0 autospectrum signal 1.1.0	σ_2^2	10-2	analytical
Moment order 1 autospectrum signal 1.1.0	2.98230560162110^5	10-3	Non regression
Moment order 1 autospectrum signal 1.1.0	$2\pi 300^2$	10-2	analytical

One also tests (compared to the analytical values and into non regression) values RMS of the estimated autospectrums.

1.2.2 Generation of signals with interpolation, many points imposed

Identification	Standard	Reference	Tolerance
Standard deviation signal 1	σ_1	1.00%	Analytical
Standard deviation signal 2	σ_2	1.00%	Analytical

1.2.3 Generation of signals with interpolation, nothing imposed, truncation of 10-100Hz

Identification	Standard	Reference	Tolerance
Standard deviation signal 1	180×2	1.00%	Analytical
Standard deviation signal 2	90×2	1.00%	Analytical

1.2.4 Generation of signals with interpolation, many imposed points and period

Identification	Standard	Reference	Tolerance
Standard deviation signal 1	σ_1	0.10%	Analytical

Standard deviation signal 2	σ_2	0.10%	Analytical

1.2.5 Generation of signals with interpolation

Identification	Standard	*Reference*	Tolerance
Standard deviation signal 1	σ_1	1.00%	Analytical
Standard deviation signal 2	σ_2	1.00%	Analytical

1.2.6 Generation of signals without interpolation

Identification	Standard	*Reference*	Tolerance
Standard deviation signal 1	σ_1	1.00%	Analytical
Standard deviation signal 2	σ_2	1.00%	Analytical

1.2.7 Generation of signals without interpolation, many points imposed

Identification	Standard	*Reference*	Tolerance
Standard deviation signal 1	σ_1	0.10%	Analytical
Standard deviation signal 2	σ_2	0.10%	Analytical