ZZZZ180 - Analytical tests related to the generation of random signals with GENE_FONC_ALEA

Summary:

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 stationary Gaussian random process characterized by his spectral concentration of power (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 grid nor of model to the finite elements.

1 Modeling A

1.1 Characteristics of modeling

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 stationary Gaussian random process characterized by his spectral concentration of power (DSP). One considers a two-dimensional DSP with auto--spectra S_1 and S_2 represented in figure 1 below.

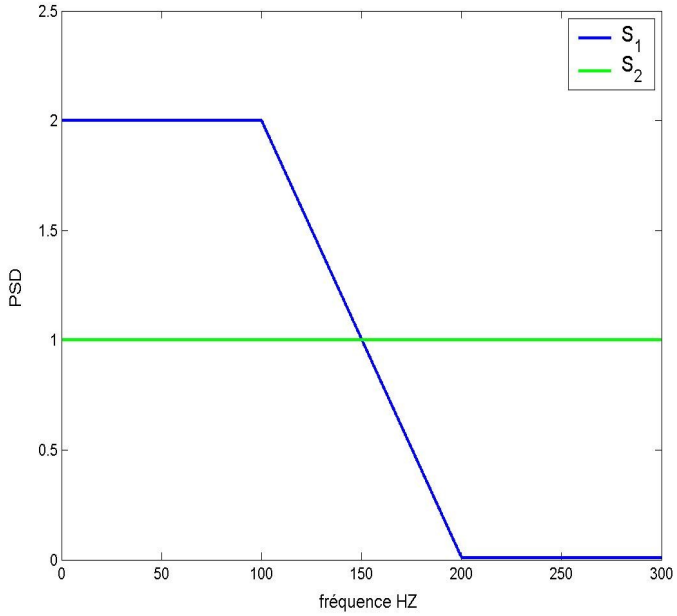

Figure 1: Pace of the auto--spectrum S_1 and S_2

The interspectre is written $S_{12}(f)=\rho(S_1(f)S_2(f))^{0,5}e^{i2\pi fT}$ where $T=0,025$ and $\rho^2=0,8$ is the coefficient of correlation. 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 the operator CALC_INTE_SPEC
- One carries out statistical postprocessings of the DSP with the operator POST_DYNA_ALEA
- One uses INFO_FONCTION to estimate the standard deviation of a given signal

1.2 Sizes tested and results

1.2.1 Generation of signals with interpolation and imposed duration

Identification	Reference	% Tolerance	Type
Variation- autospectre type S_1	σ_1	1.0 10^{-5}	Analytical
Variation- autospectre type S_2	σ_2	1.0 10^{-5}	Analytical
Variation- standard signal 1	σ_1	1.0 10^{-3}	analytical
Variation- standard signal 2	σ_2	1.0 10^{-3}	analytical
Variation- type autospectre signal 1	σ_1	1.0 10^{-3}	analytical
Variation- type autospectre signal 2	σ_2	1.0 10^{-3}	analytical
Moment order 0 autospectre signal 1	σ_1^2	1.0 10^{-2}	analytical
Moment order 0 autospectre signal 1	σ_2^2	1.0 10^{-2}	analytical
Moment order 1 autospectre signal 1	2.98230560162110^5	1.0 10^{-3}	Not regression
Moment order 1 autospectre signal 1	$2\pi 300^2$	1.0 10^{-2}	analytical

One also tests (compared to the analytical values and in nonregression) values RMS of the estimated autospectres.

1.2.2 Generation of signals with interpolation, many points imposed

Identification	Reference	Tolerance	Type
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	Reference	Tolerance	Type
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 duration

Identification	Reference	Tolerance	Type
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	Reference	Tolerance	Type
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	Reference	Tolerance	Type
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	Reference	Tolerance	Type
Standard deviation signal 1	σ_1	0,10%	Analytical
EcarT-type signal 2	σ_2	0,10%	Analytical