VIBRATION ANALYSIS AND VIBROACOUSTICS

MODULE 1: VIBRATION ANALYSIS (PROF. STEFANO ALFI)

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***Assignment 3*: Modal parameter identification**

The response of a structure to a virtual dynamometric hammer has been numerically simulated to represent an experimental test. The time histories of the impulsive force F at location x_1 and the displacements x_i at 4 locations on the structure are collected in a matrix ("Data.mat") organized as follows: $[t, F, x_1, x_2, x_3, x_4]$.

Starting from the evaluation of the FRFs between displacements and force, it is requested to:

1) Plot the "experimental" FRF diagrams.
2) Estimate the natural frequencies, damping ratios and mode shapes of the resonating modes in the range $0 - 5\ Hz$ employing simplified methods (e.g. half power point method, see slides 8,10,11 of 'Modal Parameters Identification.pdf'). Comment the obtained results.
3) Set up a modal parameter identification program, exploiting the residual minimization technique, for estimating natural frequencies, damping ratios and modes in the range $0 - 5\ Hz$. Compare the identified FRF with the "experimental" ones. Comment the obtained results.
4) Compare and comment the identified modal parameters with ones obtained with the above-mentioned methods.
5) Employing a modal approach, reconstruct the FRFs and compare with the "experimental" original ones.

OPTIONAL

i. Evaluate the co-located FRF at the location corresponding to displacement x_2.
ii. Evaluate the M, C, K matrices of the numerical model of the 4 d.o.f. (x_1, x_2, x_3, x_4) system.