

FLUID-STRUCTURE INTERACTION OF A ROTOR BLADE WITH FRICTION CONTACTS USING A ONE-WAY COUPLED METHOD

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ABSTRACT

The purpose of this paper is the non-linear aero-elastic calculation of an only rotor blades array (cyclic symmetry is not considered) for aeronautical applications in the presence of friction contacts using a one-way coupled method. The calculation is performed using a method based on the Multi Harmonic Balance Method (MHBM) and the energy balance between the aerodynamic energy and the dissipative energy in spite of the Direct Time Integration (DTI) for the strong reduction of the computation time that MHBM technique allows when nonlinearities are introduced and the system is periodic.

The nonlinearity is introduced by purposely developed contact elements, placed at the root-joints, that produce additional stiffening and damping in the system due the introduction of contact stiffness and friction forces based on Coulomb's law. The contact elements will be used to perform a sensitivity analysis of the Limit Cycle Oscillations of the system by varying the aerodynamic coefficients and the contact parameters. The results of the analysis will be compared with DTI to verify the effectiveness of the developed method.

Finally, the results of the analysis will be compared with experimental data.