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EMERGING TRENDS IN APPLIED MATHEMATICS AND MECHANICS

Smart Materials and Structures in Vibration Control

Organized by

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Smart materials and structures in the period of rapid technological development appear in numerous applications, starting with the robotics, through mechanics, biomechanics, production and machinery engineering, electro-mechanical coupling, energy harvesting, railway transport, and ending with base isolation systems and earthquake engineering. Classical structures equipped with intelligent components controlled actively, semi-actively or passively exhibit improved mechanical properties and reliability, and reduced wear, noise and lower harmful emissions. Semi-active techniques are promising in a wide range of applications due to a relatively low cost and high efficiency comparing with active control.

However, non-classical materials, i.e. magnetorheological and electrorheological fluids, ferrofluids, MR elastomers, thermoresponsive polymers, granular and piezoelectric materials, ionic polymer-metal composites, etc., require proper mathematical models. Control functions depend on the type of the structure, excitation and the type of vibrations. Further, proper control strategies elaborated for selected structures working in narrow ranges of operating parameters allow to determine properties of the filling material that will act passively in a structure in the way similar to the semi-active system.

Identification of material or structure parameters, inverse problems, vibration coupling, health structure monitoring, all in structural dynamics, result in nonlinear and ill-posed problems. Analytical solution in real-shape problems is always a challenge. Numerical simulations based on micro or macro modelling can be extended to multiscale numerical analysis.

The goal of mini-symposium is the inspection of a recent progress in the mathematical and numerical modelling of the title issues.