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IDENTIFICATION OF VISCOELASTIC PROPERTIES OF MATERIALS BY ADJUSTING FREQUENCY RESPONSE CURVES

Vítor Carvalho[(1)], Aurelio Araujo[(2)], Cristóvão Mota Soares[(3)]

[(1)]IST/IDMEC, Portugal
vitor.s.carvalho@tecnico.ulisboa.pt

[(2)]IDMEC, Instituto Superior Tecnico, Portugal
aurelio.araujo@tecnico.ulisboa.pt

[(3)]IDMEC/IST-Instituto Superior Técnico, Universidade de Lisboa, Portugal
cristovao.mota.soares@tecnico.ulisboa.pt

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Abstract: The suppression of vibrations in structures is an area that has importance not only for structural integrity but also for human comfort. In the last decades several types of materials have been developed to be applied in soft core structures, the main objective is that the core provides a significant amount of damping. In this work we consider an approach that allows for the adjustment of a numerical experimental frequency response function (FRF), obtained with a finite element method of the soft core plate element, to the FRF obtained in the laboratory or in the real service of a structure. The main objective is to estimate the engineering properties considering the real behavior of the high damping materials. The optimization process consists in minimizing the error between resonance peaks, due to the deviation of the theoretical FRF and the experimental FRF, the process variables are the engineering properties of the core material. The properties of the material can be frequency dependent and in that follow-up, the adjustment is done at each resonance peak. In an early stage an evolutionary algorithm is used to approximate a global solution and thereafter that solution is refined by a gradient-based method. This research work has been developed considered a hysteretic damping model for highly damped materials. Hence, the FRF curves do not have defined peaks and so the work focuses on the precision study of the applied optimization algorithm. Some studies will be presented using numerically simulated data but also experimental data.