عنوان مقاله:

Time Domain Parameter Identification of Fractional Viscoelastic Constitutive Equation

محل انتشار:

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نویسندگان:

Majid Shabani - *Mechanical Engineering Department, Faculty of Mechanical Engineering, University of Tabriz, Tabriz, Iran*

Kamal Jahani - *Mechanical Engineering Department, Faculty of Mechanical Engineering, University of Tabriz, Tabriz, Iran*

خلاصه مقاله:

In this work the parameters of a viscoelastic constitutive equation are identified in time domain. The considered constitutive equation is fractional Kelvin-Voigt model which is same as the classical Kelvin-Voigt model but the viscous damper is replaced by a fractional derivative operator. This way, less parameters are needed to describe the material's behavior and identified values are valid for a wide range of frequencies. The introduced procedure is specified to steady state harmonic excitation. Experimental tests are done by acreative test setup in several constant excitation frequencies. The out puts are two time histories of excitation and excitedaccelerations for each frequency. Analytically, it is proved that the fractional Kelvin-Voigt model results an elliptic hysteresis loop. The coefficients of ellipse's polynomial equation are identified for each frequency by means of the constrained linear least square method. These coefficients are used in next step to identify , the order of fractional operator, CV ,the coefficient of fractional operator and KV ,the stiffness parallel to the fractional operator, by means of the nonlinear least square method. Using the identifiedvalues, the hysteresis loop of each frequency can be plotted. Since, the nonlinear least square method is depended to theinitial guess of identified values, the initial guesses should be changed until results valid values by comparing experimental and identified hysteresis loops. Experimental hysteresis loops of some .frequencies are plotted vs their related identified hysteresis loops which show adequate coincidence

کلمات کلیدی:

parameter identification, hysteresis loop, time domain, viscoelasticity, fractional Kelvin-Voigt