

Some special properties of dynamical system caused by non-linear eigenvalue problem

Jan Kozanek

Abstract: Some special properties of dynamical system caused by non-linear eigenvalue problem Authors: Kozanek Jan, Zapomel Jaroslav The dynamical systems are defined by real mass, stiffness and viscous damping matrices and are described by the system of second-order ordinary differential equations. Corresponding eigenvalue problem is in general case of damping matrix non-linear – the so called lambda matrix problem. The steady-state response of dynamical system on harmonic excitation can be expressed in resolvent form as the linear combination of eigenvectors. Normally, the eigenvectors corresponding to the different eigenvalues are considered linearly independent. For special dynamical systems there are some pathological cases, studied in this paper, where the same eigenvector corresponds to the different eigenvalues. From a mathematical point of view, this property is known, but in dynamical systems and in particular in modal identification domains this property is somewhat surprising. We recall that in the earlier publications in connection with the eigen-solution of the lambda matrix problem it is used to name a latent vector instead of eigenvector.

¹⁾ Jan Kozanek, Ph.D.: Institute of Thermomechanics of the Czech Academy of Sciences, Dolejskova 5, 182 00 Prague 8, Czech Republic (CZ), kozanek@it.cas.cz.