

Estimation of Structural Parameters in Time Domain Using One Dimensional Piezo Zirconium Titanium Patch Model

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Abstract : This article presents a method of using the one dimensional piezo-electric patch on beam model for structural identification. A hybrid element constituted of one dimensional beam element and a PZT sensor is used with reduced material properties. This model is convenient and simple for identification of beams. Accuracy of this element is first verified against a corresponding 3D finite element model (FEM). The structural identification is carried out as an inverse problem whereby parameters are identified by minimizing the deviation between the predicted and measured voltage response of the patch, when subjected to excitation. A non-classical optimization algorithm Particle Swarm Optimization is used to minimize this objective function. The signals are polluted with 5% Gaussian noise to simulate experimental noise. The proposed method is applied on beam structure and identified parameters are stiffness and damping. The model is also validated experimentally.

Keywords : inverse problem, particle swarm optimization, PZT patches, structural identification

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