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Machine Learning Control Design for Elastic Composite Materials

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Abstract

A numerical method, based on a machine learning approach, is used to solve an inverse problem involving the Dirichlet eigenfrequencies for the elasticity operator in a bounded domain filled with a composite material. The inhomogeneity of the material under study is characterized by a vector which is designed to control the constituent mixture of homogeneous elastic materials that compose it. Using the finite element method, we create a training set for a forward artificial neural network, solving the forward problem. A forward nonlinear map of the Dirichlet eigenfrequencies as a function of the vector design parameter is then obtained. This forward relationship is inverted and used to obtain a training set for an inverse radial basis neural network, solving the aforementioned inverse problem. A numerical example showing the applicability of this methodology is presented.

Joint work with:
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