RETRIEVING THE FLEXURAL RIGIDITY OF A BEAM
FROM DEFLECTION MEASUREMENTS

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Abstract

A rigorous investigation into the identification of the heterogeneous flexural rigidity coefficient from deflection measurements recorded along a beam in the presence of a prescribed load is presented. Mathematically, one has to solve the Euler-Bernoulli steady-state beam equation subject to various types of boundary conditions. Conditions for the uniqueness of the solution of these inverse problems will be established and, in particular, it will be shown that the operator which maps an input deflection into an output flexural rigidity is Holder continuous. As, the inverse problem can be recast as a Fredholm integral equation of the first kind, numerical results obtained using various regularization methods are presented. These methods will include Tikhonov’s regularization, singular value decomposition, mollification, functional minimization and parameterisation and a comparison of the performances of each method will be made.