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Craig Rogers, University of Central Florida, Orlando, FL, **Alain J. Kassab*** (kassab@mail.ucf.edu), Department of Mechanical, Materials, and Aerospace Engineering, Orlando, FL 32816-2450, **Eduardo A. Divo**, University of Central Florida, Orlando, FL, **Ryzsard Bialecki**, Selisian Technical University, Gliwice, Poland, and **Ziemowit Ostrowski**, Selisian Technical University, Gliwice, Poland. *Identification of Non-Homogeneous Heat Conductivity by a POD-based Inverse Approach.*

A trained proper orthogonal decomposition (POD)-based inverse approach is developed to estimate the unknown spatially varying thermal conductivity of a non-homogeneous heat conducting material. A sequence of direct problems is solved for several known spatial variations of the conductivity and the corresponding temperature field is sampled at a predefined set of points. Each such sample constitutes a snapshot, and the assembly of snapshots is utilized to construct a cofactor correlation matrix from which an orthogonal set of basis vectors (POD) are extracted and utilized to optimally expand the temperature field. By a discrete analog to the variation of parameters method for PDEs, we employ radial basis functions to train the POD basis and obtain a general response of the temperature as a function of non-homogenous conductivity. This trained POD expansion serves as the direct solver for the inverse problem. To this end, the Levenberg-Marquardt method minimizes a regularized quadratic functional evaluating the discrepancy between the measured temperatures and values calculated from the model utilizing the current estimate for the non-homogeneous thermal conductivity. Several numerical examples are provided to illustrate the robustness and numerical stability of the scheme. (Received August 21, 2009)