

Preface

This special issue of CAMES is devoted to eight research papers, selected from 30 papers presented at the 3rd International Symposium on Inverse Problems of Mechanics of Structures and Materials. The Symposium, called an IMP 2013 in short, was held in Rzeszów – Baranów Sandomierski, Poland on 24–27 April, 2013. It was a continuation of two previous symposia IPM 2009 and IPM 2011, organized in Łańcut and Sieniawa, Poland.

The first four papers deal with more advanced methods of modelling and numerical analysis. The paper by Pabisek, Waszczyszyn and Ambroziński as well as one by Słoński is related to the identification of thin elastic plate material and structure parameters. In these papers the Lamb guided waves technique was applied to measure structure responses as testing results. Then, either the basis function mean square method or a sequential stochastic method was applied to find optimal values of plate internal parameters. The applied particle filters are discussed in the fourth paper by Tekieli and Słoński, as a modification of nonlinear Kalman's filters. The third paper by Orkisz and Głowacki combined the so-called physically based approximation and improved evolutionary algorithms for smoothing discrete data obtained for simple boundary value problems.

The other four papers correspond to the analysis of selected civil and structural engineering problems. In all four papers artificial neural networks (ANNs) were applied. Pabisek and Potrzyszcz-Sut formulated a neural material model related to the Ramberg-Osgood equation. ANN was applied to the analysis of a plane truss subjected to low-cyclic loading. Ziaja and Waszczyszyn analyzed two inverse problems corresponding either to the load bearing capacity of axially loaded R/C columns or the concrete compressive strength was identified. It was proved that the application of Gauss processes method gave much more accurate results than those obtained by advanced back-propagation ANN. Borowiec and Wilk applied standard ANNs for predicting consistency parameters of cohesive soils. It was proved that ANNs can give results more acceptable than those parameters identified by the linear regression method for the analyzed fen type soils. The paper by Mrówczyńska is closely connected with design of roads and buildings. The vector supported machine network was used for the classification and computing of vertical deflection values of monitored points.

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