A Data-Driven Inverse Identification of Parameters for Composite Laminated

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Abstract

There is a general concern about the discrepancies between the practical structural performance and the expected designed values in mechanical engineering. The manufacturing process to produce materials into different shapes or curvatures will inevitably change the original material parameters. The change could be as much as 20% of the original data, which yields the deviation of the practical performance of structure from its expected designed values. To address this problem, a data-driven material parameter identification method is proposed in this paper to derive the manufactured material parameters. In this method, the response data of the same manufactured material with different material parameters under specific loads, such as displacement, strain, stress etc., are collected by simulated experiments. The collected data is then used to train the neural network to establish the relationship between the response data and the material parameters. The material parameters can then be deduced inversely by inputting the measured response data into the trained neural network. Compared to the simulation data, the standard deviation of the error between the inversely predicted material parameters by the neural network is as low as 1%. It is expected that the manufactured material parameters could be reliably determined using our data-driven inverse procedure to minimize the uncertainties in the practical structural performance.

***Keywords*:** data-driving; neural network; material parameter identification, post-manufacture property.

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