IOP Conf. Series: Materials Science and Engineering **798** (2020) 012036 doi:10.1088/1757-899X/798/1/012036

Parametric uncertainty quantification in natural frequency of sandwich plates using polynomial neural network

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Abstract. In this paper, uncertainty quantification in natural frequencies for laminated soft core sandwich plates is presented by employing finite element (FE) coupled polynomial neural network (PNN) approach. The computational efficiency and accuracy is achieved by using PNN as surrogate model. Latin hypercube sampling method is employed for training of data in PNN model. The stochastic first three natural frequencies of sandwich plates are studied for individual variation in input parameters. The stochasticity in individual input parameters are considered in order to assess their influence on global response of the structure. The algorithm discussed in this article is observed to be converging with the previously published literature (for deterministic case) and validated with full scale Monte Carlo simulation (MCS) i.e. original finite element approach (for stochastic case). The computational time and cost reduced significantly by employing the present surrogate based FE approach compared to that of conventional Monte Carlo simulation approach.

Keywords: Sandwich plate, Finite element, Monte Carlo simulation, Polynomial neural network, Uncertainty quantification.