

Vibration Signals and 1-D CNN Deep Learning for Damage Identification of Coastal Structural System

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ABSTRACT

This study proposes an innovative method for identifying damage in submerged caisson-foundation structures using pseudo-damage vibration signals for one-dimensional convolutional neural network (1-D CNN) deep learning. Firstly, the description of the harbor caisson breakwater system is presented alongside with its simplified analytical model. Secondly, pseudo-damage data generation method is described on the basis of a simplified model of a caisson-foundation system. A vibration experiment was conducted under pseudo-damage scenarios to generate the necessary data. Thirdly, several 1-D CNN models were trained and evaluated by employing the pseudo-damage data. Finally, the trained 1-D CNNs were implemented to predict the damage in foundation. Experimental results confirm the feasibility and effectiveness of the proposed method, demonstrating that the compact 1-D CNN models can accurately distinguish complex foundation damage scenarios with limited training data.

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