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Damage Identification in Concrete Structure using EMI Signals of CSA Sensor and 2D CNN Deep Learning

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ABSTRACT

In this study, a 2D CNN deep learning model is developed for autonomous regressing stress and identifying damage in concrete structures using the impedance responses measured by capsule-like smart aggregate (CSA). The fundamental theory of a 2 degree of freedom (2-DOF) impedance measurement model for a CSA is presented first. Secondly, a compression experiment on a CSA-embedded concrete cylinder is conducted under different stress levels to collect data sets of impedance responses. Thirdly, the 2D CNN deep regression and classification learning model is developed to learn and extract sensitive impedance features for predicting the concrete stress and damage. Finally, the feasibility of the developed model is investigated under the effect of noise in signals and untrained data.

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