Field equipment analytics: Anomaly detection in Power plant case study

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ABSTRACT

The detection of unexpected loose parts in the primary coolant system in a power plant remains an extremely important issue. It is essential to develop a methodology for the localization and mass estimation of loose parts owing to the high prediction error of conventional methods. An effective approach is presented for the localization and mass estimation of a loose part using machine-learning and deep-learning algorithms. First, a methodology was developed to estimate both the impact location and the mass of a loose part at the same times in a real structure in which geometric changes exist. Second, an impact database was constructed through a series of impact finite-element analyses (FEAs). Then, impact parameter prediction modes were generated for localization and mass estimation of a simulated metallic loose part using machine-learning algorithms (artificial neural network, Gaussian process, and support vector machine) and a deep-learning algorithm (convolutional neural network). The usefulness of the methodology was validated through blind tests, and the noise effect of the training data was also investigated. The high performance obtained in this study shows that the proposed methodology using an FEA-based database and deep learning is useful for localization and mass estimation of loose parts on site.

REFERENCES

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