Development of Waveform Classification Method of Acoustic Emission signals by damages in CFRP plate utilizing Machine Learning

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Abstract

The acoustic emission (AE) method is used to detect and prevent material fractures because it can detect small cracks inside materials and even minute deformations that occur before a fracture. In addition, the AE method is noted because it can identify the phenomenon of destruction from the shape of the material's AE waveform. However, visual identification is required to identify the failure phenomenon arising from the AE waveform. Therefore, the challenge is that it takes a considerable amount of time, and it varies classification result depending upon the person that classify AE waveforms. In this research, using machine learning, we aim to develop a method to classify AE waveforms under different types of damage to a material. The type of AE depends upon the type of damage. In this paper, the identification of AE waveform caused by the damage of the carbon-fiber-reinforced plastic (CFRP) was performed. As damage to CFRP causes different types of fractures such as matrix cracking, delamination, and fiber breakage, we examined if it is possible to distinguish these AE waveforms using machine learning.

Keywords: Machine learning, Acoustic Emission, Carbon Fiber Reinforces Plastic,
Wavelet transform, Deep learning