

Intuitive structural condition monitoring through time-domain anomaly detection

Jaebeom Lee¹, Wonjae Choi¹, Hong Min Seung¹, Jong Moon Ha¹

¹Interdisciplinary Materials Measurement Institute, KRISS (Korea Research Institute of Standards and Science), Republic of Korea

An increasing deterioration of buildings and infrastructure highlights the critical need for enhanced maintenance strategies. Traditional safety evaluations, including routine visual inspections, exhibit limitations, such as compromised reliability and delayed risk identification. While there is a growing trend to equip structures with sensors for continuous monitoring, the exploitation of real-time measurement data is sometimes confined to simplistic statistical calculations not considering environmental and seasonal effects on structural responses. This study presents a strategy focused on the analysis of time-series data acquired from structures in real-time, aiming to establish an efficient safety management framework. Notably, we introduce an algorithm that takes into consideration the phenomenon of data shift due to environmental factors, including temperatures, contributing to the development of a robust safety management strategy resilient to such external variables. One distinctive feature of our approach lies in its ability to evaluate the normalcy of the acquired time-series data in the time-domain dimension, enabling a more intuitive interpretation and immediate response, crucial in the monitoring of structural health. By identifying irregular patterns in the time domain, decision-makers are equipped with insights that are not only instantly comprehensible but also actionable without the necessity for complex transformations or expert-level interpretation. Several application examples of civil infrastructure will be shown in the presentation, and its applicability will be discussed.