Application Test of Bridge Behavior Detection System using Carbon Nanotube Patch Sensors

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ABSTRACT: This study presents a structural health monitoring system utilizing a size-adjustable carbon nanotube patch sensor, designed to detect real-time structural anomalies such as cracks through analyzing changes in electrical resistance induced by strain. The sensor's customizable size and shape allow it to adapt to various bridge surfaces. The integrated IoT platform wirelessly transmits data for cloud-based analytics, enabling the proactive identification of abnormalities such as micro-cracks and stress concentrations. Validated through dynamic vehicle loading tests on operational bridges in various locations, the system demonstrated high sensitivity in detecting structural anomalies. The field application highlights the technology's potential as a cost-effective, durable solution for long-term bridge monitoring, offering actionable insights for infrastructure maintenance and paving the way for widespread adoption in aging or high-risk civil structures.
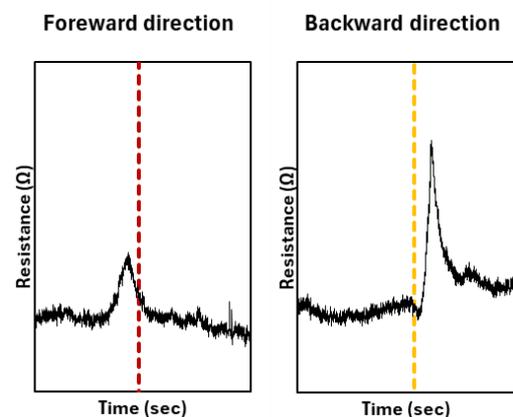
Fig. 1 Field test setup

Fig. 2 Test results