

Excessive vibration detection of stay-cables from CCTV images: a near-label-free deep learning approach using image synthesis

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ABSTRACT

This study aims to cost-effectively monitor excessive vibrations in the stay-cables of long-span bridges. Traditional sensor-based methods, such as structural health monitoring (SHM) systems, are impractical and expensive for monitoring all the stay-cables that cannot be covered by wired/wireless sensors. To overcome this challenge, the research leverages surveillance camera (CCTV) images, commonly used for monitoring traffic conditions. Deep learning and computer vision techniques, including semantic segmentation, dehazing, and tracking, were employed to address technical issues in identifying feature points from low-quality images (Lee et al., 2023). Particularly, to minimize manual labeling efforts while ensuring high segmentation accuracy, synthetic image generation techniques were utilized to automatically generate the sufficient number of training images with pixel-wise annotations. The field application demonstrates its effectiveness in establishing robust vibration detection model with minimal manual labeling requirements.

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REFERENCES

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