Vision-based Structural Displacement Measurement using a Hybrid Deep Learning Approach

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ABSTRACT

Structural displacement measurement is important for monitoring the condition and safety of infrastructure. However, traditional methods often require physical sensors and manual installation, which can be time-consuming and expensive. In addition, environmental changes such as temperature and vibration can significantly affect their accuracy. Vision-based techniques have emerged as a non-contact alternative to conventional approaches. These methods reduce the need for physical access and simplify the setup process. Nevertheless, conventional vision-based methods may be sensitive to noise and lighting variations, limiting their robustness in real-world conditions. To overcome these challenges, this study introduces a hybrid approach that combines deep learning and feature tracking. By leveraging the strengths of both data-driven prediction and traditional tracking, the method ensures reliable performance across diverse environments. Furthermore, simulations and laboratory tests were conducted to verify its effectiveness. The results demonstrate improved accuracy and adaptability, supporting more reliable and efficient structural displacement monitoring.

REFERENCES

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