Vision-based Structural Displacement Measurement using KLT Tracker and Deep Learning

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ABSTRACT

Structural displacement measurement provides critical information about the structure that can be used to assess the condition of civil structures. As one of the vision-based methods, Kanade-Lucas-Tomasi (KLT) can estimate structural displacement. However, estimating structural displacement by using KLT might not provide sufficient accuracy when the feature points disappear. Furthermore, when tracking fails, the user must manually select the new region of interest, which takes a lot of time and effort. To overcome these limitations, this study proposed a deep learning-based displacement measurement approach using a Siamese network, specifically SiamMask. The final result is the fusion of the outputs of KLT and SiamMask. To validate the performance of this method, a simulation-based experiment was conducted. The response of the model was generated by simulation, and the animation of this building was encoded into a video. Then, the displacement of the building was extracted by the movement of a region of interest from its original location. The result showed that the proposed method can not only automate the process, but also achieve substantial accuracy.

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