Crack Detection using a Texture Analysis-based Technique for Visual Bridge Inspection

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ABSTRACT: Bridge inspection is a pathway to bridge condition rating assessment, and is an essential element of any bridge management system (BMS). The success of a BMS is highly dependent on the quality of bridge inspection outcomes and accurate estimation of future bridge condition ratings. However, existing visual bridge inspection methods suffer several limitations due to human subjective judgment. In order to minimise such limitations, a feasibility study has been performed to enhance the current visual inspection method using optical image processing techniques. However, the accuracy of the inspection outcomes still requires further improvement. This paper proposes an automatic bridge inspection approach employing wavelet-based image features along with support vector machines (SVM) for automatic detection of cracks in bridge images. A two-stage approach is followed, in the first stage, a decision is made as whether an image should undergo a pre-processing step (depending on image characteristics); in the second stage, wavelet features are extracted from the image using a sliding window texture analysis-based technique. Consequently, an average accuracy of 92% (effect of training image types on accuracy) is obtained even when undertaking experiments with noisy and complex bridge images.

Keywords: Bridge inspection, condition ratings, bridge management system (BMS), wavelet-based crack detection, texture analysis-based technique, bridge images.