A Vision-based Displacement Measurement Method for Structural Health Monitoring of Large-scale Infrastructures

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Summary

A vision-based displacement measurement method for structural health monitoring of large-scale infrastructures such as high-rise buildings and long-span bridges is presented. The method uses digital image processing techniques including a target recognition algorithm, projection of the captured image, and calculation of the actual displacement using target geometry and the number of pixels moved. To measure the displacement of a flexible structure from a distant location which can be regarded as a fixed reference point, a novel image processing method has been devised by means of successive estimation of relative displacement and rotational angle using a synchronized vision-based system. By measuring the same target with two independent cameras placed in a line, a redundant displacement value is obtained and can be utilized for calculating the rotational angle at the intermediate camera position. The effectiveness of the method has been validated through field tests of a full-scale five-story building frame structure.