

# **Employing vision-based sensing for long-term structural monitoring: Exploring the effects of stability on the robustness of DIC measurement**

**N. Kassotakis\*<sup>†</sup>, N. Burn\*, L. Fenney\*, A. Pillai<sup>†</sup>, L. Johanning<sup>†</sup>**

<sup>\*</sup>Imetrum, Wraxhall, Bristol, BS48 1NA

E-mail: name@imetrum.com, web page: <http://www.imetrum.com>

<sup>†</sup>College of Engineering, Mathematics and Physical Sciences, University of Exeter, Penryn TR10  
9FE, UK

Email: name@exeter.ac.uk

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## **ABSTRACT**

Digital Image Correlation (DIC) is a well-established technology in the realm of indoor, small-scale experimental material testing. Apart from short-term measurements, however, the same cannot be said for outdoor, long-term monitoring of full-scale structures belonging to the ever-growing domain of Structural Health Monitoring (SHM). Outside of a few unique case studies (i.e., numerous weeks of monitoring), DIC lacks employment for long-term monitoring campaigns. This study investigates spurious measurements of DIC in an outdoor context through various long-term experimental campaigns. Firstly, the displacement of various fixed control points was measured. This is herein termed drift, since it should be equal to zero. Apart from displacement drift, an array of camera stability (i.e., camera pitch, roll, and yaw) and environmental parameters (i.e., luminosity, humidity, temperature) were monitored simultaneously. The study found that: a) the effect of camera stability was of major significance to the displacement drift, b) the luminosity parameter was of major influence on the outlying displacements, however not drift; c) the temperature parameter was hypothesised as the cause of drift in all scenarios since it has a common periodicity with all the spurious measurements and physical rotations/movements of the camera; and d) the employment of camera stability and environmental sensors could improve the DIC data robustness. These findings are promising, demonstrating causes of avoiding spurious measurements and potential avenues of improving the overall robustness of DIC for its employment in SHM.