Adaptive Subset-based Digital Image Correlation for Micro-crack Evaluation

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ABSTRACT

This paper proposes adaptive subset-based digital image correlation (DIC) for micro-crack evaluation. The subset size selection plays an important role in DIC accuracy. Smaller subset size for DIC can enhance the local minute deformation analysis, but it may not include dominant speckle features, augmenting DIC errors. Moreover, optimal subset sizes can be spatially different if speckle patterns are spatially biased. In this paper, a novel adaptive subset size determination technique which assigns spatially optimized subset sizes within the region of interest (ROI) is proposed for enhancing DIC accuracy. One more superiority over the existing techniques is that the optimal adaptive subset sizes are automatically computed through iteration of a normalized cross correlation matching process within ROI. The proposed technique is experimentally validated by introducing micro-cracks in a concrete specimen with surface random speckle patterns. Furthermore, to show the superiority, the adaptive subset-based DIC accuracy is compared with the conventional ones.

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