A versatile stereo photogrammetry based technique for measuring fracture mode displacements in structures

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The measurement of fracture mode displacements in structures which are susceptible to cracking such as adhesive joints in composite components – is becoming increasingly important. Such measurements are essential for the understanding of the root causes for specific fracture damage types. Furthermore, they can be used to assess the remaining life span of a structure for its safe operation. An improved version of a previously devised small displacement measurement system (SDMS) is used to measure local relative displacements (LRDs) at the trailing edge of a wind turbine blade. A purpose-made automated image processing software (AIPS) allows a rapid and reliable evaluation of a multitude of subsequently taken measurements at a high-precision level. The SDMS is used to measure the LRDs at three different locations close to the trailing edge of a wind turbine rotor blade. In addition, complementary measurements obtained by linear transducers are compared with the associated LRD component obtained by the SDMS. The 3D LRD measurements showed to be in good agreement with the predictions of non-linear finite element analysis. The paper closes with a brief discussion of the proposed measurement approach and the nature of LRDs as they appear in close vicinity to trailing edge joints.

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