The determination of the material properties using DIC

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Nowadays, the strain gauge method or other contact methods of measuring deformation are often replaced by optical deformation measurement techniques. Among the most common and universally applicable optical non-contact methods is currently digital image correlation (DIC). The developed computational correlation algorithms allow to track the movement of material points in set of images capturing the deformation process with sufficient accuracy. This allow to obtain a sufficiently reliable estimate of the distribution of deformation fields. Therefore, the optical method of digital image correlation can be used to measure deformations in various applications, such as: monitoring the condition of structures, monitoring the growth of fatigue cracks, testing at high temperatures, etc. where the use of standard methods is difficult or financially expensive. The adaptability of the DIC technique lies in the possibility capture of images with standard cameras, applicability to a wide range of dimensions and materials of tested samples and structures.

The paper focuses on the use of open source MATLAB 2D DIC software Ncorr to evaluate the deformations of a test sample during a static tensile test. The results of the uniaxial strain estimation obtained by the DIC method were verified by experimental measurements using an installed strain gauge and a reference extensometer. Subsequently, the Ncorr software was extended with functions enabling the determination of the basic material parameters of the samples: Young's modulus of elasticity and Poisson's ratio.

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