The determination of basic material properties using DIC

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In determining the basic material properties, in recent years contact the strain gauge techniques of deformation measurements are often replaced by non-contact deformation measurement techniques. Digital image correlation (DIC) is currently one of the most popular non-contact optical method. The robust computational correlation algorithms developed so far allow a sufficiently accurate description of the movement of material points during the deformation of the tested sample. They effectively provide an estimate of the distribution of deformation field. For this reason, the relatively simple optical DIC method is widely used to estimate displacements and deformations in various applications: material characteristic investigation, structural condition monitoring, fatigue crack growth tracking, high temperature testing, etc. The adaptability of the DIC technique lies in the technology of image capture by standard cameras, applicability to a wide range of dimensions and materials of the tested samples and constructions.

The contribution is focused on the use of the open source MATLAB 2D DIC software Ncorr [1] to evaluate the deformations of the test sample during the static tensile test. Tensile tests were carried out on flat samples made in different dimensions and with different materials. The influence of selected parameters of the correlation algorithm in the settings of the Ncorr program on the estimation of deformations was evaluated. The results of uniaxial strains obtained by the DIC method were verified by experimental measurements using an installed strain gauge and a reference extensometer. Subsequently, the basic parameters of the material of the samples were determined: Young's modulus of elasticity and Poisson's ratio.

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[1] Blaber, J., Adair B., Antoniou, A. (2015) Ncorr: Open-Source 2D Digital Image Correlation Matlab Software, Experimental Mechanics 55:1105–1122