

Application of digital image correlation method for road and railway material testing

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Fast development of materials and technologies used in civil engineering has been observed in recent years. Many of these materials are heterogeneous or anisotropic. Therefore, it is necessary to use methods that allow a wider analysis.

Digital Image Correlation (DIC) is a precise, non-contact, optical method used for measuring the deformation of structural elements and materials subjected to external loading. The system consists mainly of digital cameras and specialised computer software. Cameras are used to capture consecutive images of the surface of tested object before and during the deformation period. The obtained digital image data is analysed by the DIC software in which the mathematical correlation analysis is applied. Finally, a set of displacement and deformation maps for the entire specimen surface is created (e.g. [1-3]).

The examples of the application of the DIC method for testing road and railway materials are shown in this presentation. In the first part, the theoretical fundamentals, advantages, and limitations of the DIC method are described. Then the implementation of this method for laboratory testing of selected materials is presented. The results of the tests carried out on asphalt mixtures, stone, concrete and soil stabilized with a hydraulic binder are discussed [4]. Special attention is paid to research on reinforcing geosynthetics used in road and railway structures [5]. The conducted research allowed evaluation of the possibility of implementing the DIC method to assess deformation of road and railway materials in laboratory tests. A wide spectrum of studied materials enabled to identify the areas in which the DIC method gives a significant advantage over traditional tensometric measurement methods.

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