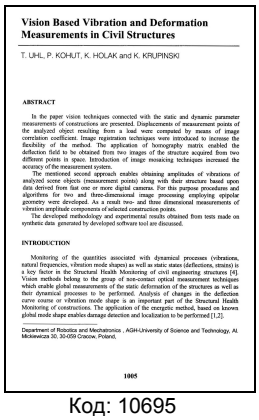

Vision Based Vibration and Deformation Measurements in Civil Structures

T. UHL, P. KOHUT, K. HOLAK and K. KRUPINSKI

ABSTRACT

In the paper vision techniques connected with the static and dynamic parameter measurements of constructions are presented. Displacements of measurement points of the analyzed object resulting from a load were computed by means of image correlation coefficient. Image registration techniques were introduced to increase the flexibility of the method. The application of homography matrix enabled the deflection field to be obtained from two images of the structure acquired from two different points in space. Introduction of image mosaicing techniques increased the accuracy of the measurement system.

The mentioned second approach enables obtaining amplitudes of vibrations of analyzed scene objects (measurement points) along with their structure based upon data derived from fast one or more digital cameras. For this purpose procedures and algorithms for two and three-dimensional image processing employing epipolar geometry were developed. As a result two- and three dimensional measurements of vibration amplitude components of selected construction points.

The developed methodology and experimental results obtained from tests made on synthetic data generated by developed software tool are discussed.

INTRODUCTION

Monitoring of the quantities associated with dynamical processes (vibrations, natural frequencies, vibration mode shapes) as well as static status (deflections, strains) is a key factor in the Structural Health Monitoring of civil engineering structures [4]. Vision methods belong to the group of non-contact optical measurement techniques which enable global measurements of the static deformation of the structures as well as their dynamical processes to be performed. Analysis of changes in the deflection curve course or vibration mode shape is an important part of the Structural Health Monitoring of constructions. The application of the energetic method, based on known global mode shape enables damage detection and localization to be performed [1,2].

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Ключевые слова:

Содержание.