COMPUTER VISION METHOD FOR ANALYZING THE OSCILLATION AND DISPLACEMENT OF SPECIMENS DURING MECHANICAL SHOCK TESTS

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Abstract:

The Spiez Laboratory tests civil protection components of all types against ground shock on specific shock test facilities. Acceleration sensors and velocity measurements provide hereby information about the displacement by integrating the corresponding signal. Until now, only post-shock functional tests and visual controls are feasible to carry out a subsequent damage analysis. For this reason, a novel computer vision based method is developed in order to capture the whole horizontal shock process which allows the analysis of the specimen oscillation, its deflection as well as the detection of design vulnerabilities.

As an initial task, the existing measurement data acquisition has been synchronized with the newly employed high speed camera system. Following, the latter has been positioned and calibrated in order to carry out first test measurements to register the displacement. Based on the obtained data, it has been decided to develop an individual solution with the help of the OpenCV library and point markers. Hereby, the main procedure is as follows: set up camera, calibrate camera, install test specimen, register camera images during the shock and evaluate camera images. One crucial task is the camera calibration. With the help of a specifically designed calibration target, it was achieved to correct any errors due to the camera optics as well as the perspective of the camera.

Consequently, a method was elaborated to measure the displacements in the measuring plane independently of the camera position. Hereby, different software solutions were programmed for the calibration, measurement and evaluation. By experiments it was shown that the novel measuring system is functional with an accuracy of approximately ± 2 mm.