Calibration analysis of a computational optical system applied in the dimensional monitoring of a suspension bridge

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This paper describes the analysis of the calibration procedure of a computational optical system applied in the dimensional monitoring of the 25th of April suspension bridge (P25A) in Lisbon (Portugal). The analysis includes the displacement optical measurement approach, the calibration method, the reference standard prototype and the experimental setup. The evaluation of the measurement uncertainty is described, including input measurement uncertainty contributions related to the experimental design and the use of Monte Carlo numerical simulation as tool for determination of the measurement uncertainty related to the calibration test, as well as a sensitivity analysis to identify the major sources of uncertainty. Conclusions are drawn about the suitability of the calibration method and reference standard prototype.

Keywords: Optical Metrology, Computational Vision, Suspension Bridge, Displacement

1. Introduction

Safe mobility of persons and goods in transport networks is a growing concern of society due to human and economic consequences related to eventual failure. Visual inspection, observation and monitoring of key-elements in transport networks – such as bridges and viaducts – provide relevant information on their condition and structural safety. In this framework, several types of quantities can be measured in order to characterize both structural actions and responses.

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