



Vision-SHM method for structural monitoring based on photogrammetric computer vision

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Abstract

In this paper, a method called Vision-SHM is presented. It is based on photogrammetry and post-processing of data, specifically developed to monitoring load tests on reinforced concrete framed structures, with or without masonry wall infill. A multi-station approach enables to reach the resolution required for structural analysis. The proposed method allows a complete and discrete characterization of the deformed shape evolution. Furthermore, displacement and strain fields are easily computed, as well as the corresponding principal directions, particularly relevant in D-regions, such as beam-to-column nodes. The main advantage of this method is both the quantity and quality of the information obtained by using a single acquisition system. The parameters computed in the scope of structural analysis, namely, the detailed characterization of the deformed shape, and identification of the compressive strut and cracking regions, provide important data to support the development and validation of innovative design methods for rehabilitation and strengthening of existing structures.

Keywords: inspection; maintenance; assessment; repair; instrumentation; monitoring; image-processing; concrete.

1 Introduction

The design methods for rehabilitation and strengthening of existing structures are based on the knowledge of both material properties and structural behaviour. The detailed survey of the structures behaviour is important to generate innovation and design excellence in the built environment. To learn with the existing projects is a way for development and implementation of innovative conceptual design processes. In a first approach, the new concepts are tested and validated in experimental environment. Structural monitoring plays a significant role to the comprehensive assessment of both infrastructures

and experimental research tests. The improvements that have been presented are focused on getting more and better information about the structural behaviour. These are often based on the application of cutting edge technologies, allowing obtaining a high amount of data and presenting customized post-processing interfaces. The frontier research resulting from the collaboration between different areas of engineering, such as civil, electronic and computer, and architecture and construction industry contributes to improve the design processes. In this scope, vision systems have experienced a significant evolution in the last decade, noticeable by the number of scientific publications and by the emergence of commercial