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# ESTIMATION OF VERTICAL DEFLECTIONS IN CONCRETE BEAMS THROUGH DIGITAL CLOSE RANGE PHOTOGRAMMETRY

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Abstract. Deformation monitoring, and in general structural health monitoring, of civil infrastructure systems is important in terms of both safety and serviceability. Traditionally, large structures have been monitored using surveying techniques, while fine-scale monitoring of structural components has been done with geotechnical instrumentation. This paper reviews the advantages and disadvantages of using remote sensing methods, such as terrestrial laser scanning and digital close range photogrammetry, for the purposes of precise 3D reconstruction and the estimation of deflections in structural materials. It is also shown how a low-cost setup of multiple digital cameras and projectors can be used for the monitoring of concrete beams subjected to different loading conditions by a hydraulic actuator. The photogrammetric system used does not require any physical targets other than for the purposes of establishing the relative orientation between the involved cameras. The setup was tested in two experiments, and the beam deflections resulted from the photogrammetric system were compared to the ones from a set of one-dimensional laser transducers and a terrestrial laser scanner. The experiments proved that it was possible to detect sub-millimetre level deformations given the used equipment and the geometry of the setup.

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