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SHAPE AND DISPLACEMENT MEASUREMENTS USING ISOGEOMETRIC STEREO-CORRELATION

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The aim of this study is to measure the 3D shape and the displacement fields of a structure by using *a priori* information about its surface representation (i.e. CAD model using NURBS [1]) in a StereoDIC framework [2]. Using isogeometric S-DIC [3], the shape and displacements measured remain completely consistent with the surface description. Figure 1 shows the results for such an approach when applied to a compression test on upper diaphragm tube used in landing gears.

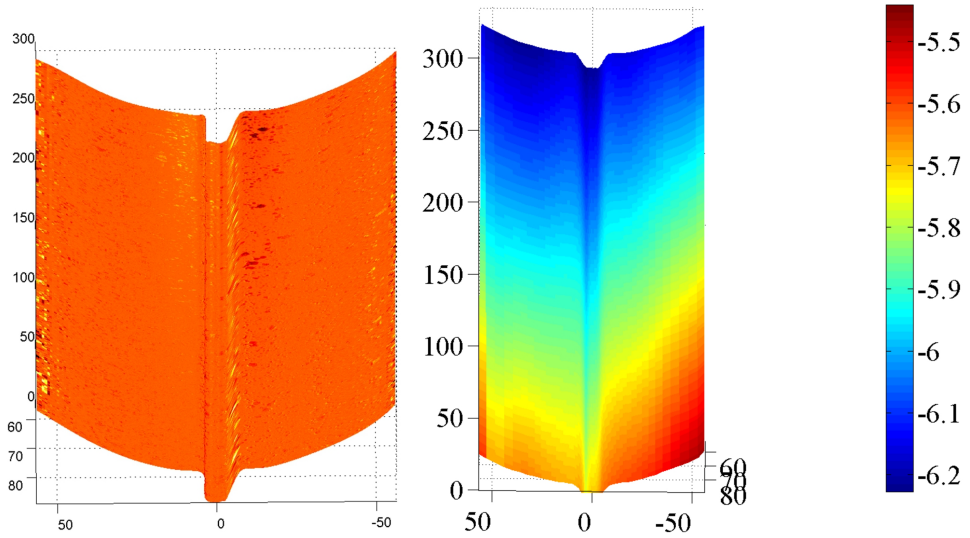

Figure 1: Shape and displacement measurements (along vertical axis) of an industrial part using isogeometric stereoDIC during a compression test

Although the majority of StereoDIC methods provide clouds of 3D displacement vectors associated with clouds of 3D points [2], which are subsequently interpolated to get continuous fields, the proposed isogeometric stereoDIC allows continuous 3D shape and displacement fields to be measured using NURBS as both shape and kinematic base (Figure 2). This type of approach constitutes a natural tool to bridge the gap with numerical simulations based on isogeometric analysis.

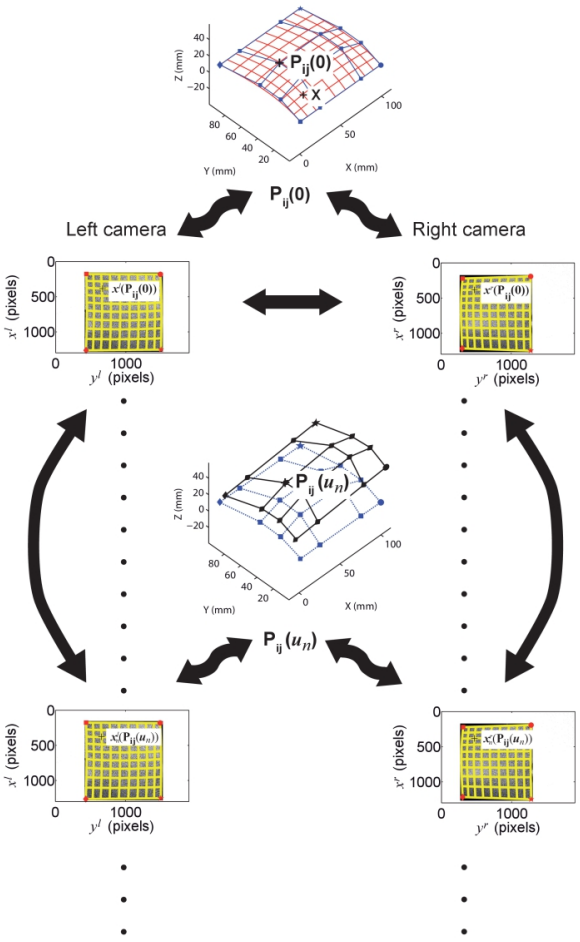

Figure 2: Isogeometric approach to stereoDIC used in this study. The first part is dedicated to shape measurement (described by control points P_{ij}), the second one to the displacement of the control points

REFERENCES

[1] L.A. Piegl and W. Tiller. *The Nurbs Book*. Monographs in Visual Communications. Springer Berlin Heidelberg, 1997.

[2] M. A. Sutton, J.-J. Orteu, and H W. Schreier. *Image correlation for shape, motion and deformation measurements*. Springer, 2009.

[3] B. Beaubier, J.-E. Dufour, F. Hild, S. Roux, S. Lavernhe, and K. Lavernhe-Taillard. Cad-based calibration and shape measurement with stereodic: Principle and application on test and industrial parts. *Experimental Mechanics*, 2013.