

Title: A discretize-then-map approach for the treatment of parameterized geometries in model order reduction

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Abstract: We present a general approach for the treatment of parameterized geometries in projection-based model order reduction. During the offline stage, given (i) a family of parameterized domains, (ii) a parameterized mapping between a reference domain and the parameter-dependent domain of interest, and (iii) a finite element triangulation of the reference domain, we resort to an empirical quadrature procedure to select a subset of the elements of the grid. During the online stage, we first use the mapping to "move" the nodes of the selected elements and then we use standard element-wise residual evaluation routines to evaluate the residual and possibly its Jacobian. We discuss how to devise an online-efficient reduced-order model and we discuss the differences with the more standard "map-then-discretize" approach (e.g., Rozza, Huynh, Patera, ACME, 2007); in particular, we show how the discretize-then-map framework greatly simplifies the implementation of the reduced-order model. We apply our approach to the two-dimensional RANS simulations of the flow past the Ahmed body.

The work is in collaboration with Professor Angelo Iollo, Dr. Lei Zhang (Inria Bordeaux), and Dr. Andrea Ferrero (Politecnico di Torino).