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# Model order reduction and domain decomposition strategies for the solution of the dynamic elastic-plastic structural problem

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## Abstract

A new strategy for the efficient solution of highly nonlinear structural problems is proposed, based on the combined use of Domain Decomposition (DD) and snapshots version of the Proper Orthogonal Decomposition (POD) techniques. The formulation here presented is tailored for applications in elastic-plastic structural dynamics. In this context the POD is applied to domains that remain elastic and a double strategy to update the reduced basis is adopted. First, the Singular Value Decomposition (SVD) proposed allows to update the reduced basis as soon as a new snapshot is stored; secondly, an *online* adaptation technique of the reduced space is performed, through a plastic check during the reduced analysis. The applications show that the computation time necessary for solving elastic-plastic problems can be reduced of approximately 50%, while keeping accuracy comparable to that obtained for the full model with a classical monolithic method.

*Keywords:* Proper Orthogonal Decomposition (POD), Domain Decomposition (DD), non-linear Model Order Reduction (MOR), elasto-plasticity, Singular Value Decomposition (SVD).

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