RBniCS – reduced order modelling in FEniCS

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`RBniCS` [1] is a python-based library, developed on top of `FEniCS` [3], aimed at the developement of reduced order models in the `FEniCS` environment. In particular, reduced order techniques such as the certified reduced basis method and proper orthogonal decomposition-Galerkin methods are implemented. The `FEniCS` project allows `RBniCS` to take advantage of the high-level (e.g., human readable) code used for the automated solution of partial differential equations. Thanks to the features of `FEniCS` the final user needs to prepare a short code (around 100 lines) to carry out a reduced order simulation.

It is ideally suited for novice users willing to learn reduced basis methods and reduced order modelling, thanks to an object-oriented approach and an intuitive and versatile python interface. Indeed, it is a companion of the introductory reduced basis handbook [2], and has been already used in doctoral classes within the "Mathematical Analysis, Modelling, and Applications" PhD course at SISSA, as well as for courses within the "Master in High Performance Computing" held by SISSA and International Centre for Theoretical Physics (ICTP).

`RBniCS` can also be used as a basis for more advanced projects that would like to assess the capability of reduced order models in their existing `FEniCS`-based software, thanks to the availability of several reduced order methods and algorithms in the library.

References

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[3] A. Logg, K.-A. Mardal, G. N. Wells, et al. *Automated Solution of Differential Equations by the Finite Element Method*. Springer, 2012.