

## Isogeometric analysis based reduced order modelling for incompressible viscous flows in parametrized shapes: applications to underwater shape design

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We provide a new concept "tool" from CAD-like geometry to final simulation with the aim of dealing with parametrized shapes managed by efficient free-form deformation techniques into an isogeometric analysis setting. This tool is totally integrated into model order reduction techniques, based on POD, developed for stable incompressible viscous flows (velocity and pressure) in parametrized shapes. This computational environment has been created in the framework of the project UBE – Underwater Blue Efficiency – for the optimization of the shapes of immersed parts of motor yachts, including exhausting flows devices. The study is benefitting of several properties of reduced order modeling approaches such as offline-online calculations for parametric design, as well as synergies with isogeometric analysis properties. Convergence, stability and consistency properties are verified as well in test case and then applicative results are introduced.

### References

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