

Solving multi-physics models with NGSolve

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In this talk we present the multi-physics structure of our finite element software library NGSolve. Its strength is the abstract problem formulation in generic function spaces. Particular realizations are high order finite element spaces for scalar as well as vectorial fields, and continuous as well as hybrid discontinuous elements. This allows a native discretization of many different physical fields.

We present element-level p-version and sub-domain level h-version domain decomposition preconditioning strategies which are generic for a wide class of elliptic equations, and are well suited for large scale parallel computing.

We discuss high order coupling strategies between non-matching meshes, which allow the discretization of moving domains.

We give some examples of multi-physics simulations, and discuss the coding-effort of extending NGSolve to new physical effects not considered by the library at the time of development.