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Two-phase flow simulations in pore-geometries

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Pore scale simulations of multi phase flow in porous media present a promising approach in the development and verification of continuum scale models as well as in the understanding of the underlying processes of flow phenomena like hysteresis or the peculiarities of the capillary fringe. As typical pore geometries involve complicated geometries with peculiar topological properties, the generation of a computational mesh, required by finite element (FE) based simulation approaches, becomes a limiting obstacle.

We present a numerical discretization based on discontinuous Galerkin methods which does not require a grid which is fitted to the computational domain. In this approach, the resolution of the domain boundaries may be chosen independent of the FE basis. Furthermore, we will present discretization techniques allowing for an accurate representation of the interface conditions i.e. the jump in the pressure and the velocity derivatives. First results of simulations for two-phase flow in pore geometries are discussed.