

Robust untangling of curvilinear meshes

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In this talk, we present a technique that allows to untangle high order/curvilinear meshes. The technique makes use of unconstrained optimization where element Jacobians are constrained to lie in a prescribed range through moving log-barriers. The untangling procedure starts from a possibly invalid curvilinear mesh and moves mesh vertices with the objective of producing elements that all have bounded Jacobians. Bounds on Jacobians are computed using robust estimates.

The technique is applicable to any kind of elements, both for surface, volume, hybrid or boundary layer meshes. A series of examples demonstrate both the robustness and the efficiency of the technique.

In some examples we show that it is possible to control the stable time step of the computation for curvilinear meshes through an alternative element deformation measure.