17th MSS-Seminar

Wednesday, May 11th, 15:30, Nägelsbachstr. 49b

Elliptical Grid Smoothing with Grid Orthogonality at the Boundaries - Theory, Implementation into a CFD code and Validation of the Implementation

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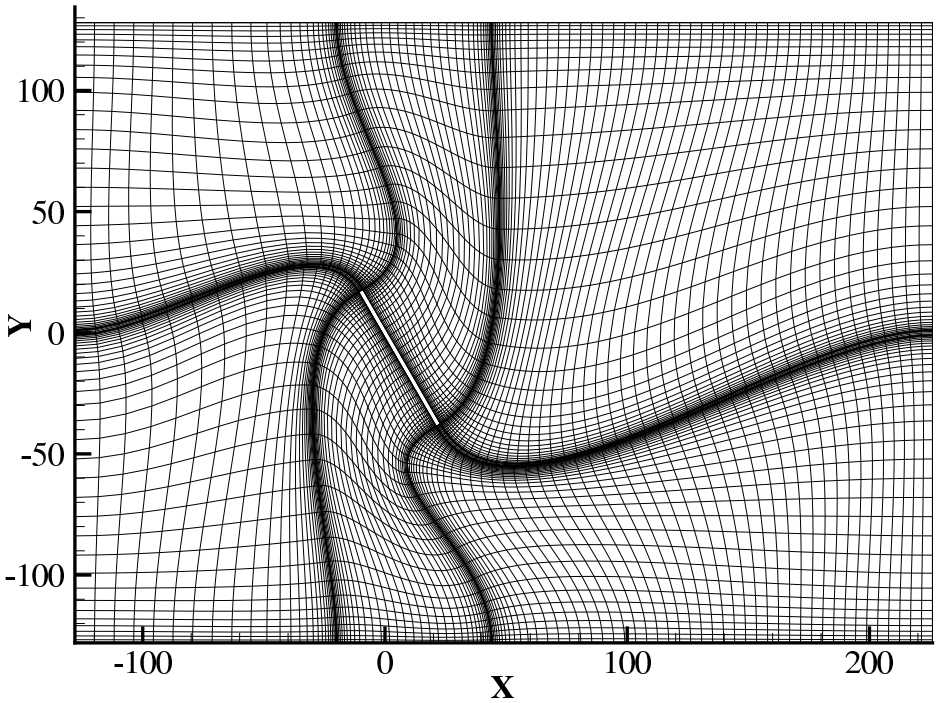

One of the most important aspects of CFD simulations is the grid, on which the calculations are performed. In the case of block-structured grids, especially the smoothness of the grid plays an important role when it comes to properties like convergence rate and partly to the error of the approximation. In the case that the underlying geometry of the problem is fixed and only a single grid is needed for a specific calculation, it can be generated by the user in a satisfying way. But if the geometry is time-dependent, e.g. in the case of Fluid-structure-interactions or Flows with free surfaces involved, there may be as much demand as a different grid per timestep. In the latter case, an automatic grid generation algorithm has to be sought, which not only generates body-fitting grids, but the generated grids also have to come with a high degree of smoothness, especially if the boundaries of the grids get heavily distorted. The elliptical grid smoothing algorithm presented in this work fulfills these properties and can also achieve grid orthogonality at the boundaries, which is a quite important grid property for CFD simulations. The method therefore defines the grid as the solution of a system of partial differential equations, which is then approximated numerically. The aim of this work is to implement the grid generation equations into the CFD code FASTEST-3D. Some examples of the results show the correctness of the implementation.