

Bachelor's thesis No.: LSS-B?
Task for the Bachelor's thesis of:

Systematic investigation of the mesh quality and various mesh smoothing algorithms on the numerical flow simulation

Overall topic:

Numerical simulations of heat and fluid flow problems are predominantly influenced by the applied computational mesh topology and the mesh quality. Block-structured meshes offer numerous advantages, but their generation involves higher manual interaction compared to unstructured meshes. Various parameters control the quality of these block-structured meshes, which can further be improved using various mesh smoothing methods. The present thesis should systematically investigate the available mesh smoothing techniques in the commercial mesh generation tool *ANSYS IcemCFD* for various academic configurations. Furthermore, simple fluid flow simulations should prove the importance of the mesh quality.

Tasks in detail:

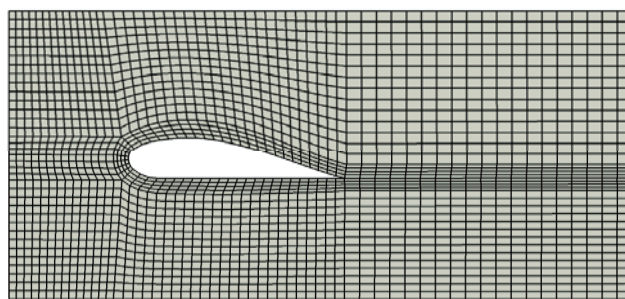
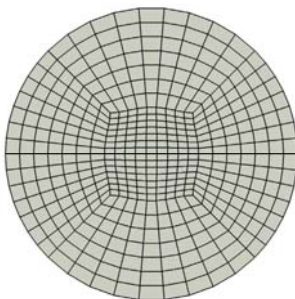
- Perform block-structured mesh generation for simple academic configurations in ANSYS IcemCFD, including junction and bends, etc.
- Apply all the available mesh smoothing algorithms (i.e., Laplace smoothing, Sorenson-Laplace, Sorenson-Thomas & Middlecoff, Hilgenstock - Thomas & Middlecoff, etc.) and check the obtained mesh quality.
- Perform simple fluid flow simulations on these meshes.
- Check accuracy, robustness and computational cost, as a function of mesh quality.
- Draw conclusions.

Pre-requisites:

- Basic knowledge in Computational Fluid Dynamics
- Experience with a CAD software is advantageous

Supervisor:

- PD. Dr. Gábor Janiga (janiga@ovgu.de)



Beginning: as soon as possible