Near-wall Boundary Conditions for Large Eddy Simulation

Near-wall turbulence modelling is computationally a very expensive problem. The project is devoted to a novel approach based on non-overlapping domain decomposition. It allows us to avoid calculations of the region with high gradients in the vicinity of the wall while retaining sufficient overall accuracy. The technique has been successfully applied to low- and high Reynolds number RANS models [1-4]. The domain decomposition is achieved via the transfer of the boundary condition from the wall to an interface boundary. The obtained interface boundary conditions are mesh-independent. They can be used to avoid the computationally expensive resolution of a high-gradient region near the wall. Moreover, once the solution is constructed in the outer region, the near-wall profile can be resolved if required.

In the project, the approach will be extended to essentially unsteady problems and complex geometries. In application to Large Eddy Simulation it will be combined with the mode decomposition techniques such as Proper Orthogonal Decomposition and Dynamic Mode Decomposition to reproduce stochastics in an efficient way. If successful, the results can be widely used for industrial applications.

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