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# An Efficient Platform to Capture Flow Features In Industrial Applications

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## Extended Abstract

Computational Fluid Dynamics for industrial applications, like internal flows with obstacles or mixing configurations, can provide great insight into flow features and facilitate optimizing performance in such configurations. Even with the use of an appropriate turbulence model, numerical modelling of these flows can be quite expensive to capture the evolving flow features. We use a cut-cell approach to accurately capture the geometry of such flow configuration along with an octree-based grid structure leading to high-resolution, unity aspect-ratio grids. The method is implemented in an open-source finite volume platform; scripts are used for the complete process from geometry tessellation to initial hex mesh with cut cells to define the geometry, followed by an octree level refinement in the solver to capture the flow features accurately. Test cases include mixing tee geometry with a parametric study to find the most effective mixing conditions (equal Re for hot vs. cold fluid when compared to other combinations like equal mass flow rate for hot and cold fluid) and flow past obstacle for a given block ratio in a pipe. Specific vortex structures in the wake of the obstacle as well as horse-shoe vortices at the leading edge of the obstacle are identified. This work serves as a methodology to conduct high-resolution fluid dynamics to study efficient mixing configurations as well as capture flow features in complicated geometries with vanishing gap between the obstacle and pipe.